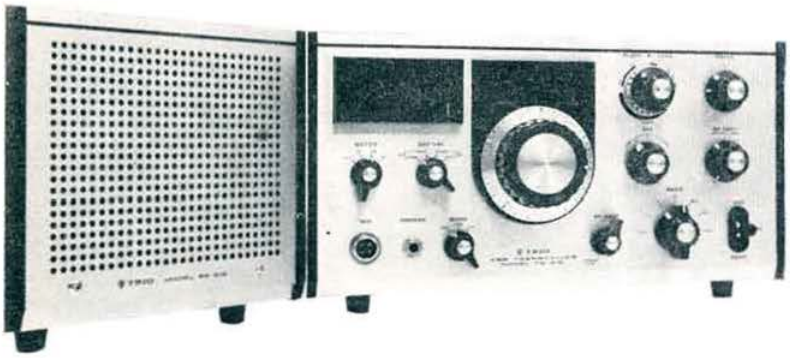
SEPTEMBER 1973

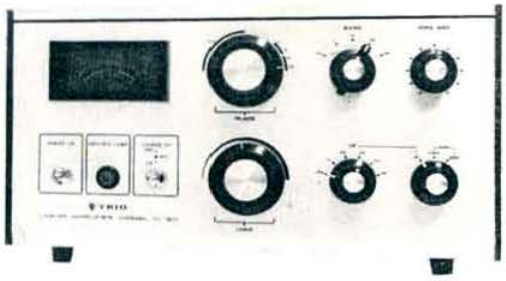
RADIO COMMUNICATION

REVIEWED IN THIS ISSUE



THE TRIO MODEL TS515 SSB TRANSCEIVER

The TS515 with its associated psu and speaker Model PS515



The Trio TL911 linear amplifier designed for use with the TS515

RSGB Diamond Jubilee Year

1913 – 1973

Journal of the Radio Society of Great Britain

SEPTEMBER 1973

RADIO COMMUNICATION

Volume 49 No 9 Price 40p

CONTENTS

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HW-202


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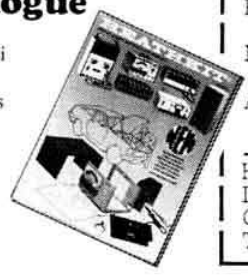

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15012 15037 13062 15087 15112 15137 15162 15187 15212 15237 15262 15287 15337 15362 15437 15462 15475 15487 15512 15537 15562 15587 15612 15637 15687 15712 15737 15837 15887 15912 15937 15962 15987

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2XL (METAL 10X)

2184 2638 2844 2854 4868 2875 2889 2910 2924 2931 2938 2945 2950 2952 2966 2968 2980 2987 3008 3023 3072 3081 3102 3142 3278 3403 3411 3432 3446 3460 3467 3474 3881 3495 3841 3921 4140 4182 4257 4399 4410 4415 4417 4418 4420 4422 4427 4431 4435 4444 4465 4469 4473 4478 4654 4689 4703 4710 4724 4808 4860 4889 4966 5010 5491 5499 5506 5514 5521 5551 5566 5589 5599 5604 5611 5619 5626 5630 5641 5642 5649 5654 5659 5671 5680 5687 5692 5695 5697 6337 6537 6540 6552 6557 6559 6567 6582 6590 6597 6612 6627 6634 6637 6640 6642 6647 6649 6652 6657 6659 6662 6664 6667 6672 6677 6791 8364 8439 8837 8839 8854 8862 8864 8871 8888 8913 8953 8956 8967 8971 8983

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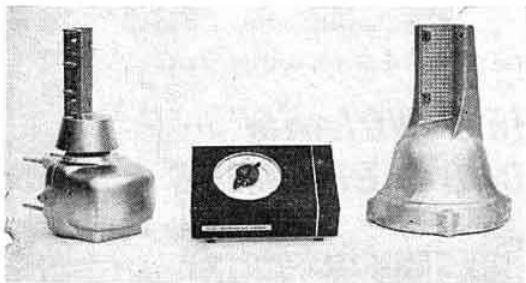

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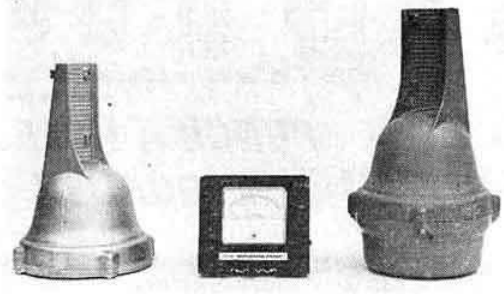

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ALL ROTATORS Ex-stock—Try us and see!

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70/¼. 70 MHz, ¼ wave ...	£3·00	BGA, 144 MHz, ¼ wave ...	£6·15	Magnetic mount	£6·15	Note. Deduct 50p from price of aerial if base is not required.
144/¼. 144 MHz, ¼ wave ...	£2·85	B5, 144 MHz, ¼ wave ...	£4·35	All aerials complete with base.		

G WHIPS (Carr. 50p Coils, 20p) THE FINEST MOBILES (Ex-Stock) + VAT

Tribander 10, 15, 20m. ...	£9·45	LF160 160m. coil	£7·50	160 Ranger	£7·40	80m. coil	£4·00
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GEM-QUAD. The best FIBREGLASS 10–15–20m. QUAD + VAT Carr. paid.

2 ele.	£74·50	3 ele.	£109·80	4 ele. ... ... £144·00	Conversion kits ex-stock.

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Hy tower, 10-80m. (self-sup)	£110·00	LC800, 80m. coil for 14 AVQ	£7·75	TH3 Jnr., 10-20m. 3 ele. 600W.	£51·50	203BA, 20m. 3 ele. beam ...	£72·00
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12AVQ, 10-20m. vert. ...	£16·50	TH3MK3, 10–20m. 3 ele. 2 kW	£75·00	DB10-15 10-15m. 3 ele. ...	£57·50	103BA, 10m. 3 ele. beam ...	£28·50
14AVT, 10-40m. vert. ...	£24·50			204BA, 20m. 4 ele. beam ...	£80·00	LA1 Lightning arrestor ...	£14·50
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Mustang, 10-20m. 3 ele. 2kW	£45·50	TA33 Jnr., 10–20m. 3 ele.	£36·50	TA32 Jnr. 'E' for 2" mast	£26·50	SWL Listeners dipole ... £12·50
TA33 Jnr. 'E' for 2" mast ...	£37·00	TA32 Jnr. 10–20m. 2 ele. ...	£29·00	TA31 Jnr. Rotary dipole ...	£17·00	

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

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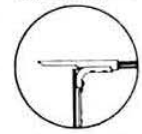
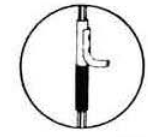


The original hinge and sleeve clutch mechanism.



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BMI Bumper mount	£5·00	RM10	£4·97	RM20	£6·12	RM75	£8·12
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T286A	6m.	(4 x 1·5m.)	£11·60	T3610A	10m.	(5 x 2m.)	£19·70	T3612B	12m.	(4 x 3m.)	£19·60
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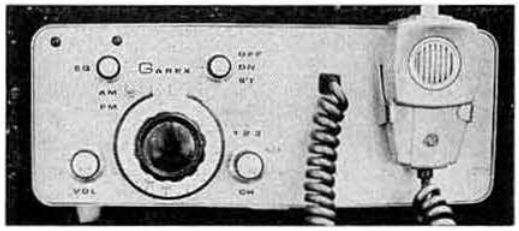

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TX only as above to special order. UHF Terlonic sweep generator. 440 to 900MHz. Microwave generator. Creep 7B generator. Wind generator. Pen recorder 240/440V.

COMPONENTS

FM (Phase Mod) RF P.C. board. Fully transistor, assembled. Suitable for 4-9 or 12MHz crystals. Osc. Multipliers and Mod. 24MHz output at 0.5W. 12-14V DC input. Circuit and mod. sheets supplied. Can easily be GDO'd for an 8MHz crystal. Ideal for the front end of a fully transistor transmitter. AM or AM/FM. Please state if 4—9 or 12MHz model is required. **£4.85**

FM/AF Board (TX) to suit phase mod. Board **£1.85**
ditto—slightly soiled **85p**

455kHz FM IF board. **£2.65. 455kHz AM IF** board. **£2.65.**
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10.7MHz IF board. **£2.35**
ditto—slightly soiled **£1.70**

Mic pre-amp boards. **52p**
FM squelch board **52p**
AM squelch board **27p**

CAMERA VIDEO BOARDS. Completely assembled. **£3.50** inc. post.
ditto—slightly soiled **£2.30**

Plug-in Rectifier valve replacement stack. Octal(int) base. Full wave diodes 2·6kV peak at 200 ma plus. **68p**

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P.P. OC28/35 to QQV03-20a. (Driver to suit **50p.**) **£1.25**
Single EL84 to QQV03-10. **85p**
P.P. EL84 or similar to QQV03-20a. **£1.80**

All the above are assembled and include circuits.

Type 'O' variable capacitor 410pf, size 1.25" × 1.37" × 1" deep **22p**
Diodes 1AS029 **10p. 12 for £1**

Rectifier Boards 4 diodes for bridge cct, etc. Plus one bias diode RF choke and resistors **8p**
Matrix pins, 100 pkt., lead through types **10p**
4 small assorted VHF pre-set air sp. trimmers **25p**
1 amp cct breakers **40p.** Crystals 5.000MHz **25p;** 2 metre 9MHz (low end of band) **50p** all HC6U 2.4 and 6.0MHz B7Q **25p.**
Aluminium chassis 6" × 4" × 2.5" h. **45p**

Valves EB91 **10p;** 6BQ7A **15p;** 6BH6 ex. **12p**

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Transistors NKT404/OC28 ex. **10p;** 2G220 ex. **15p;** DT1602 **5p;** MJ2254 **15p;** 2G228 **25p;** ADY23 **25p.** Diodes 303C33 **15p;** 1N23B **25p**

Relays 12V 2 pole c.o. ex. **15p;** 12V 4 pole co., ex. **17p;** 12V heavy duty 25a S.C. **35p;** 12V ceramic ins. 4 pole co., plus 1 make. 8 amp cct **25p;** 2 pole c.o. 2" spacing, ceramic, ideal for HF TX **50p**

Audio kit Transistor, assembled P.C. board, Driver and p.p. out OC28/NKT404. Transformers (3 ohm output) and cct **£1.75**

Mains Transformers Base Station, quick heat QQZO6-40. 110-240 Pri. Sec. 7 windings. 232V, 276V, 60V, 50V, 2.1V, 17.5V and 12.6V. 11.5 lbs. **£3.75**
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110-240 pri. sec. 170-0-170 at 90ma; 50V at 50ma; 6.3 at 3.3 amp. 4" × 3.5" × 2.7" h. plus 1.25" under chassis. 5.5 lbs. ex. **85p**
110-240 pri. sec. 0-146V-232V at 160ma; 26.5V at 1 amp; 13.9V at 5 amp; 50V at 50ma; 4.75" × 4" × 3.25" h. plus 1.1" under chassis. 10.5 lbs. **£2.50**
230/40 Pri. Sec 380-0-380 @ 240ma C core W 7lbs. 4 × 3·75 × 4·5"h. **£3.75**
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230/40 Pri. Sec 0-72V @ 40ma 0-6·8V @ 10a 0-6·3 @ 4·5a. C core W 5·5lbs 4 × 3·75 × 4·25"h **£2.50**
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Small 110 Pri. Sec 30 100ma **2 for 50p**

Filters 50kHz. 455 L **25p**

Chassis Section Mobile PSU 380V at 160ma, complete 90% wired, ex., Bridge Rec **£4.75**
ditto—slightly soiled **£4**

Readybuilt Mobile PSU New chassis section input 12-16 vdc outputs 450V bridge. 50V bias plus. 2.2. and 1.1 heater windings if required. ADZ11 transistors. Potted Toroidal transformer. 450V section will voltage double for SSB HF transmitters, inc. cct. As mentioned in recent article. **£10.85**

Toroidal Transformers BR 12V dc. input. All ex.

	265V at 150ma output	2.25" × 2" × 1.6"	**£1.60**
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V db.	390V at 200 ma	2.9" × 2.5" × 2.5"	**£1.75**
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All potted inc. ccts. ex. denotes ex equipment.

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ditto in 3" width. **20p**

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TW cases 4.5 × 12 × 8" deep, perforated, as used with Twomobile. Inc. loose back and front cover. **£4.25**
Less front and back covers **£3.50**

FM Transceiver RBM A41 38-55MHz. Fully tuneable. Inc. battery holder and back pack assemb y.

Base Station STC AM662 HB 6-40a PA Fully trans. RX Xtal filter 12.5kHz spec. **£75**

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Due to staff holidays, a slight delay may occur during the mid two weeks of September.

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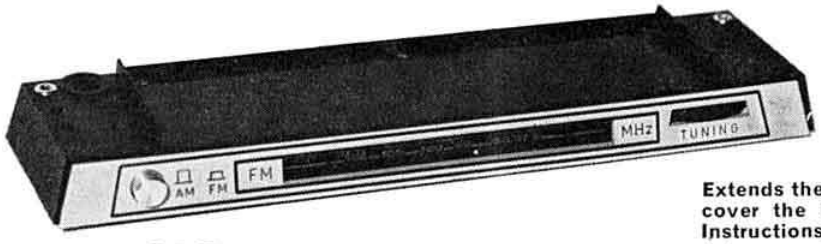

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QTC AMATEUR RADIO NEWS

Ignition interference

Existing regulations require that combustion engines do not radiate electro-magnetic energy exceeding specified limits between the frequencies of 40MHz and 70MHz. The Wireless Telegraphy (control of interference from ignition systems) Regulations 1973 extend the upper frequency limit to 250MHz.

IARU meeting

A meeting of the vhf managers of the national societies of the IARU Region 1 division will be held at the headquarters of the DARC at Baunatal over the weekend 12 to 14 October 1973. The existing 144MHz band plan will be under discussion and the meeting will consider future plans for repeaters and beacons.

New books from RSGB

On sale at the Leicester exhibition in October will be three new books published by the Radio Society of Great Britain—*Amateur Radio Awards* compiled by C. R. Emary, G5GH, containing details of the world's major awards and much operating information; the 1974 edition of the *RSGB Amateur Radio Call Book*, a new method of production enabling late information to be included; and the *Teleprinter Handbook*, an entirely new book of 380 pages by D. J. Goacher, G3LLZ, and J. G. Denny, G3NTT, covering the entire field of European and American teleprinters and associated equipment, and a unique book in this field of amateur radio.

Amateur Radio Awards is available now—details on this page; obtain your copies of the other publications from the RSGB stand at the exhibition or from Society headquarters from the last week in October.

Also coming soon is *Ham Notebook*, a 175-page paperback containing the best of the feature of that name which appears monthly in *Ham Radio Magazine*.

Vacancy at RSGB HQ

A vacancy exists at RSGB headquarters for an **administrative assistant**, who should have held an amateur transmitting licence (Class A) for at least five years.

The applicant should be prepared to deal with technical and members' queries, either by correspondence or telephone, on general technical matters, reciprocal licensing and other aspects of amateur operating.

Working hours: 9.15 to 5.15, five days a week. It is suggested that the post would be suitable for someone in the age range 50 to 60. Salary subject to negotiation.

Write in confidence to: The General Manager, RSGB, 35 Doughty Street, London WC1N 2AE, and mark the envelope "Personal."

"The Milliwatt"

This is the title of the regular publication of the QRPP which is devoted to the activities of amateur radio operators using under 5W. There are six issues in each year, each containing 16 to 20 pages devoted to low-power operation. Printed by litho in A5 format, the *Milliwatt* is a low-cost publication obviously fulfilling its purpose in carrying news of this facet of amateur radio.

Subscriptions are £1.60 for six issues and the UK agent is Waters and Stanton Electronics, 8 Gay Bowers, Hockley, Essex. The publication is sent direct to subscribers from the USA.

Licence figures

The Ministry of Posts and Telecommunications advises that the following numbers of amateur licences were in force at 30 June 1973:

Class A	14,732	Class B/M	1,013
Class B	3,296	Television	247
Class A/M	3,030		

DF dinner

Mr R. J. Pearce-Boby, well known in df circles, is organizing a dinner for the df fraternity on Friday 16 November 1973. This will take place at the "Chicken in the Basket", Benson, between Oxford and Wallingford, and it is hoped it will be the first of an annual event. Details will be published later.

Start 'em young

Among the well-known "Ladybird" series of books for children are two which will have particular appeal to those with an interest in electronic subjects. These are *The Story of Radio*, one of the "Achievements" series, and *Making a Transistor Radio* in the "How to make it series".

The first of these tells the story of radio from the early forecasts of Maxwell and the experiments of Hertz and Marconi to modern communication via satellites.

With the help of full-colour illustrations, the second covers such topics as aerials (including how to wind ferrites), earths, components, simple transistor circuits and regenerative receivers, all in the context of the general theme of the book, which is the stage-by-stage construction of a transistor radio. It would make an ideal small gift for the son/grandson/nephew who shows an interest in things electronic, and who has some degree of simple constructional ability.

Both books are obtainable from RSGB at 20p each, inclusive of postage and packing.

Scottish VHF Convention and Region 13 ORM

22 September 1973

Pollock Halls of Residence

Edinburgh University

PROGRAMME

2pm: Opening ceremony followed by ORM. (GM3AEL, G3FZL and G3GVV will represent Council).
2.45pm: "VHF/UHF Affairs", by Geoff Stone, G3FZL.
3.30pm: Tea and biscuits.
4pm: "Portable experiences" by G. I. Knight, GM8FFX. (It is also hoped to run a session on "Getting started on microwaves" in parallel).
5.30pm: Informal discussion.
6.30pm: Dinner followed by trophy presentations.

As part of the convention there will be a constructional exhibition with a prize for the best entry.

Tickets: Convention only .. 30p. Lunch (1pm) .. 70p. Convention and dinner .. £1.25.

Available from V. W. Stewart, GM3OWU, 9 Juniper Avenue, Juniper Green, Midlothian EH14 5EG, to whom remittances should be made payable. Accommodation is limited to 150, so please book in advance.
Overnight accommodation and breakfast may be available. Please write direct to The Deputy Steward; the charge is likely to be about £2.25. It may not be possible to accept bookings after 14 September.
If coming by car listen out for GM3BQA/A on 2m, mainly ssb around the calling channel, or GM3HAM/A on 4m.

Oscar 6

The battery condition of the satellite continues to give cause for concern and the power supply will undoubtedly be the determining factor of the life of the satellite. On the credit side the highly stable orbit of Oscar 6 means that predictions can be made for a considerable time ahead with no loss of accuracy.

The satellite has a repetition period of 263 orbits which, based on the existing parameters, comes to exactly three weeks. This means that the repeating orbit will come 21 days later with almost exactly the same elevation and azimuth angles. Having once acquired a set of orbit data for a three-week period this can be used indefinitely into the future by the addition of 263 to the orbit number, ie orbit Nos 4108, 4371, 4634 and 4897 will have similar characteristics.

Examples of this repetition are:

Date	Orbit No	Crossing time gmt	Crossing long °W
7 September	4,096	2042	358
28 ,,	4,359	2046	359
8 September	4,108	1942	343
29 ,,	4,371	1946	344
9 September	4,121	2037	357
30 ,,	4,384	2041	358

These figures refer to an ascending orbit, ie S to N path, with equatorial crossing times and longitudes. The corrections for a latitude of 50°N are +16·38min and +18·29°W.

RSGB Region 7 Diamond Jubilee ORM and Dinner

Saturday 6 October 1973

Winning Post Hotel, Whitton, Nr Twickenham, Middlesex

PROGRAMME

2pm: ORM commences. Council will be represented by Roy Stevens, G2BVN, and Bill Green, G3FBA. The chair will be taken by Robin Hewes, RR for Region 7. Also present will be John Graham, G3TR, chairman of the HF Contests Committee, and Andrew Holloway, G3VUQ, secretary of the Interference Committee.

7 for 7.30pm: Dinner. The guest of honour will be Dr J. A. Saxton, President of RSGB. A representative of BOAC will present the prizes to the winners of the RSGB Diamond Jubilee HF Contest,

Supporting the ORM from 1130am will be an RSGB bookstall, a raffle, and a demonstration including deviation measurement (members can have their equipment monitored) by members of the UK FM Group (London).

Talk-in on 144·48 and 145MHz fm, 145·41MHz ssb and 160m. Hotel located on the A315, Chertsey Road. Nearest station: Whitton on the Waterloo-Staines line. Sandwiches and other refreshments will be available at the bar during opening hours, and lunches may be ordered.

Admission is free. Dinner will cost £2.

Dinner tickets from Alan Foss, G8EAY, (deputy RR7) 77 Coolgardie Avenue, Chigwell, Essex, to whom remittances must be made payable. SAE appreciated. Applications to be taken up by 28 September.

For those operators who would like to acquire a set of predictions on which to base their future participation, WB5CBC has indicated his willingness to supply these. The print-out will show time, azimuth bearing, elevation and range from the individual location. The data may be obtained by sending US$3.50 (which includes air mail delivery) together with the following information:

name and address;
altitude above sea level (feet or metres);
latitude (north or south) and longitude (east or west) as accurately as possible in degrees, minutes and seconds.

Send to: W. Johnston, WB5CBC, 1808 Pomona Drive, Las Cruces, New Mexico 88001, USA.

Tragic death of GW3YPH

In our obituary column we record with deep regret the death of Walter Turner, GW3YPH, who was electrocuted as he was setting up a new aerial in the back garden of his home. It is believed that a charge arced across to the aerial from an overhead cable, killing him instantly.

His death is even more tragic because of his reputation as a most meticulous man in matters of safety, and his untimely death illustrates the constant need for caution where electricity is concerned.

RSGB Region 10 Diamond Jubilee ORM and Dinner

Saturday 22 September 1973

University College, Park Place, Cardiff

Further to the announcement on p454 of the July issue of *Radio Communication*, circumstances have made it necessary to amend the timetable as follows:

11am:	Opening
2.15pm:	Business meeting
5.15pm:	Lecture
7 for 7.30pm:	Dinner

Members are reminded that in order to meet the requirements of the College Catering Officer for events held in vacation, no dinner ticket applications can be accepted after 12 September.

Advance notice

South-east Counties HF Convention

Sunday 18 November 1973

Airport Hotel
Crawley

Trade stands **Lectures** **Displays**

Details later

Information from the convention secretary: Derek Thom, G3NKS, 20 Bramble Close, Copthorne, Sussex, RH10 3QB.

Nominations for election to the 1974 RSGB Council

The Articles of Association (as amended at 1 January 1972) require that not later than 10 September in each year the Council will send to each member entitled to vote a list of those Council members who retire by rotation or for any other reason on the succeeding 31 December. The list must indicate those members who are willing to accept nomination for re-election and the list must also indicate whether the vacancies are to be filled by election of an ordinary member or on a zonal basis.

The following members retire by rotation at the end of this year:

Ordinary members
Mr E. G. Ingram, GM6IZ, who will accept nomination for re-election.
Mr R. F. Stevens, G2BVN, who will accept nomination for re-election.
Mr B. D. A. Armstrong, G3EDD, who wishes to retire from Council and does not seek re-election.

Zonal members
Mr W. F. McGonigle, GI3GXP, Zone F, who will accept nomination for re-election.
Mr C. H. Parsons, GW8NP, Zone E, who will accept nomination for re-election.
Mr A. W. Smith, GM3AEL, Zone G, who will accept nomination for re-election.
Mr R. W. Fisher, G3PWJ, retires in accordance with Article 28 of the Articles of Association as he was appointed to fill a casual vacancy in Zone B, but will accept nomination for re-election.

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

In the event of insufficient nominations being received to fill all vacancies arising, Council has power to fill any remaining vacancies and all nominations properly made shall thereafter be declared elected unopposed.

Members nominated for election to the Council on a zonal basis must be resident within the zone for which they are nominated and the nominators must be Corporate Members resident in that zone.

RAE Courses, 1973-4

Details of more RAE Courses are to be found on page 533 of the August issue of *Radio Communication*.

Acton, London. At the Acton Technical College, High Street, London W3 6RD, commencing 19 September at 6.30pm. Enrolment will be on Thursday 6 and Wednesday 12 September, from 6.15 to 8.15pm, in Room 26 at the college. Course tutor will be W. G. Dyer, MIEE, G3GEH; fee for three terms is £4.

Aldridge, Staffs. At the Tynings Lane Evening Institute, commencing Friday 14 September, 7.30 to 9.30pm. Enrolment is on 7 September, from 7.30 to 9.30pm; course tutor is G3XFN.

Bangor, Co Down. At the Bangor Technical College, commencing about 18 September, on two evenings per week. Further details from the course tutor, C. A. Billington, GI3WSS, QTHR, or from the college.

Bedford. At the Westfield School, Queens Park Bedford, commencing at the end of September. Enrolment will be in mid-September. Course tutor is E. Elsley, G3YUQ; further details from J. Kiggins (headmaster) at the school, tel Bedford 56116, or the course tutor.

Birkenhead. At the Technical College, on Thursday evenings at 7.30pm, commencing September. Course tutor will be L. Roberts, G3EGX; applications should be made to the college as soon as possible. Further details from Mr Roberts, 18 Croxteth Avenue, Liscard, Wirral.

Borehamwood, Herts. At the College of Further Education, Elstree Way, commencing 26 September at 7pm; Enrolment will be on Monday and Tuesday 10 and 11 September from 1700 to 2030. Course tutor: G. L. Benhow, G3HB.

Brentford. Brentford Adult Education Centre, Clifden Road, Brentford, Middlesex. Commences 24 September. Enrolment on 12, 13, 17 and 18 September from 6.30 to 8.30pm.

Bridgend, Glam. At the Bridgend Technical College, on Thursday evenings at 6pm. Course tutor will be Brian Jones, GW3WRE.

Brighton. At the Technical College, Pelham Street, Brighton BN1 4FA, commencing in September, on two evenings per week. Further details from the Faculty of Engineering, Richmond Terrace.

Bury, Lancs. At the new Community Centre, under the auspices of the Bury and Rossendale Radio Society, and commencing on 18 September. Details from J. D. Clifford, 10 Arley Avenue, Bury, Lancs, tel 061-764 3466 (evenings).

Chesterfield, Derbyshire. At the College of Technology, Infirmary Road, commencing 13 September. Enrolment will be on 3-5 September, from 5 to 8pm at the college. Further details from course tutor—J. A. Gascoigne.

Chingford, E4. At the Chingford Community Centre, Simons Lane, North Chingford, commencing Monday 24 September. Enrolment will be from 7.30pm, 17-19 September, classes being at 7.30 each night. Course tutor will be G2HR. Fees: £2.65 (seniors) and £1.25 (juniors, under 18).

Croydon. At the Western and Purley Further Education Centre, Technical College Annexe, Tanworth Road, on Thursday evenings, commencing September. Course tutor will be P. L. A. Burton, G3ZPB; further details obtainable from the Evening Class Handbook and local press.

Glasgow. At the Further Education Department of the Glasgow College of Nautical Studies, 21 Thistle Street, Glasgow C5, on Tuesdays and Thursdays, commencing 11 September. Enrolment will be at 7pm on the opening evening, course fee is £3 (no fee for students under 18). Classes will be held from 7 to 9.30pm each night.

Grantham, Lincs. At St Hugh's Secondary School, Dysart Road, on Mondays, commencing 24 September. Enrolment will be at the first class; course tutor will be A. Ellis, G3PJR.

Grimsby. Grimsby Adult Education Institute, Hereford School, Westward Ho, Grimsby. Mondays, 7 to 9pm, commencing 17 September. Enrolment 11, 12, 13 September from 7 to 9pm. Further particulars from H. Watson, G3HTI QTHR, or Grimsby Education Department.

Harlow, Essex. At the Technical College, College Gate, The High, Harlow. Enquiries to E. P. Essery, G3KFE QTHR, tel Bishops Stortford 2501.

Harrow. Harrow College of Technology and Art, Watford Road, Harrow. Commences 27 September. Enrolment 15, 17 September. Further information from D. T. Busby, G8ELB, Harrow College of Technology (Resource Unit).

Highgate, London. At the Whittington School, Highgate Hill, NW3, commencing 7pm, Monday 24 September. The course is organized by the Grafton Radio Society, and the tutor will be B. C. Bond, G3ZKE QTHR, tel 01-485 7065. Enrolment will be the week before the first class.

Ilford, Essex. At the County High School for Girls, Granbook Road, Ilford, Essex, commencing 26 September at 7.15pm. Enrolment will be 10-13 September, 7-8.30pm. Fees: £3 (over 21) and £1.50 (under 21).

Islington. De Beauvoir Evening Institute, Tottenham Road, Balls Pond Road, Islington N1. A booster course for those who have failed the RAE. Tuesdays and Thursdays, 7.30 to 9.30pm, commencing 25 September. Enrolment 17 September. Tutor is Fred Barns, G3AGP.

Knaresborough, Yorkshire. At the Knaresborough Centre, King James Road, Knaresborough, Yorkshire, commencing 20 September at 7.30pm. Also a course on morse code every Tuesday, commencing 18 September. Fee £1 per course per term.

Loughborough, Leics. At the Technical College, Radmoor, Loughborough, commencing 18 September. Enrolment will be on 10-12 September, 6 to 8pm. Classes will run from 6 to 9pm each evening (6-7pm morse, 7-9pm theory and practical), and course tutor will be D. R. Doughty, G3FLS. Fee: £3.53.

Newport, Mon. At the College of Further Education, Nash Road, Newport, commencing on Wednesday 19 September. Enrolment the previous week. Course tutor will be L. A. Groucott, GW3YTJ.

Oldham, Lancs. At the Oldham College of Technology, Rochdale Road, Oldham OL9 6AA, commencing September. One evening per week will cover the RAE syllabus, another evening is intended as a post-examination course of benefit to qualified amateurs. Course fee is £3 per course. Enrolment was on 29-31 August, students are recommended to contact the college to arrange enrolment.

Perth. At the Technical College, Crieff Road, Perth, commencing on Monday 24 September. Enrolment will be from 4 to 7 September between 1400 and 1600, and 1830 and 2030, at the college. Course tutor will be GM3YEW, who hopes to provide morse practice before the class begins each evening at 7pm.

Plymouth. At the College of Further Education, on Mondays and Wednesdays, from 6.30 to 9.30pm. Course tutor will be D. M. Webber, G3ENX, tel 6800 (day) or 773238 (after 6pm).

Portsmouth. At the North End Education Centre, Drayton Road, Portsmouth, on Tuesdays and Thursdays. Further details from G6NZ, or the principal.

Princes Risborough, Bucks. At the Adult Education Centre, Merton Road, commencing Monday 24 September at 7pm. Monday is theory night, tutor R. Whiting, G3POF. Thursday is morse night, tutor S. Ford, G44CV. Enrolment will be on 12 and 13 September, 7-9pm.

Slough, Bucks. At the Slough College of Technology, Wellington Street, Slough, Bucks SL1 1YG, commencing in September. On Fridays from 1830 to 2130 (morse 1830-2100, theory 2100-2130) for the RAE, and 1900-2115 for advanced students. Course tutors will be E. C. Palmer, G3FVC, J. Baldwin, G3WQC, and R. Hemmings, G3VCT. Enrolment on 13 and 17 September, from 1000 to 2000. Further details from Department of General Studies, at the college.

Stoke-on-Trent. At the Northern College of Further Education, Longton Annexe, Trentham Road, Longton, on Thursdays commencing 13 September. A separate morse class will be held on Monday evenings. Course tutors are K. H. Parkes and E. Lycett. Enrolment will be at the college, Moorland Road, Burslem, on 5-7 September.

Wembley, Middx. At the Copland Evening Institute, Cecil Ave, Wembley, commencing 17 September, and every Monday thereafter. 7 to 8pm each night will be devoted to morse, 8 to 10pm theory. Enrolment will be on 10, 11, 12 or 13 September, from 7 to 9pm; course fee £3. Further details from I. J. Bayliss, G8CZQ, 4 Aintree Close, Hillingdon, Middx. tel West Drayton 47258.

Wolverton, Bucks. At the Wolverton Technical College, Milton Keynes, commencing early September. Enrolment is on 4 and 5 September. Classes will be held on Thursday evenings, further details from college or G3LCS QTHR.

Wombourne, near Wolverhampton. At the Wombourne Evening Institute, Ounsdale Schools, Wombourne, near Wolverhampton. Enrolment on 10 and 11 September, 7 to 9pm; course lecturer, R. W. Tomkys, G3NOW.

Phase-locked vfo for 2m transmitters

by Dr A. GSCHWINDT, HA5WH*

IN recent years a commonly-used method of frequency stabilization has been the phase-locked oscillator. The aim of this article is to give some help to the amateur who wishes to modify an old crystal-controlled oscillator in a 2m transmitter to a vfo with nearly the same frequency stability.

This approach is suitable for transmitters with the oscillator/multiplier/amplifier arrangement, but by modification of the applied frequencies any other output frequency may be obtained. In the arrangement shown, the output signal will lie in either the 16 or 48MHz band.

Principle of operation

The general principle of high stability, high-frequency VFOs is to use a high-frequency crystal oscillator and mix its output with a low-frequency vfo, and choose the lower or upper sideband at the mixer output. In most cases the design of a bandpass filter with good selectivity for the mixer output will be a difficult task for the constructor. The use of afc techniques is a great help to receiver designers, but in only a few instances for amateur equipment (especially fm applications) does afc fulfil the requirements.

The best method of frequency stabilization is to use a phase-locked loop, where the control loop keeps the phase of the reference and stabilized oscillator together, and alters the phase of the stabilized oscillator in such a manner that the resultant phase difference will be very small. This connection between the two oscillators is analagous to a gear-wheel transmission.

Block diagram of the phase-locked vfo

The system block diagram is shown in Fig 1. The stabilized LC oscillator operates on 16MHz, and its second harmonic is mixed with the signal from a 33MHz crystal oscillator to give an output in the 0·55-1MHz band.

The reference oscillator is also tunable in the 0·55-1MHz band, and signals from the two oscillators are compared in a phase detector. The error voltage at the output of the phase detector is used to control the phase (and frequency) of the 16MHz LC oscillator. If the frequency of the reference oscillator varies, the 16MHz LC oscillator follows it.

The phase-locked loop consists of the following sections: the reference oscillator (in this case the 33MHz and 0·55–1MHz oscillators serve as references), the phase detector (a transistorized phase detector is used), the loop filter (a second order loop with an RC filter), the control element (a varicap diode) and the controlled LC oscillator (a 16MHz LC oscillator).

In this arrangement the radiated frequency (in the 2m band) and the vfo frequency have the following relationship:

$$f_{radiated} = 148{\cdot}5\text{-}4{\cdot}5\ f_{VFO}\ \text{MHz}$$

where f_{VFO} is the frequency of the vfo lying in the 0·55-1MHz band

Factors affecting frequency stability

The resultant frequency stability of the vfo is determined mainly by three effects:

$$\triangle f_r = 9\frac{\triangle f_1}{2} + \triangle f_2 + \triangle f_e \simeq 4{\cdot}5\triangle f_1 + \triangle f_2$$

where $\triangle f_r$ = the frequency variation of the radiated carrier
$\triangle f_1$ = the frequency instability of the 0·55-1MHz oscillator.
$\triangle f_2$ = the frequency instability of the 33MHz crystal oscillator.
$\triangle f_e$ = the effect of the closed phase-locked loop on the resulting frequency stability

In this system is it easily arranged that the loop provides little degradation of the frequency stability of the vfo. In other words:

$$\triangle f_e \ll f_r.$$

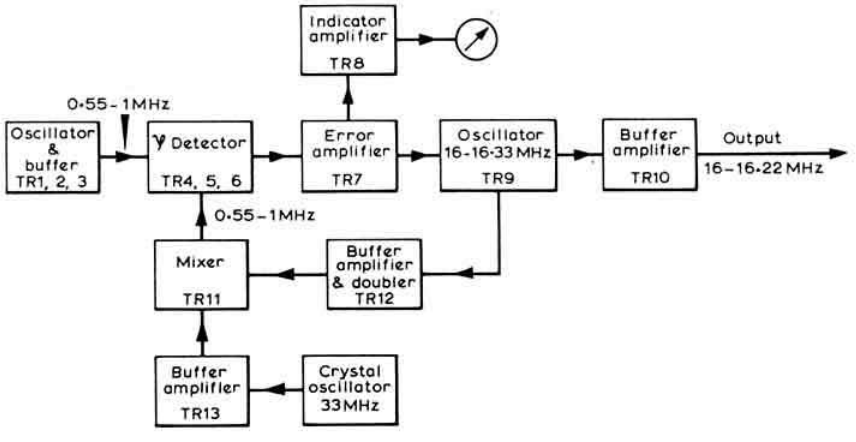


Fig 1. Block diagram of the complete phase-locked vfo

* Budapesti Muszaqi Egyetem, Garami erno ter 3, Budapest 11, Hungary.

To ensure that the loop does not affect the stability there must be a good oscillator on 16MHz, and as wide a bandwidth in the loop as is possible without risking instability. An unstable, noisy 16MHz LC oscillator means more work for the loop in keeping good stability, which is the reason the well-known phase-locked ic block with its internal RC oscillators is not used.

If it is desired to use one of the phase-locked loop ICs, an external LC oscillator should be arranged.

Now to consider the stability of the oscillator. The arrangement suggested is equivalent to a mixer type oscillator with a 16·5MHz fixed crystal oscillator and a vfo operating in the 0·275-0·5MHz band. This type of device would not be easy for the amateur to design, especially when an output signal with spurious below 50dB is required.

What is the spectrum purity in the phase-locked arrangement? The filter for the attenuation of the 0·55-1MHz components is the loop filter, so to get the best frequency stability it would be useful to use as wide a loop bandwidth as possible. But with increased loop bandwidth, the danger of loop instability increases. The solution is therefore something of a compromise and the loop bandwidth will be about 8-10kHz. This ensures high attenuation of the 0·55-1MHz components, so maintaining the purity of the radiated signal.

The 33MHz crystal (and its harmonics) falls outside the danger zone, so here there is no problem. The lock-in range of the loop, measured in circuit, is about 15-20kHz. The tracking range, of course, is wider than the necessary 0·222MHz (16-16·222MHz).

After switching on the circuit, the vfo locks in automatically and retains stability. Care must be taken that the loop is, in fact, in a "lock-in" condition because in the "lock-out" condition the transmitter could radiate on spurious frequencies (out of band radiation). There are several methods in use for lock-in indication, and a simple way has been chosen—an indicator which measures the control voltage in the loop.

The reference vfo (0·55-1MHz)

The oscillator works in a capacitive three-point arrangement (TR1). Its output signal feeds a buffer amplifier with frequency corrective RC elements in its collector circuit; the output voltage of TR3, relative to the emitter, is 100mV p-p.

With the given variable capacitor, the vfo can be tuned from 0·55-1MHz, and it is desirable to apply mechanical or electrical bandspread to ensure easy tuning. Care must be taken regarding the temperature compensation of this oscillator.

The tuned circuit for the vfo is an i.f. transformer from a transistorized radio.

Phase detector and error voltage amplifier

The phase detector is built up with transistors. The signal fed to the input of TR6 controls in common phase the emitters of TR4 and TR5, while the signal from the TR11 mixer drives TR4 base, and the input signal will be phase inverted on its collector. Between the collectors of TR4 and TR5 will appear the difference and sum of the two signals and they switch on the diodes D1-D5.

The whole phase detector consists of three transistors and four diodes. Its output signal is filtered by the loop filter consisting of 56kΩ and 470Ω resistors and a 0·47μF capacitor. The derivation of a phase-locked loop is introduced in [1].

The loop filter is followed by a dc amplifier (TR7). An external dc voltage, variable by the potentiometer controlling the dc voltage of TR7, can be added to the loop error voltage. The collector voltage of TR7 is common with the tuning voltage of the varicap diode, so by adjusting the potentiometer the 16MHz oscillator frequency can be tuned when the loop is in a "lock-out" condition. When the pull-in zone of the loop is reached (15-20kHz) the loop will be locked.

The tracking band (by good alignment) will be in the segment 16-16·222MHz. The 16MHz oscillator tuning is carried out by a varicap diode, and the 16-16·222MHz band needs a determined dc voltage.

The meter (M) shows the voltage of the varactor and it is adjusted so that it gives full-scale deflection when the oscillator is tuned through the exact frequency band. The mechanical zero of the indicator is shifted off the scale so that in a "no signal" condition the needle is below zero. When the control voltage is not on the scale of the indicator it therefore means that the loop is not locked.

If the tuning of the 16MHz oscillator is accurate, the needle of the panel indicator will stay at all times on the scale. As the reference oscillator is tuned through the band, the collector voltage is proportional to frequency.

TR8 is an emitter follower, driving the indicator, which needs 200μV for full-scale deflection.

The 16MHz LC oscillator (TR9)

The oscillator is loaded by a tuned circuit in its collector, resonated at 32MHz, and the signal for the mixer is taken from this low-Q circuit.

If it is desired to have a 48MHz output signal, it is best taken from the collector, whereas in the arrangement shown, the output signal is taken from the base of TR9 by a capacitive divider.

Mixer and crystal oscillator

The second harmonic of the 16MHz oscillator is amplified by TR12, TR13 is a buffer for the 33MHz oscillator. The common outputs of TR12 and TR13 are tuned by a circuit resonating at 32·2MHz which sums the two signals having the second harmonic of the 16MHz LC oscillator and the 33MHz from the crystal oscillator.

The two signals are mixed by TR11 and the i.f. signal appears on the collector. The i.f. stage includes a low-pass filter which drives the phase detector, ensuring low attenuation.

Amplifiers for 16MHz

The clean and stable 16MHz signal then goes through a buffer amplifier with an output voltage of 1V p-p across 70Ω, and if this is high enough it can be fed straight into the crystal socket of the transmitter. If a higher voltage is needed, TR16 (Fig 3) will provide 5V p-p across 70Ω.

If the loop is locked, the closed loop should not be broken during receiving, as in this case the oscillator is radiating and its harmonics could interfere with co-channel reception. With careful attention to good shielding, the radiated signal can be kept to a low level.

To obtain higher attenuation, the two-amplifier stage may be switched out during reception with switch TR10. When it

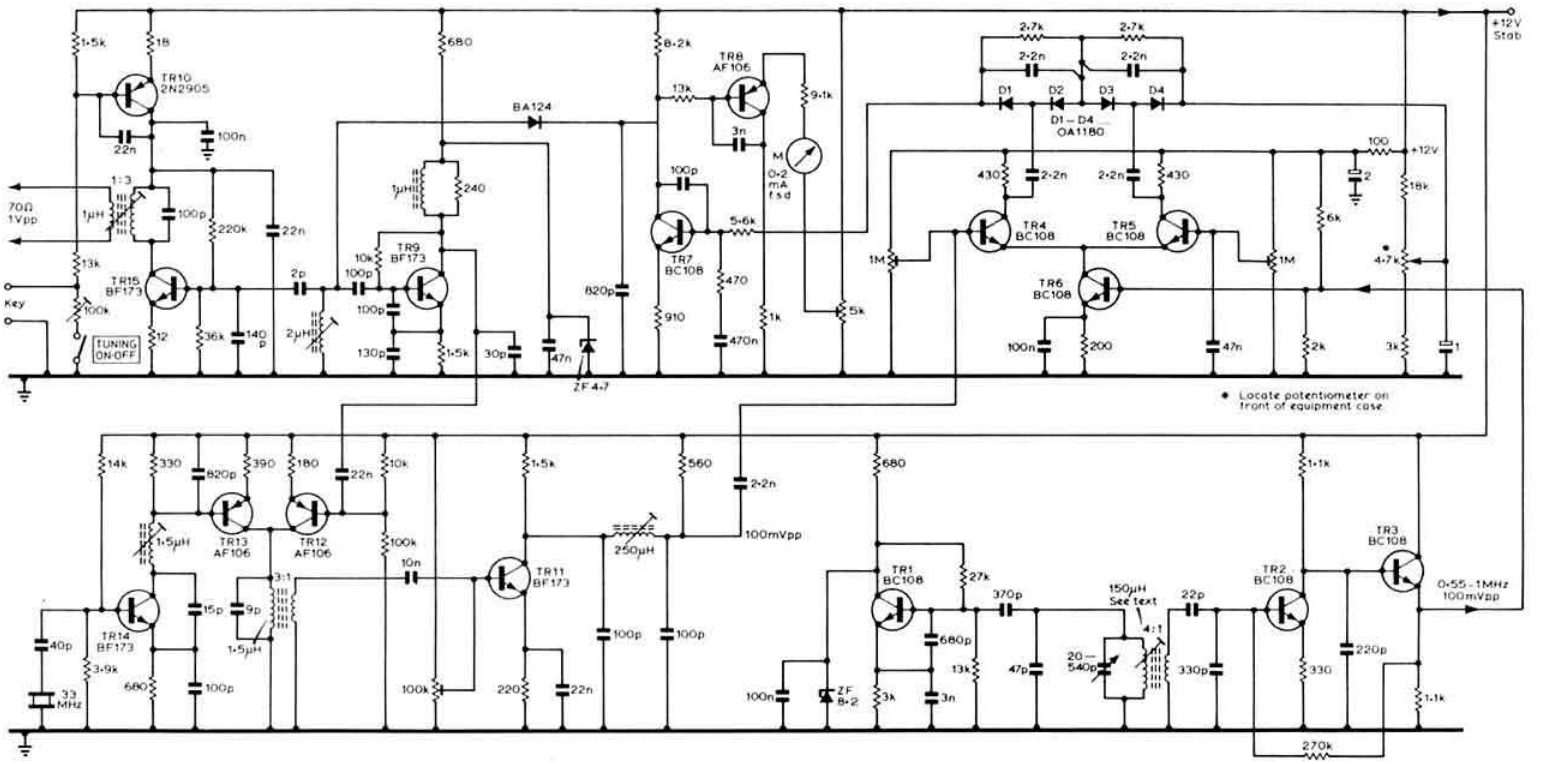


Fig 2. This version of the phase-locked vfo uses discrete components, an alternative ic version is given later

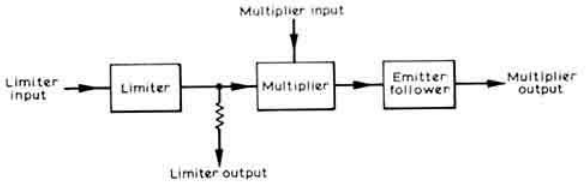


Fig 4. Block diagram of the TAA661A integrated circuit, which is used as the basis of the most recent version of the vfo

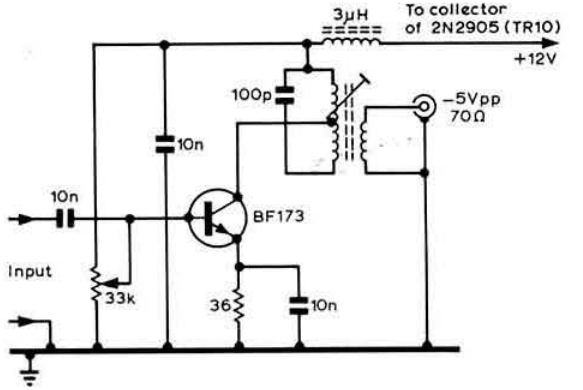


Fig 3. The 16MHz amplifier

is closed, TR15 has no dc voltage on the collector; if the base resistance of TR10 is grounded TR15 is supplied with dc.

If some series resistance is added by the key, the output voltage will be variable and then one can tune easily and exactly on the received frequency, as an hf transmitter/receiver arrangement. The transmitter does not radiate in this case, and the tuning does not cause disturbance to the neighbouring channels.

Results

The first model was built in 1971 and several Hungarian amateurs are using this vfo; results are satisfactory, and the stability of the circuit is nearly the same as the former crystal oscillator.

IC version of the vfo

Since the first part of this article was written, an integrated-circuit version of the vfo has been developed, using a special-purpose ic recommended for fm receiver i.f. and detector stages. The TAA661A has a limiter and a multiplier balanced mixer in the same chip, the limiter with input and output connections and also an internal connection to one input of the multiplier as shown in Fig 4.

In the usual arrangement the limiter drives the multiplier in two separate ways: directly (internally connected), and by an external 90° phase-shift circuit. The limiter works as an overdrive amplifier, with a bandwidth of 60MHz. If it is to be used as a feedback amplifier it is clear that an oscillator can be produced by using the limiter section of the ic.

The circuit arrangement to give a 33MHz overtone crystal oscillator can be seen on the circuit diagram of the vfo (Fig 5), the crystal is located between the input and output of the limiter. The tuned circuit ensures the necessary phase shift for the loop by providing positive feedback on 33MHz.

The multiplier section acts as a double-balanced mixer. The free multiplier input is driven by the collector voltage of the 16MHz LC oscillator, consisting of a number of second harmonics which are used for mixing. The output signal of the first ic goes through a low-pass filter and controls the limiter section of the second ic. This second ic is used as an i.f. limiter for the 0·55-1MHz signals, and as a phase detector to indicate the phase difference between the local reference and the down-mixed second harmonics of the 16MHz LC oscillator.

The loop filter (20kΩ, 22kΩ and 50nF) determines the bandwidth of the loop, and its output voltage controls the phase and frequency of the 16MHz LC oscillator via a BA101 varicap diode.

The control voltage and the output frequency (and reference frequency) have the following relationship when the loop is properly adjusted:

Output frequency (MHz)	Reference osc frequency (MHz)	Voltage measured on the cathode BA 101
	1·1	4·06
16·00	1·0	4·28
	0·9	4·51
16·10	0·8	4·75
	0·7	5·01
16·200	0·6	5·28
16·225	0·55	5·42
	0·5	5·57

When the loop is in the out-of-lock condition the output voltage of the second ic is about 6·3V. This ensures that when the power supply is switched on, the loop will in a few milliseconds automatically be in the lock-in condition. The reason

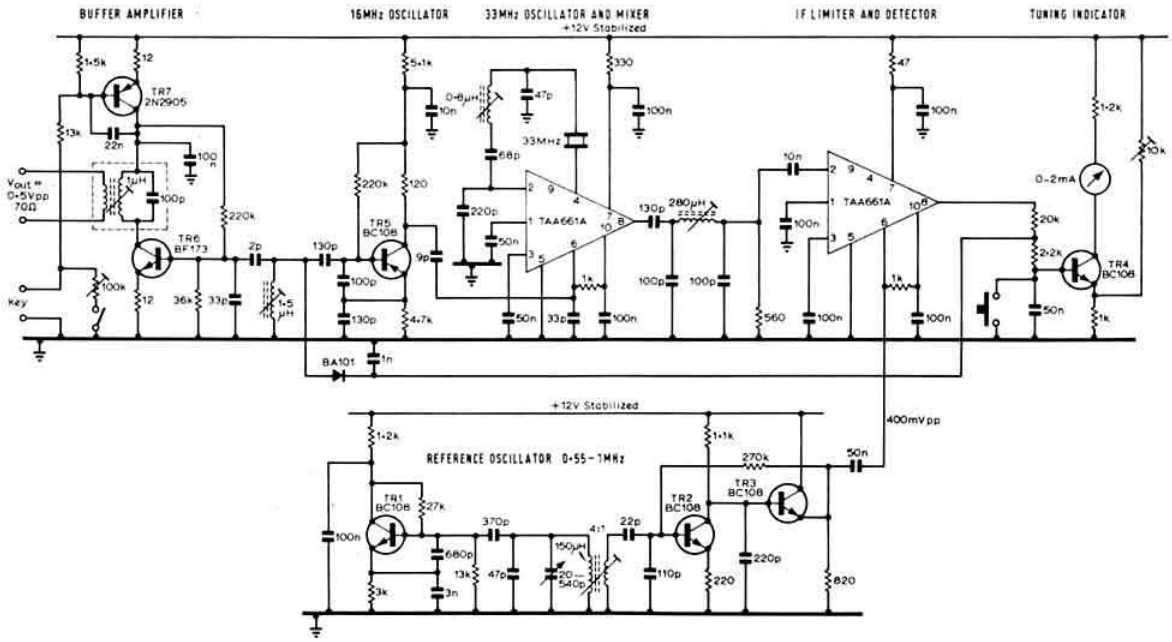


Fig 5. Complete circuit of the latest version of the vfo, using ICs

is simple—as the output voltage of the second ic increases, it passes the lock-in value of the loop.

In practice it is not necessary to use the push button (PB) for fresh lock-in as the loop will stay in the closed condition during operation.

The tuning indicator shows the varicap control voltage and helps the operator to check the loop. The panel indicator (2mA fsd) and its driver amplifier are so controlled that the indicated current is about zero at 16MHz and 2mA at 16·22MHz. It is useful to shift the indicator mechanical zero a little below the zero mark to obtain definite zero crossing for the 16MHz frequency indicator.

If the loop is in the lock-out condition it is only necessary to push the button for a short time and the loop will be closed at once.

Modification of the reference oscillator

The second ic requires a higher input voltage for its phase detector than the transistorized version, so it is necessary to slightly modify the component values of the 0·55-1MHz LC oscillator. Since the supply voltage is established, the zener diode can be eliminated from the collector circuit of the oscillator, so that the collector voltage is increased, giving a higher output rf voltage.

The capacitive divider at the oscillator stage is also modified, to provide the 400mV p-p signal level for the phase detector.

Conclusions

The amplifiers for the 16MHz output signal are the same as in the transistorized version already described, so the circuit does not show the last stage giving the increased ouput level (5V p-p).

In the integrated-circuit version of the phase-locked vfo, eight transistors and four diodes have been replaced by two ICs with the added bonus that the alignment of the equipment is much simpler and operational reliability greater.

Reference

[1] Floyd M. Gardner: *Phase-lock techniques*, 1966.

NEW PRODUCT

FET multi-test set

The Conway Masteranger is a silicon solid-state fet multimeter suitable for many professional and radio amateur applications. Measurements that may be made with in-built facilities include:

dc and ac voltage—1·5/5/15/150/500mV,
1·5/5/15/50/150/500/1,500V,
full scale deflection values;

dc and ac current—eight ranges to a maximum of 1·5A;

resistance—scale × 10, × 1k × 100k × 10MΩ, with a maximum of 10,000MΩ;

decibel ranges—13 ranges from −80dBm to +66dBm in 10dB steps. The input resistance for dc voltage ranges is 100MΩ.

An unusual feature of the instrument is the floating input circuit. This results in the elimination of the hazard arising when one side of the circuit to be measured is connected to the meter case and also gives additional measuring versatility. The instrument can be operated from either an internal battery or a 115/230V line power supply cassette inserted in place of the battery cassette. There is a 6in (150mm) mirror scale for dc, ac and ohms, and the meter movement is short circuited when switched off thus offering complete protection during transit. The 80 ranges are selected by a single rotary switch and pushbuttons. When used to measure resistance the instrument applies low power to items under test. This facility enables tests to be carried out on most types of semiconductors without risk. For instance on the ohms × 100k range the voltage maximum is 1·2V and the current maximum 1·2μA.

The Masteranger multi-test set has dimensions of 7¼in by 6½in by 3½in and weighs 5·5lb. The cost of Model 639 with leather carrying case and batteries is £105.60. It is obtainable from Pambry Electronics Ltd, One Chimney, Blackpond Lane, Farnham Royal, Bucks SL2 3EA.

NEW BOOKS

IEE Conference Publication No 95

Following the international conference on *Satellite systems for mobile communications and surveillance* organized by the Institution of Electrical Engineers in March 1973, the papers presented at the conference are available as Conference Publication No 95 from the IEE. The 32 papers presented in this volume cover many aspects of aeronautical, maritime and land mobile communications using satellites. The authors are specialists in their fields and the information presented incorporates the latest thinking on the various applications. For both the radio amateur and the professional interested in this sector of communications this book is of considerable value. 196 pp, A4 format, photolitho, soft covers, obtainable from: Publication Sales Department, IEE, 70 Nightingale Road, Hitchin, Herts SG5 1RJ.

Mullard booklet

Quality and reliability of Mullard resistors and capacitors is the title of a booklet recently issued by Mullard Ltd, the purpose of which is to provide a simple guide to quality and reliability testing. Of considerable interest to those concerned with the production and buying of electronic components, the booklet can be obtained, quoting reference TP 1360, from the Instrumentation and Control Electronics Division, Mullard House, Torrington Place, London WC1E 7HD.

Colour code chart

Mullard Ltd have recently published a large wall chart (approx 2ft by 3ft) giving details of the company's capacitor and resistor ranges. Full information on the various types of both components is given in addition to colour codes and the preferred series of values. Requests for copies should be made to the Instrumentation and Control Electronics Division, Mullard Ltd, Mullard House, Torrington Place, London WC1E 7HD.

EQUIPMENT REVIEW

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

The Trio Model TS515 ssb transceiver

It is some time since the reviewers were given the opportunity to evaluate a transceiver, and it is interesting to see what differences are creeping in to amateur radio equipment. It was with some surprise that examination of the equipment brought one of those situations where one thinks that one is repeating a past experience and yet it is impossible.

Then the penny dropped—the TS515 has a very distinct resemblance to the Heathkit SB101 in layout (OK—it is reversed!) and choice of i.f. and so on. It is said that imitation is the sincerest form of flattery. The SB101 sets a standard in its class, so why spend a lot of money re-inventing similar philosophies?

The Trio TS515 was loaned for review by B. H. Morris and Co (Radio) Ltd, 84-88 Nelson St, London E1 2DY, and the current price is £210 plus VAT.

General description

Thirteen printed circuit boards are used, mounted on a cadmium-plated steel chassis. Interconnections is with cable forms, most of which are terminated in simple single wire plugs and sockets thus making board removal a simple task. Ten valves are used—mostly in the later stages of the transmitter, but also in the rf amplifier and mixer stages of the receiver. Thirty-three transistors were counted—mostly bipolar silicon, but FETs are used in the 4·9 to 5·5MHz vfo, microphone input and on the output of the bridge diode balanced modulator. Just for good measure, 51 diodes appear used in many different ways. A 25kHz calibration oscillator is supplied as standard.

The front panel has 11 controls, the largest being the tuning control which has excellent "feel" and drives the vfo variable capacitor through a well engineered gear-box. The tuning rate is 25kHz per turn and the movable skirt is calibrated at 1kHz intervals. A large meter is provided, the associated switch giving access to pa anode current, alc bias, rf output level and pa anode voltage on transmit. In the receive condition the meter automatically reads received signal strength. AGC is switched fast or slow and the same switch controls the 25kHz calibrator and optional external vfo facility. The rf gain control doubles as a pull switch to disable the receiver incremental tune control to make receive and transmit frequencies identical.

The volume control has a coupled power off switch—which is a pity due to the potential unreliability of these switches and creating unnecessary wear on the track (but cost has to be pruned somewhere!). PA anode loading and tuning controls are concentric, and a drive control peaks drive on transmit and rf on receive. A three-position lever switch provides transmit/receive and transmit by vox control. If the high impedance microphone has a pressel, this can also be used for transmit via the four-pin front panel microphone plug. A tip and sleeve 8Ω headphone socket automatically cuts the loudspeaker when the jack is inserted. USB and lsb are switch selected; the same filter is used bu the carrier generator oscillator is altered from one side to the other. The vfo is not "sideswiped" to compensate, so the tuning scale has separate calibration marks for usb and lsb. An optional cw filter is available which is switched into circuit by diodes.

The rear panel contains an SO239 UHF series aerial socket with the facility of a separate receive aerial socket if required, selected by a slide switch. A 12-way miniature Jones socket receives the various voltages from the separate matching loudspeaker/psu cabinet—and incidentally the inter-connecting cable supplied is of unusually generous length. The six-blade cooling fan motor receives its power from a separate interconnecting cable, which rather baffled the reviewers at first, who could not understand why the fan was not working. Eventually the fan cable was discovered in the pack after consulting the handbook. An octal socket is used to provide control of the associated TL911 linear amplifier, and a small nine-pin socket controls a separate vfo if required. If break-in keying is required, a tip, ring and sleeve key jack is used and the vox circuit is used to control the transmitter. Bias for the pa and rf output meter sensitivity is controlled by a pair of potentiometers. A screen grid on/off switch is provided to assist the neutralization procedure and probably could be used to provide very low power output when used with a vhf transverter.

Pre-set adjustments that are revealed when the top lid is opened are mic-gain, vox sensitivity, vox delay and anti-trip. S-meter controls are mounted on the i.f. board, both sensitivity and zero being adjustable, the former control being an unusual and welcome feature.

The tests

Sensitivity

In order to provide comparison with equipments previously reviewed, a level of 2μV emf was applied from a TF2002 Marconi Instruments signal generator. This should correspond to 1μV pd if the input impedance of the receiver is 50Ω. The signal generator was adjusted in frequency for peak audio output which occurred at about 1kHz.

Band (MHz)	S/N ratio (dB)
3·5	25
7·0	24
14·0	24
21·0	25
28·0	22

On all bands the maximum audio output for 10 per cent distortion was well in excess of the 1W specification.

Selectivity

The check was made using the calibrated incremental dial of the TF2002, the output level of which was adjusted for a constant S-meter reading of S2. The −6dB bandwidth was

2·8kHz and the −60dB bandwidth 4·6kHz; just nicely within the manufacturers' claim.

S-meter

S points	Decibels rel 1μV pd	S points	Decibels rel 1μV pd
1	+16	8	+36
2	+20	9	+39
3	+24	+10dB	+43
4	+26	+20dB	+49
5	+28	+30dB	+57
6	+31	+40dB	+66
7	+33	+50dB	+73

The S9 level was then checked on the other bands.

Band	Input for S9 (dB rel 1μV pd)
3·5MHz	+39
7·0MHz	+40
21·0MHz	+44
28·0MHz	+49

After noting the sensitivity on the lower S readings, the adjustments on the i.f. board were re-set according to the handbook which suggests +30dB for S9 on 14·175MHz. A re-check gave S1 as +4dB, a more satisfactory indication.

Spurious responses

Each band was checked for both first and second i.f. breakthrough. The worst results were second i.f. on the 3·5MHz band at 87dB rejection and first i.f. on 7MHz at 58dB rejection. Well within specification.

First i.f. image on the 3·5MHz band was 95dB, and 66dB on the 28MHz band, both very satisfactory results.

Birdies

The only birdie found was on 21·2MHz, and that was quite weak. Certainly a tribute to whoever settled on the i.f. and oscillator frequencies.

Intermodulation

As usual this was checked by feeding in two TF2002 generators through matching pads. The 14MHz band was chosen, and the generators spaced 20kHz apart. The output of the generators was increased together until a signal equivalent to 1μV pd was observed 20kHz below the lower frequency generator and 20kHz above the higher frequency generator. The level when this occurred was +65dB rel 1μV pd. A very satisfactory result.

Blocking

This again was checked on 14MHz at maximum rf gain using two signal generators. One was adjusted for a signal to noise ratio of 14dB and the level of the other spaced 10kHz away was increased until the wanted signal to noise ratio was degraded by 3dB. At this point the unwanted signal was +66dB relative to the wanted. As with intermodulation, a good result.

The vfo

The dial skirt was optically aligned at the centre of the vfo range. ie 5·2MHz. The vfo frequency was then measured at 50kHz intervals and the error noted.

VFO freq (MHz)	Error (Hz)	VFO freq (MHz)	Error (Hz)
4·9	−597	5·25	+525
4·95	−714	5·3	+709
5·0	+250	5·35	+531
5·05	+464	5·4	+506
5·1	+338	5·45	+1162
5·15	+37	5·5	+185
5·2	0		

Manufacturers' specification

As a matter of interest, the word "specification" is being phased out of technical leaflets and handbooks by the professional UK manufacturers since under the Trade Descriptions Act figures quoted under that heading can be construed to be specific and any variation therefrom could be a contravention of the Act. So they play safe and use the term "technical data".

Frequency range	3·5–4·0MHz 7·0–7·3MHz 14·0–14·35MHz 21·0–21·45MHz	28·0–28·5MHz 28·5–29·1MHz 29·1–29·7MHz
Modes	SSB (A3j)	CW (A1)
Input power to final stage	3·5–21MHz 180W 28MHz 120W (When used with PS515 power supply)	
Aerial impedance	50–75Ω	
Carrier suppression	Better than 40dB	
Sideband suppression	Better than 40dB	
Microphone impedance	High impedance type (50kΩ)	
Transmit audio frequency bandwidth	400–2,600Hz at −6dB points	
Harmonic radiation	Better than 40dB	
Sensitivity	3·5–21MHz bands 28MHz band	0·5μV 10dB s/n 1·5μV 10dB s/n
Image ratio	More than 50dB	
I.F. breakthrough	More than 50dB	
Frequency stability	Within ±2kHz from 1min after switch on to 60min and then 100Hz per 30min.	
Selectivity ssb & cw:	More than 2·4kHz at −6dB Less than 4·8kHz at −60dB	
AF output	More than 1W (10% distortion)	
Receiver output		
Impedance	8Ω for both loudspeaker and headphones	
Power consumption	350W at max output on transmit 120W at max audio output on receive (when used with PS515 psu)	
Dimensions	13in wide, 7⅝in high, 13⅛in deep	
Weight	22lb	

This shows that for the most accurate work the scale needs to be checked to the nearest 25kHz, but few will bother to do this.

Dial backlash amounted to about 300Hz—good, but rather more than was expected after examination of the gear box. Resetability was very good, only a few hertz. So for accurate frequency work always tune from the same direction.

AGC

The reviewers have observed a number of receivers, but this result has not been bettered—quite remarkable!

Signal input rel 1μV pd	Audio output rel that at 1μV pd
+ 20dB	+1dB
+ 40dB	+1·5dB
+ 60dB	+1·5dB
+ 80dB	+1·6dB
+100dB	+1·8dB

Drift

The manufacturers say in the handbook, in the vfo section, "Since adjustment of this unit calls for a high degree of skill, it should never be touched". The inference is that any user is not likely to have the relevant skills. Their point of view is understood, but nevertheless it would be helpful to

know how to adjust the temperature compensation. Certainly the reviewers wished to have a go as the result of the following:

Time from switch on (min)	Drift (Hz)	Time from switch on (min)	Drift (Hz)
1	+43	15	+49
2	+55	20	+26
3	+59	30	−55
4	+62	40	−128
5	+64	50	−188
10	+66	60	−231

There was marked over compensation, but the order of drift tends to suggest that if the compensation were slightly readjusted, drift would be much less. The fact that the drift was still going well after an hour is a little unusual. However, the manufacturers claim of less than 2kHz in the first hour was met by a wide margin, and although not checked, the claim of 100Hz per minute thereafter may well be met. Unfortunately the reviewers read that part of the claim after the equipment had been returned. The difference in frequency between transmit and receive was measured at 4Hz.

Crystal frequencies

Crystal freq (kHz)	Error (Hz)	Crystal freq (kHz)	Error (Hz)
12,395·0	−1195	37,395·0	+241
15,895·0	+563	37,995·0	+907
22,895·0	+629	3,393·5	+90
29,895·0	+99	3,396·5	+49
36,895·0	+795	3,394·3	+153

These errors are typical of this type of equipment.
The 25kHz crystal-controlled calibrator measured 0·1Hz low, but since this is the last digit on the counter it also represents the tolerance of the measurement.

Transmitter power output

For the two-tone test the transmitter was fed into a dummy load and a spectrum analyser coupled to the output. On each frequency band the two-tone input was increased until the intermodulation products were −26dB relative to each tone; the power output was then measured. The cw figures are maximum power output on single tone.

Band (MHz)	PEP (W)	CW (W)
3·5	144	140
7·0	140	145
14·0	90	130
21·0	130	120
28·0	120	130

In some cases during this test the maximum input rating was exceeded, but this does indicate that at rated input the IPS should be very good.

Harmonics

These were measured on a wide-band Hewlett Packard Spectrum Analyser which has a dynamic range approaching 70dB. The TS515 was loaded into a dummy load and driven for maximum power output on single tone.

Band (MHz)	2nd harmonic	3rd harmonic	4th and greater harmonics
3·5	—44dB	—58dB	60dB
7·0	—45dB	—56dB	70dB
14·0	—56dB	—52dB	60dB
21·0	—42dB	—50dB	64dB
28·0	—43dB	—46dB	60dB

Since no previous reviews have included this measurement, it is difficult to comment on a comparative basis. Certainly from a professional point of view harmonic attenuation is much as one would expect and is satisfactory.

Receiver incremental tuning

Many receiver incremental tuning controls are asymmetric in frequency pulling. The TS515's control is well designed with +2,678Hz and −2,948Hz.

Handbooks

There are separate handbooks for the TS515 transceiver and PS515 loudspeaker and power unit. The TS515 circuit was on a separate sheet (a useful feature if you do not lose it!). Unfortunately all the module interconnections are shown as parallel lines which make accurate following of a lead a hazardous business. Other than that comment the handbooks are of good standard and no "odd English" was found.

In use

The main use of the review equipment was made by G3USB whose main comment was that he never realized how poor his own set-up was until he compared it with the TS515. After he reluctantly returned the equipment, he did not use his own rig for some weeks. No adverse comments were made apart from an intermittent fault which showed up as excessive noise on the receiver after a long period of use. It was found that the noise came from the pa section—switching the screen volts off and on cleared the fault for a substantial time.

Conclusions

Amateur equipment has improved substantially over the years and the TS515 can be considered among the best currently available. Although owing a lot to Heathkit it is well engineered in its own right.

An apology

The reviewers must apologize to B. H. Morris for the somewhat extended period it has taken to prepare this review after the return of the equipment. The only excuse is that the pressures of today's industry are increasing.

New equipment

A broadband vhf amplifier suitable for use on the 144MHz band is manufactured by Tadiran (Israel Electronics Industries Ltd). The specification for this amplifier shows the gain as 8·5dB minimum with an efficiency of 41 per cent. With a maximum input of 7W the minimum rf output is 50W at 13·6V, with harmonic content a minimum of 15dB below the carrier. Input and output impedance is 50Ω. Protection against infinite vswr gives immunity against damage that might be caused by aerial faults. The one-off price for this amplifier is £60.00. Further information available from the Components Division, Auriema Ltd, 442 Bath Road, Slough SL1 6BB.

TECHNICAL TOPICS

by PAT HAWKER, G3VA

WITH the approach of autumn, now could be the right time to start work on one of the longer term projects of amateur radio. How often do we all say, "I would like to have a shot at it if only I had the time." Now, if ever, is the season of the year when we should be able to make time. And there should be no shortage of ideas—there are plenty of interesting possibilities floating around just crying out for further development—there are several in the following pages.

Conical reflectors

For the uhf and microwave operator the ultimate in high-gain aerials has for many years been the parabolic dish, the larger the better. But a true paraboloid is not an easy shape to come to terms with. The main reason for this is that the paraboloid is a doubly-curved surface: if constructed from flat sheets of material, part of the material needs to be either stretched or compressed or both. There is, I believe, an ingenious technique for moulding plastic reflectors which are then metallized—but even this is hardly a "one-off" procedure. Is there any alternative?

The answer, it would seem, is definitely yes—at least for vhf and uhf operation up to a few gigahertz. Recently Fred Brown, W6HPH/G5AWI, brought to my attention an approach which was new to me—and I suspect to many others. It was all explained in detail in an article he wrote in 1966 for *VHF'er* which I hope I am not denigrating by calling "little-known". This article shows that conical reflectors, constructed very easily from flat sheets of material, hardware cloth in his case, can provide an extremely useful substitute and give considerably more gain than would a corner reflector type of aerial, and is just as easy to build.

The shallow cone has the advantage of being a singly-curved surface and can, of course, be made from flat circular sheet by removing or overlapping a segment of the material. The conical reflector aerial makes use of the fact that it is not really vital for the surface of a parabolic reflector to be a true paraboloid. It is usually accepted,

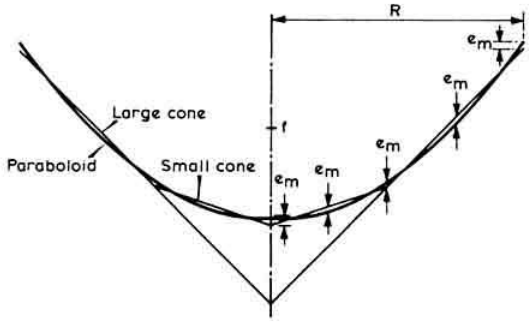


Fig 1. Principle of the polyconic reflector showing the small departures (m) from the true paraboloid

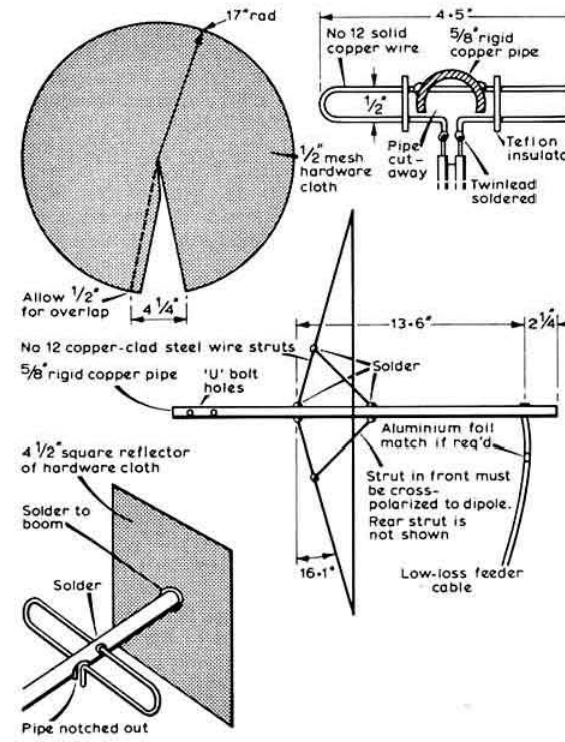


Fig 2. Details of a 1,296MHz single conical reflector aerial providing about 16dB gain

G5API points out, that there can be departures of up to $\frac{1}{16}$ of the wavelength concerned at any point on the surface without suffering any significant deterioration of gain and directivity. This $\frac{1}{16}\lambda$ figure may not sound very much but, in practice, it permits quite drastic changes in the overall shape. Up to a certain size, in terms of wavelength, it can be a shallow cone; up to an even greater diameter it can be formed by fitting two shallow cones, one inside the other: Fig 1.

Fred Brown's original article shows that a two-cone reflector is entirely satisfactory up to 13·86 λ diameter in certain conditions. This means that one could build a reflector of 10½ft diameter at 1,296MHz, or even 31·5ft at 432MHz, without having to worry about those doubly-curved surfaces. For single cones it is possible to go up to 3·46 λ, and details are given of a high-performance 1,296MHz aerial with a gain of just over 16dB "constructed in a few hours" for a cost of $1.50, the cone having a radius of 17in. Both the cone and the small 4½in square reflector for the folded dipole element are made from ¼in mesh hardware

cloth: Fig 2. In some ways the aerial is rather like the short backfire uhf aerial described in the April *TT*—and, of course, one of the possible applications of conical reflectors would be as high-gain television aerials.

One way and another it seems well worth considering the conical reflector as an alternative to the parabolic dish.

New tvi filter for uhf tv?

Brian F. Rose, G3LUR, in investigating a novel hf discone aerial with vertical polarization, recently ran into a case of swamp interference to a local dual-standard tv set—unfortunate for him but quite possibly lucky for the rest of us since it caused him to experiment with stub rejection filters for the tv receiver with interesting results.

He writes: "The tv receiver was one of those with separate vhf and uhf aerial sockets; tvi was in evidence as a picture beat with loss of sync on vhf 405 lines only. The interference disappeared when the uhf aerial was removed and a high-pass filter fitted in the vhf coaxial lead. The isolation provided by this filter, however, was bypassed whenever a uhf aerial was connected while the set was receiving vhf channels. Even though on this set uhf programmes were very weak (due to a badly installed uhf aerial) no tvi was caused on uhf.

"Various forms of braid breakers, including small Mullard toroids of various grades of ferrite, were tried, but it was not found possible to get less than about 10dB attenuation on the uhf signals, so degrading still further an already grey picture. Two open-circuit quarter-wave stubs in the braid and centre conductors were better, with only about 3dB attenuation on wanted signals, after pruning. However, even this was not satisfactory.

"Experiments with tobacco-tin high-Q breaks seemed promising, but it was felt that the filters would be too touchy for use on domestic sets and rather expensive and difficult to assemble. But they led me to what may be a new and simple way of making foolproof filters of only about 1dB attenuation, capable of being built in five minutes at a cost of five pence! In effect these consist of high-Q breaks fashioned in 300Ω line: Fig 3.

"Construction is as follows: Two pieces of low-loss coaxial tv feeder with solid centre conductors are bared to a length of 1in. A pigtail is formed from the braid, and the centre conductor bared to a length of $\frac{1}{4}$in and bent at right angles. The pigtail is held parallel to the cellular insulation and soldered to the inner conductor, thus forming a loop at the cable and measuring about $\frac{1}{4}$in by $\frac{3}{4}$in. These two loops form the input and output coupling loops of the high-Q break.

"The resonator is formed from 300Ω twin lead by soldering a short-circuit across one end of a piece about 1ft long. The actual length will depend on the uhf channels in use in the locality: Bands IV and V stretch over the octave 470 to 960MHz but the local stations will be in one of the channel groups only 88MHz wide. (**Note**: this is not always true as there are a number of non-standard distributions where the four allocated channels spread over a good deal wider bandwidth –*G3VA*). Velocity factor of the widely available Aerialite 300Ω twin cable is 0·84.

"The loops are placed on opposite sides of the twin lead as close to the shorted end as possible; it will usually be convenient to take the input and output leads away in opposite directions as in Fig 3. Assembly is completed by binding the three pieces together with tightly stretched pvc tape. The major part of the twin lead should be clear of the binding and should be raked slightly away from the coaxial feeders.

"Two suitable tv plugs complete the assembly; it can then be inserted in the lead to the receiver and the stub adjusted, preferably while viewing the programme on the lowest local channel number. Cut back the twin lead in steps of $\frac{1}{16}$in removing your hands well away from the lead while checking each time for an increase in tv signal. When correctly trimmed it should be possible to receive all four channels (of course, at the moment only three are used) equally well, but final adjustment may be made by very fine shaves of the twin feeder, using the mid-band station. Ideally this final adjustment should be made after fitting the filter to the tv set on which it is to be used. If the local channels are towards the top of Band V (high channel numbers up to the sixties) the pruned length of the stub may be only about 4in, for $\frac{1}{4}\lambda$ resonance.

"Direct feedthrough of signals by capacitance coupling between the two loops is reduced if these are placed so that the inner conductor of one loop is opposite the braid of the one on the other side of the resonator.

"It was found that optimum results were obtained with $\frac{1}{4}\lambda$ stubs but that the performance was completely spoiled when attempts were made to use fine tuning spills. On the other hand, $\frac{3}{4}\lambda$ stubs worked almost as well (2dB attentuation of wanted signal) and permitted a fine tuning spill to be attached; this took the form of a piece of brass foil folded around the twin lead for a length of $\frac{1}{4}$in, and slid to and fro around a voltage point. But for most applications such a tuning facility is not really worth the impaired performance. Out-of-band attenuation appears to be at least 20 to 30dB within the tuning band of a uhf receiver.

"Similar filters can also be used to filter the output of low-power vhf transmitters in those situations where the provision of a more elaborate bandpass filter is not required. Tests have been made with rf powers of up to 25W on 144-MHz although such an approach is possibly more useful on the 70 or 23cm bands."

G3ULR adds that a still better bandpass characteristic has been obtained using a double-resonator version of this filter, using a piece of twin lead pruned to be $\frac{1}{2}\lambda$ long on the working

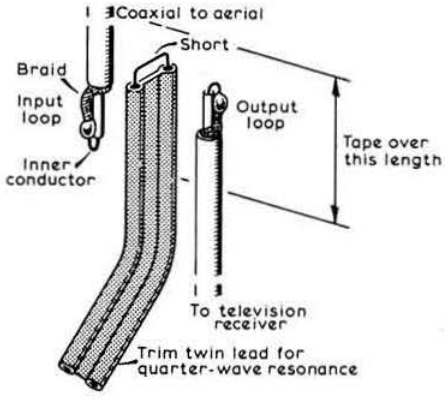


Fig 3. High-Q break filter for uhf television receivers. The loops should be assembled in close contact with opposite faces of the twin lead resonator

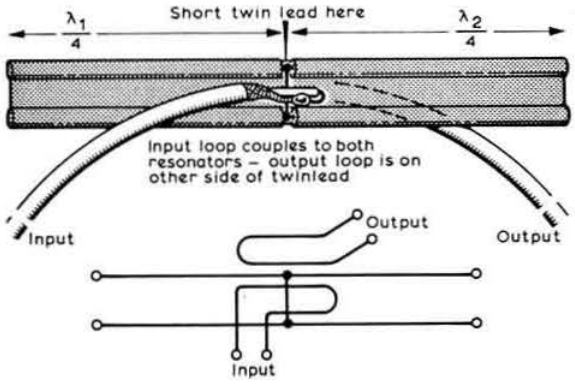


Fig 4. Bandpass version of the high-Q break filter tuned to different channels (wavelengths λ1 and λ2)

frequency, with a short-circuit placed at the centre of the line: Fig 4. The input and output loops are placed on opposite sides, as before, but with half their area coupling to each of the resonators. In its tvi application one resonator of such a filter is tuned to the highest frequency station, the other to the lowest.

G3ULR suggests that this form of filter would appear to make conventional high-pass filters an expensive luxury when dealing with uhf tvi, has less attenuation than a ferrite braid-breaker at vhf, while performing the same function at uhf. In all these filters the braids of the coaxial must not be in contact.

Since these filters are susceptible to hand-capacitance it would presumably be necessary to ensure that when fitted they do not move around near metal objects. One can see a slight problem arising in some areas at some time in the future when the fourth programme channel opens, unless this is one of the inner channels for the locality. There might also be a problem in areas where very wide non-standard channels are or will be in use. A 1973 list of all uhf transmitters and their channel numbers—covering stations in operation and those expected to open in the next year—can be obtained on request from IBA Engineering Information Service, 70 Brompton Road, London SW1 3EY: just ask for the *Pocket guide to tv transmitters*.

Single mosfet 144MHz converter

A single-device 144MHz converter may seem a throw-back to the days of the super-regen and may not appeal to the more serious-minded vhf operators. On the other hand it represents the type of challenge that some amateurs find irresistible. So for them at least, Fig 5 provides the circuit diagram of a tunable 144MHz converter originally described by Goliardo Tomassetti, I4BER, in *Radio Rivista*, No 7/72, but picked up from *Electron*, April 1973. I.F. output is about 27MHz and the fairly elaborate high-pass input filter minimizes direct breakthrough. The converter is based on a dual-gate mosfet in a self-oscillating arrangement not unlike that of the single-gate self-oscillating mixer described in *TT* (June 1969) and *ART*.

This type of converter, with suitably modified input arrangements and changed inductor values, might also be suitable for those looking for a simple unit for one or more hf bands.

Power FETs from the USSR

Advanced semiconductor technology is not usually associated with either the USSR or the East European countries, and most of the journals coming from those parts seem to reflect devices of significantly less variety in this respect than their American and West European counterparts. But it is always dangerous to generalize—as the following notes will show.

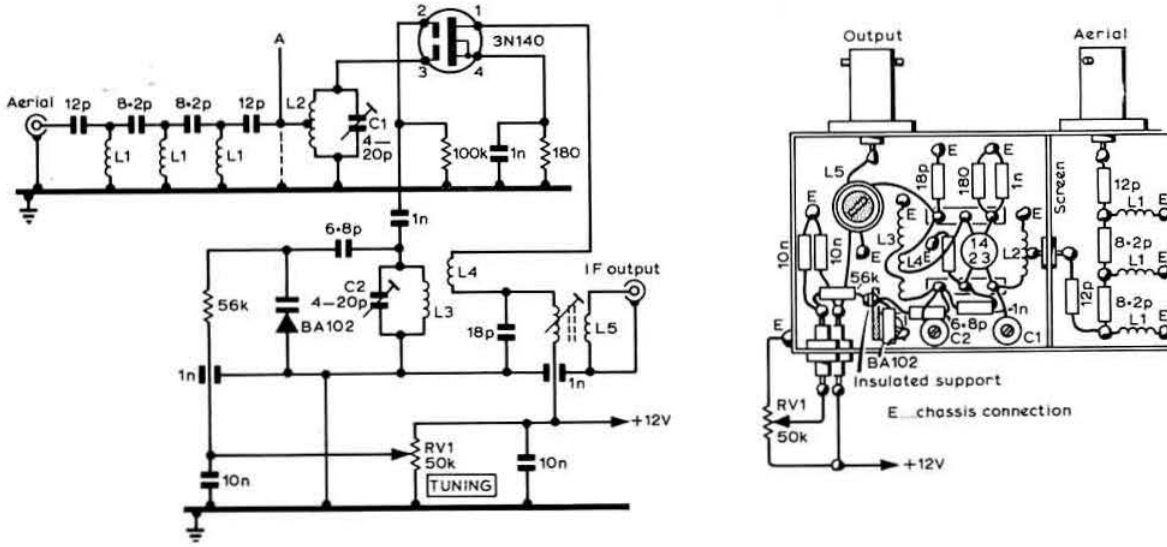


Fig 5. Single dual-gate mosfet 144MHz tunable converter. L1, 5 turns spaced 1mm with 2m diameter; L2, 8 turns 6mm core; L3, 5 turns as L2; L4, 3 turns 6mm; L5, 15 turns 0·32mm spaced on 6mm with 1 turn coupling link. A 40673 mosfet would be preferred to the 3N140 as it has built-in protective diodes

T. Roeves, G3RKF, writes to say that his firm (Suvicon Ltd, Hagley House, Hagley Road, Birmingham B16 8QW, telephone 021-455 8261) is now marketing in the UK some Russian semiconductor devices of unusual interest.

For example the K┌┐901A represents what appears to be a world first in being a commercially-available power fet capable of providing 10W rf output up to 60MHz with a power gain of 13dB and up to 1A drain current. Another device, the K┌┐902, will give several watts output at 1GHz.

A pair of power fets, in Class B push-pull, is claimed to provide a very simple multi-octave linear amplifier from hf to vhf with quite high input and output impedances, so making matching easy. G3RKF has no independent opinions yet as to the ruggedness of such amplifiers but suggests that since the devices may well have been developed initially for military service this should be reasonably high. Like many of the interesting field effect devices appearing in the West, these Russian fets are manufactured by means of ion implantation techniques. The structure provides high breakdown gate-to-drain voltage characteristics and does not require matching with a transmission line in order to produce high output power, since optimum load resistance is of the order of 50 to 100Ω.

Other USSR devices being handled by Suvicon include rf bipolars in stripline packages using overlay and interdigited type structures akin to those used in American rf power transistors. Also low-noise bipolars (2dB noise at 1GHz, 2mA) in a stripline package; and various fet devices including dual-gate rf types. G3RKF does not say how prices compare with Western devices, though clearly some of these are unlikely to come very cheaply.

We are still puzzled that British firms which developed prototype power fet devices quite a few years ago seem to have lost interest in the breed.

High-performance fet mixers

To return to the more familiar electronics habitat of California to follow up our earlier items on double-balanced fet mixers of exceptional dynamic range (for example *TT* March 1973). The 16-page Siliconix application note by Ed Oxner, *Junction fets in active double-balanced mixers*, has now been published and proves to be a most useful guide to the design of such mixers and their associated wideband transformers. I am not sure whether these notes are yet available from the UK office (Siliconix Ltd, Shirley Lodge, 470 London Road, Slough, Bucks); if not try Siliconix at 2201 Laurelwood Road, Santa Clara, California 95054, USA. The firm is going to market a special jfet "quad" device for this application although these will not be low cost, at least to begin with. The note starts off with a statement that just about sums up the views of many concerned with communications receivers: "Dynamic range is probably the most important consideration in modern receiver design."

Ex Oxner is now tackling two more application notes likely to prove of interest: one on fet oscillators and their a.m. and fm sideband noise density, the other on broadband transformers. Because of reciprocal mixing it is not much use striving after mixer dynamic range unless the purity of the injection oscillator is good and its sideband noise is low. He mentions that using a fundamental uhf oscillator based on a U310 fet, sideband noise can be better than −135dB down 5kHz from carrier! This implies the possibility, with a multiplier chain, of having, say, a 5GHz local oscillator signal far cleaner than could be achieved with a bipolar transistor or Gunn diode. He believes that the secret of such performance is to have the gate essentially at earth potential to reduce the lf noise voltage. It was in *TT* of August 1969 that we reported the views of Walter Schreuer, K1YZW, that FETS were an excellent choice for oscillators in providing less sideband noise than valves and appreciably less than bipolar transistors.

Small plastic instrument cases

The mention of small aluminium die-cast boxes has reminded me that I was recently sent details of a new range of Minos miniature instrument cases in moulded plastics, forming an alternative to aluminium for applications that do not require total electrical screening. The body of the box is finished in intense black so that no painting is required; the front cover can be supplied in aluminium or in the more attractive white pvc-faced steel. Sizes available are 100 by 65 by 50mm (2½ by 3¾in) and 130 by 100 by 50mm (3¾ by 5in). The case is moulded ABS plastics, with built-in printed circuit board guides. The firm is West Hyde Developments Ltd, Ryefield Crescent, Northwood Hills, Northwood, HA6 1NN. Price for one-off works out at around 50 or 60p.

Low-noise cascode fet amplifier

While writing, Ed Oxner also passes along details of a useful low-noise cascode amplifier for such applications as an i.f. pre-amplifier (or for an Oscar 6 pre-amplifier?). This uses a dual jfet (such as the U257 or lower cost epoxy encapsulated E420 or two E300 devices). The amplifier, Figs 6 and 7, was packaged in a small aluminium cast box 1 by 2 by ¾in with BNC coaxial connectors for input and output; it achieves 20dB gain and a 1dB noise figure quite easily at 30MHz, and for as long as the input is tied to 50Ω the amplifier is rock stable. The two inductors are on toroid cores and orientated at right angles to one another to ensure minimum cross-coupling.

He also repeated the design, with some variations, at 150MHz, achieving similar gain and a noise figure of 1·6dB. He has also tried a fet/bipolar combination very successfully

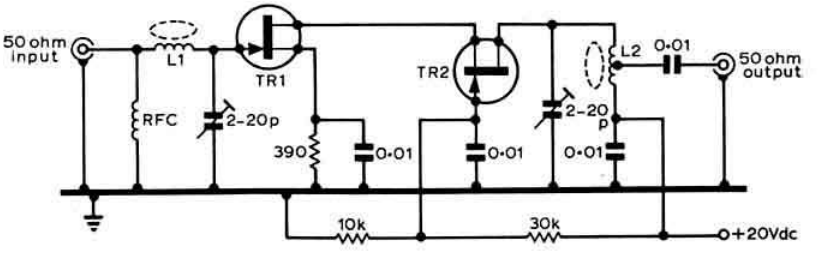


Fig 6. Cascode 30MHz i.f. amplifier with 20dB gain and noise figure of 1·2dB. L1, 1·7-μH, 22 turns of No 24 awg enamel on Micrometals T50-10 toroidal core; L2, 20 turns as L1 tapped 7 turns from earthy end. TR1 and TR2, Siliconix E300 (single jfet) or U257 or E420 dual fet. RFC 30μH Delvan rf choke

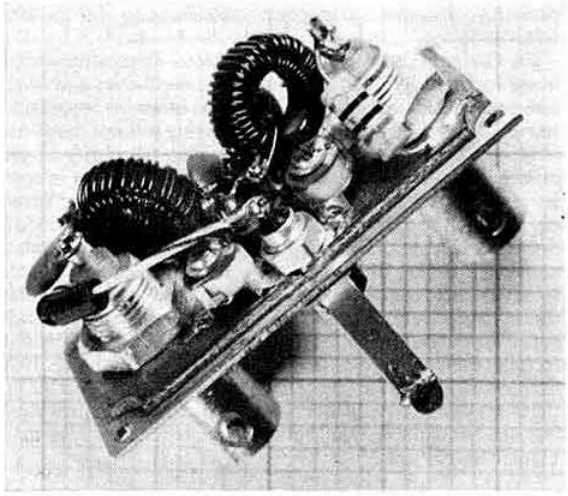


Fig 7. Photograph of the 30MHz amplifier

but is planning to try feedback and other circuit dodges to achieve wide bandwidth.

Ceramic resonators as nbfm filters

M. J. Cooper, BRS33780, has recently been considering the use of Brush Clevite ceramic resonators as an economical alternative to 10·7MHz bandpass crystal filters for nbfm applications, and has come up with some useful suggestions. He says that the circuit arrangement shown in Fig 8 will reduce the normal bandwidth of 230kHz down to about 10kHz. The system has been tested over several weeks of operation and appears to function reasonably, although he still regards it as being in the experimental stage and would be interested in comments or suggested improvements from members (his address is 12 Black Barn Lane, Usk, Mon. NP5 1BP).

He uses a Brush Clevite FM4 ceramic fm resonator, and the diagrams show the difference between normal use and modified by the external circuit for narrow passband. The waveform complexity is due to the complex equivalent circuit of these resonators: the filter behaves like a series resonant at the null points and a parallel resonant circuit at the peaks 1 and 2. The height of these peaks and the point at which the circuit breaks into oscillation is set by RV1.

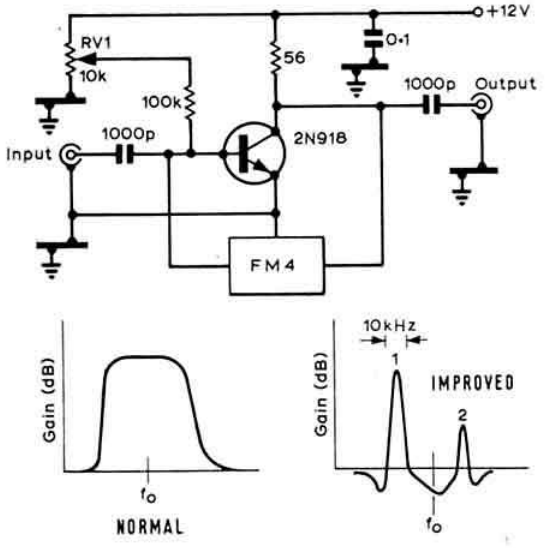


Fig 8. Use of ceramic resonators to provide narrow-band filter

Low-power dsb/am transmitter

There can be little doubt that for non-channel operation in the presence of random interference the system providing the highest degree of communications effectiveness open to the hf operator would be dsb (suppressed carrier) transmissions received on a binaural demodulator. Even without special forms of demodulation, dsb is a very effective system and fully compatible with ssb since it can be converted into ssb within the receiver. It is also a system which is well suited to low-cost QRP transmitters, particularly for operation on such bands as 28MHz where nobody could seriously suggest there is no room for two sidebands.

We have given circuit details of a mini-dsb transmitter in *TT* before, but a recent design (Fig 9) appears in *Electron* (March 1973) by F. Prien, PA0GG, based on one that appeared in *73 Magazine*. Using only two rf transistors with a 28MHz crystal, plus a couple of af transistors, it can provide up to about 1W dsb, with up to about 40dB carrier suppression in a conventional diode balanced modulator; the 2N2048 stage is operated as a linear. To align the transmitter it is advisable to check the resonant circuits with a grid-dipper and then to use the S-meter of a receiver. With the balanced modulator control set out of balance, the rig will produce low-power a.m.

Low-cost phase-locked loop demodulator

In "Circuit Ideas" (*Wireless World*, July 1973, p337) Rodney King provides an interesting low-cost circuit of a phase-locked loop demodulator using only a single 7401 integrated circuit; this is an even lower cost system than one that stemmed from PA0KSE that I had described a few months before. It is claimed that although the precise characteristics will be effected by differences between 7401 devices, it can give satisfactory performance for most amateur experimental applications: Fig 10.

The operation is as follows: the gates A, B and C form a relaxation type oscillator voltage controlled by the current sources supplying pins 10 and 13 and by the value of C1. Gate D is arranged so that when pin 6 is high it operates as a linear amplifier; in operation pin 6 is high or low due to the oscillator output: this gate thus acts as an amplifying phase detector. Its output goes via the low-pass filter formed by R4 and C2 to the oscillator to complete the loop. Audio output is taken through the filter R5/C3.

With C1 22pF the operating frequency is about 10MHz and the frequency band over which a lock will be maintained is governed by R6: if this is 270Ω, lock is maintained for about 2MHz, if 10k about 300kHz. The optional R7 provides fine adjustment of the operating frequency if required. Audio output swing is just over 1V.

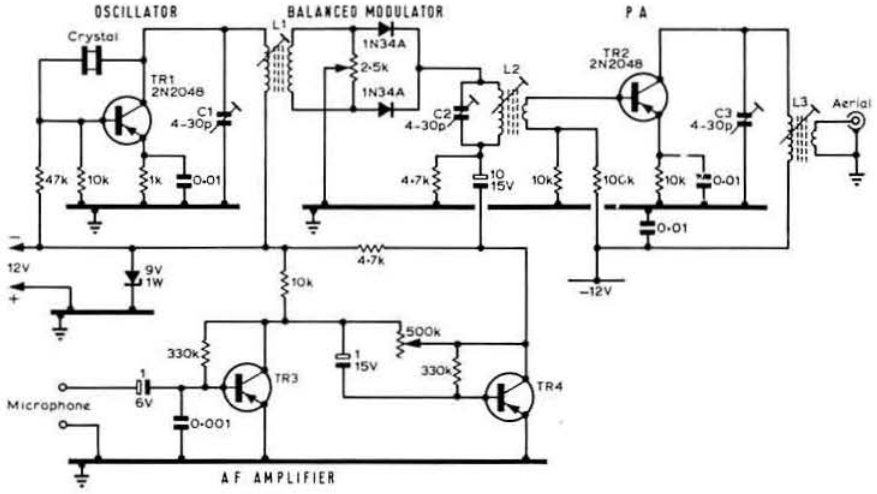


Fig 9. Low-power 28MHz dsb transmitter. L1, L2 and L3 have 24 turns, No 24 wire on ¼in former

Although the price of special-purpose pll demodulators has been coming down, this low-cost system could prove attractive to those considering synchronous demodulation for such applications as broadcast reception. The problem with pll systems when applied to amateur reception is the tendency to jump to and lock on the loudest signal appearing at its input.

After preparing the above notes, a letter has come in from Joe Cropper, G3BY, giving his experiences in using the above technique. He writes:

"I made up the phase-lock loop using the SN7401 and although I have only patched it into the hf receiver it seems to be performing as claimed. For reasons of convenience only one i.f. stage is used instead of the usual two but the sensitivity was only just below normal. There were no fm stations to judge its true performance but it was interesting to start off with low signal strengths where the loop just failed to lock and then turn up the gain to obtain lock. On cw the locking as the carrier was keyed gave the impression that good strength was there if it had been possible to heterodyne the signal; on 7MHz broadcast stations a beat note became audible at the bottom of deep fades as lock was lost, and it appeared later when checking the receiver in its normal mode that this was just about when the signal was becoming lost in the noise. Although, of course, these were a.m. stations, some audio was resolved, but at reduced strength but good quality—possibly due to unintentional rectification in the ic—or some frequency modulation on the a.m. carrier!

"I can confirm the variation in characteristics with each device. I found that when C1 was 22pF, as shown, the frequency was about 4MHz and I had to use a nominal 1,000pF to get near to 455kHz; I found R7 (4·7kΩ preset) essential for adjustment to a definite frequency. I made R6 10kΩ since there seemed no point in having a 2MHz locking range with a 4kHz bandwidth in the receiver, and perhaps the change in this value was one reason for the change in operating frequency. Voltage readings with no rf input were: ht rail, 5·2V (13mA); pins 1, 6, 8 and 9, 0·95V; pins 2, 3 and 13, 1·46V; pin 4, 3·5V; pin 5, 1·5V; pins 10, 11 and 12, 0·9V. To sum it up, I do not know how the sensitivity compares with a purpose-built phase-lock loop device—but evidently it is a usable idea."

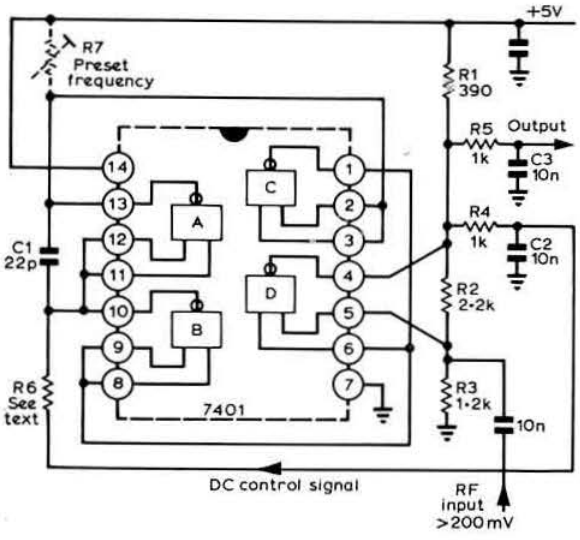


Fig 10. Low-cost phase-lock loop demodulator formed from single general purpose 7401 integrated circuit. Values shown suitable for operation at about 10MHz (but see text)

INTERFERENCE PROBLEMS

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

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

MICROWAVES—1,000MHz and up

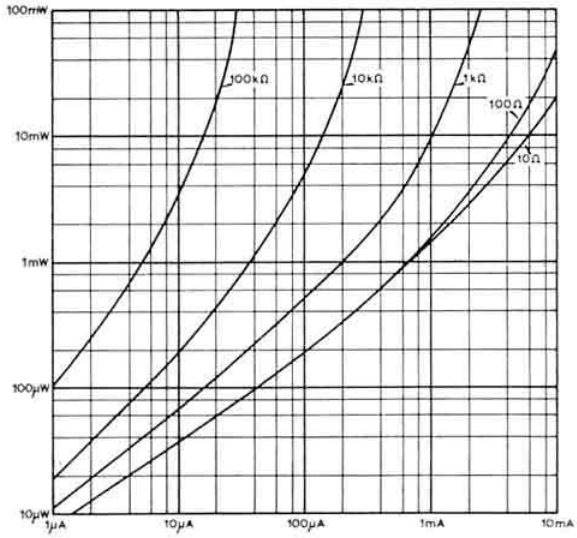
by DAIN EVANS, G3RPE*

Rough measurements of power

Conventional point contact mixer diodes can be used to provide an indication of rf power with an accuracy sufficient to prevent gross mistakes in the construction of microwave equipment. The relationship between rf input and dc output for a typical diode is shown in the figure, and was derived from data given in the 1972 edition of the *Microwave Engineers Handbook*. Although this data applies specifically to X-band, the results obtained at other microwave frequencies would be expected to be similar. Each curve corresponds to a particular *total* series resistance. The resistance of meters, which is typically 100Ω for 1mA fsd, 1,000Ω for 100μA fsd and so on, in some cases is significant and must be allowed for.

As an example of the use of this data, suppose a mixer is fed via a 20dB (×100) directional coupler from a klystron, and a current of 0·9mA is observed on a meter having a resistance of 100Ω. The power indicated by the diode corresponds to 1·4mW of rf, which implies that the klystron is delivering in the region of 140mW. Comparing this value with manufacturer's data will give a guide to the efficiency of the system.

Someone with time and suitable test equipment could provide a most useful service by checking the output of a variety of mixers at various frequencies. If the results obtained are sufficiently reliable, then a simple method of calibrating those most useful devices, variable attenuators, may be practical. Have we any volunteers?

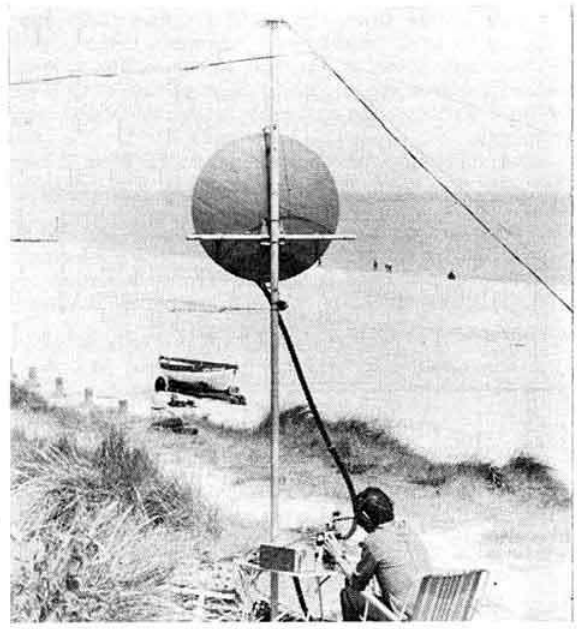


The approximate relationship between rf power input and dc output for a conventional point contact mixer diode

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

A test at 10GHz over a long sea path

On 20 June G3ZGO went to Flamborough Head, and G3RPE and G3YLV went to Happisburgh, 13 miles south-east of Cromer, to test a 184km (114-mile) long sea path off the east coast. The intention was to take advantage of the propagation mechanism of superdiffraction, that is transmission within the duct formed by moist air lying between the water surface and relatively dry air above, which can lead to very low rates of attenuation. Consequently both stations were set up near sea level, G3RPE at about 25ft and G3ZGO at either 20ft or 100ft. The transmitter used a V55 klystron of 400mW nominal output feeding a dish 3ft in diameter. The receiver was fed from a 2ft dish, and used a 1N23WE mixer diode into a 1MHz wide 30MHz i.f. amplifier with an fm discriminator.



G3RPE/P near Cromer working G3ZGO/M on Flamborough Head over a 114-mile sea path

Weak signals were heard throughout the day, fading in and out of the noise. However, just after noon the signals peaked up, and for about a minute rose to the equivalent of about S7. Perhaps a significant feature was that the signals had disappeared in tests at 9pm and 10pm, by which time the sun had gone down. (An alternative explanation could be that our delicate microwave ears had been desensitized by the clatter on the 80m talk-back link). As would be expected, attempts to work in the other direction using a 5mW transmitter were unsuccessful.

What conclusions can be drawn from these tests? The most obvious one is that working this type of obstructed

path is practical with even wide-band equipment if of moderate power: in this case the obstruction, the sea, was 2,200ft high! The range of the equipment measured under these conditions suggests that it is feasible to work the Channel Islands, Ireland, Belgium, Holland and, of course, France.

Accounting for the signal strength observed is not easy. The path loss capability of the system, calculated from its parameters, is about 199dB. As the signals rose just above threshold, we may presume a signal/noise ratio of 10dB: hence the path loss was about 189dB. This path loss is significantly lower than the path loss for tropospheric scatter, 238dB, and very much lower than for propagation over a "smooth earth". On the other hand, the loss was significantly greater than free space, 158dB, or via a perfect duct, 135dB. The best interpretation at this time is that propagation was via a leaky duct.

Conditions on the day appeared to be good for duct formation as we understand them. It was a hot cloudless day with a smooth sea. Perhaps the only uncertainty was that the light wind was from the wrong direction: coming off the sea, it was presumably more highly saturated than a land breeze would have been.

Looking back on the day, one is still a little surprised that one can transport equipment to a strange site and manage to point aerials in the correct direction to within a degree merely by reference to landmarks on a 1in map. This was just as well—if the aerials had needed aligning by trial and error, it is unlikely that anything would have been heard at all.

SWL NEWS

by BOB TREACHER, BRS32525*

Knowing what you need

Many listeners, including your scribe, are very keen on chasing dx on the five main amateur bands. There are undoubtedly many different ideas on how a countries heard record should be kept but the method shown below, which is already in use by the writer, Chris Henderson and Malcolm Whitfield, A8458, is possibly one of the more clear, concise and easy-to-read systems in use and it can be seen at a glance exactly which elusive countries are needed on which band.

	10	15	20	40	80	160
CR7	√	√	√		√	
CR8			√			
CR9						
CT1		√	√	√	√	
CT2	√		√	√	√	
CT3			√		√	
CX		√	√			
DL	√	√	√	√	√	√

DX and all that . . . and more

Bernard Hughes, BRS25901, has written a very interesting letter in which he mentions that he now has the whole of the African continent confirmed and the Marconi-Kemp Class 1 Award as his latest piece of "wallpaper". Bernard has been sorting out some of his rarer QSLs and offers the following to make our mouths water: AC6H, BV1USA, CR9AK, JT1KAA, KG6IF (Marcus Is), XV5AC, VE7IR/XU, XZ2TZ, 1S9WNV (Spratly Is), 7G1L (Republic of Guinea). As he says, they make good conversation pieces when a visitor calls at the shack!

A letter received right on the deadline came from Stan Sharred, A8313, who supplied a good list of Top Band dx as follows: LU5HFI, PY1RO, VO1FB, EP2BQ, 5Z4KL and ZP9AY—all these being hooked on cw.

David Johnson, A7511, apart from supplying a score for the Countries List which took him over an hour to compile, provided some interesting information on the Heathkit spectrum analyser, the SB610, which he had just purchased. David can now give more critical reports when QSLing, and he has also used it to test local amateurs' equipment. Not content with this fine piece of equipment, he was actively engaged on building an sstv monitor as his next constructional project. Apart from these interests, A7511 was also organizing a special event station, GB2CCF, for the Clitheroe Castle Fete on 1 September. Listener reports will be welcomed and will be answered via the bureau.

Reminders

G3YOU, QTHR, is the RSGB QSL Bureau sub-manager for BRS/A numbers. Stamped addressed envelopes at least 6in by 4in should be sent to him only and not to any of the other QSL sub-managers.

Cray Valley RS 5th SWL Contest takes place on 15-16 September. Rules in July *Radio Communication*.

All updated scores for the 1973 Countries Table, and news, views and comment for inclusion in the November *SWL News* should reach your scribe by 2 October 1973.

1973 Countries Table

	10	15	20	40	80	160	Total	Mode
BRS33358	104	181	205	91	95	4	680	ssb
A7460	81	159	206	77	107	8	638	ssb/cw
BRS6604	51	114	145	103	63	15	491	cw
BRS25901	61	103	178	67	72	5	486	ssb
BRS33364	47	121	167	57	84	6	482	ssb
BRS33823	61	119	144	54	93	8	479	ssb
A8458	68	113	119	40	36	3	452	ssb
BRS33211	45	96	138	53	115	—	447	ssb
BRS25429	20	87	122	68	107	6	410	
A7784	44	83	120	58	60	5	370	ssb
A8094	43	80	111	33	53	6	326	
BRS32524	4	66	124	28	78	3	303	ssb
A7511	—	53	113	36	70	4	276	ssb
BRS32286	14	64	87	21	80	—	266	
A8320	—	58	118	33	45	1	255	ssb
A8037	40	54	99	18	39	2	252	ssb
A8313	0	7	71	15	51	17	161	cw/ssb
A8374	10	55	59	—	8	2	134	ssb
A7139	5	30	28	25	41	5	134	ssb
A7951	9	17	61	12	29	3	131	ssb
A8065	17	21	25	18	35	3	119	
A7700	8	26	42	18	20	1	115	ssb
BRS33210	1	20	33	8	38	6	106	ssb
A8431	—	8	43	29	31	1	102	ssb

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

FOUR METRES AND DOWN

by JACK HUM, G5UM*

A house of many mansions

"Could we please have less of the 'mode war'," asks Brian Pickrell, G8ARM: "I run crystal controlled a.m. on 70cm but I don't try to force this down people's throats, and in consequence I don't like to have to read all these exhortations to G8s to take the morse test. I, along with most early G8 calls, am not interested in cw so please, G3 lads, give it a rest, and use the *FMD* column space for more important things."

But there is no war. Each to his own inclinations that best serve "... the self training of the licensee in communication", as the vital parchment puts it. Metre-waves are a house with so many mansions that he is a fortunate individual with time to spare to inhabit them all, much less to find time to cross to the other mansions below 70MHz.

If there *is* time to spare it helps if one can go along with Item 9 of "The Metre Wave Man's Code" and equip oneself for as many modes as possible, bearing in mind that there is no "best" mode. If one does this one can circumvent that apartheid trend lamented by G3CGQ on this page in July which prevents one mode from talking to another.

Oscar and the G8-man

Early in Oscar's life it became evident to G8CEX of Westcliff-on-Sea that cw was the best mode with which to access the satellite. What could a non-telegraphist G8-man do about working the dx through it? Barry Turner decided to find out.

After making his first via-Oscar contact last 24 December, the limitations of his existing ssb equipment became apparent to him over the succeeding weeks, and a programme was initiated to improve it. From the subsequent months of successful satellite chasing 'CEX reached a number of conclusions, which may be summarized thus:

1. A circular-polarized transmitting aerial is a "must" in the interests of consistent performance, though it need not be large or complicated. The existing 8-el flat-top is used for extreme range operation; for high angle passes a 3-el crossed Yagi array was built from discarded television Ch 1 and Ch 9 aerials, fixed on a simple swivel mount and rendered capable of being pre-set anywhere between 45° and 90° to the horizontal.

2. For reception on 29·6MHz a dipole has been adequate, though the advantages of a low-angle aerial for extreme range are recognized.

3. Many a 10m receiver will benefit from the addition of a simple fet pre-amp, or even a self-contained 29MHz converter ahead of it.

4. Tailored audio is important: a bandwidth of 300-3,000Hz provides good intelligibility under high noise conditions while occupying only a small bit of 2m/10m.

5. Transmitter power output requirements vary from orbit to orbit, but it seems to G8CEX a counsel of perfection to recommend some means of reducing power for the favourable orbits. Although he has 450W erp available (" . . even so, many has been the time when this has disappeared completely from my receiver as a result of satellite agc blocking"), G8CEX can hear his own signal coming back when he uses only 3W of A3J during low activity overhead passes.

Looking ahead to Oscar 7, Barry Turner feels that a bandplan will be essential to separate the cw and sideband emissions, with perhaps a segment in the middle for cross-mode contacts.

He gives high praise to the GB2RS Sunday morning satellite predictions, but wishes they were more readable at his particular QTH. No 2m broadcast is within normal range; the 80m one is ". . . layers thick with Continental stations". This is the perennial coverage problem. As G8CEX observes, "An Oscar project is a fast moving affair and an orbital prediction bulletin missed can be disastrous". Is there, one wonders, a better method of "broadcasting" the info? (*See Oscar 6 item in QTC*—Ed).

Other Oscar currencies

Noting the G3IOR-G6CJ correspondence about beyond-horizon Oscar signals, GW8BPG of Barmouth recalls similar phenomena he observed seven years ago when engaged on ground station tracking of weather satellites in the 136MHz band. Frequently, signals would appear before the predicted times, rise to a readable peak for 20-60sec and disappear. Five minutes later, right on prediction, they would reappear, to be held during the pass time. But when the main signal died away, the short lived burst did not recur. Any theories?

This effect was most marked on N-S and S-N high arc passes.

Another ARRL Satellite 1000 Award for the UK. Mike Walters, G3JVL, has just qualified for No 108.

Repeaters at 70cm

Members' comments about the potential value of repeater beacons in the 70cm band have prompted G8AUU to describe the current situation on the Continent. The German network in a grid 70 by 70km is built round nine channels at 50kHz spacing. The first channel is at 431·05 giving repeated output at 438·65MHz, the second at 431·1 giving output at 438·7, and so on up to 431·45 coupled with 439·05MHz. It will be noted that the spacing between input and output channels is 7·6MHz.

"Seventy-centimentalists" will at once detect the difficulties that would surround the adoption of these frequencies in the UK. For one thing, there are restrictions in the use of our two-meg allocation below 432MHz. For another, there might be a QRM problem for the /T men above 433·5, though on this point G8AUU says that tests in Switzerland suggest that unless the atv receiving station beams directly at the relay no degradation of picture occurs. And anyway, video uses horizontal polarization and fm repeaters vertical.

Still with G8AUU, on now to . . .

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The scene on 70cm

. . . and he proffers the reminder, regarding the G3UBX comment last time about *two* calling frequencies in the 70cm band, that 433·2 is useful for fm callers, with 433 for all modes. He goes on to say:

"The reason for the choice of 433·2 may be of interest, and may also encourage some 70cm activity on fm. Two popular simplex channels in London were 144·4 and 145·2. It was soon realized that 144·4 tripled made 433·2 and that 433·2 mixed with 288MHz (a 96MHz crystal × 3) gave 145·2. So the strapping of the 144·4 transmit and 145·2 receive to a spare channel position, and the addition of the up-down converter to the aerial socket made a 70cm rig running a few watts of 433·2 fm. Eventually, when 70cm rigs in their own right came into use, this frequency was a natural".

And just above it, on 433·4, the Newark Net goes into action Mondays at 8pm, kept up to strength, when G3SHY returns to college this month, by adherents from nearby Nottingham.

Over at Droitwich, G3ZUL, ruminating on the recent 432MHz expedition with G8ACB, pronounced it ". . . a mixed success, but the key was a marvellous tool on 70cm"—a hint which Class A men who may be building for the band should not ignore. Big surprise for 'ZUL was to catch G3WKF/P over 200 miles away at Boscastle. Many would be glad enough to work Cornwall on 2m, let alone 70cm. And many were glad to catch ZUL/ACB in Brecon in the July contest, when foul weather discouraged many portables from venturing forth (even so, from what could be heard it sounded as if the leaders would have notched 50-plus contacts).

Portables pick prime sites. What if you are stuck with the one you have at home? Though it may be an indifferent one it will pay off on 70cm if your locals know you are active and therefore worth beaming on. Few could be worse placed than G8EIC, who is virtually surrounded by the British Steel Corporation at Staveley, and in order to work southwards is compelled to beam northward to bounce his signal from a nearby 300ft chimney stack. If there were a trophy for tenacity it should go to 'EIC.

A reminder about on-the-hour-calling (see G3UBX last month): do not confine your CQ to one bearing. Sharp 70cm beams mean that few will hear you outside your main lobe. If no response comes to your first on-the-hour call, crank the beam round 30° and immediately put out another call, half a minute's CQ and half a minute's listening. Vary the pattern slightly to catch the other chap (who may be doing the same) before he goes over.

Talk-through in D-land

Now comfortably settled at a high spot QTH east of Dusseldorf, G8CEA is currently DA2XU (also licensed as F0PV, ON8IO, PA9VY and even at times "/LX"). Richard Spencer tells us that from home he has five 2m repeaters within range, DB0WW Duisburg, DB0VK Cologne, DB0WA Aachen, DB0WE Essen and DB0XO Bergheim, on Channels R2-R6 respectively (144·15 to 144·25 in 25kHz steps). He adds:

"Any 144MHz fm-er coming over to Germany via Liege-Aachen or Antwerp-Eindhoven-Venlo who is crystalled for German channels is welcome to drop me a card if he wants a contact, or to be steered through to the Rhine." Richard Spencer is at 4-Dusseldorf-Gerresheim, Wulfertzberg 1.

The 1·6MHz spacing between input and output channels will be gradually phased out, and by the end of 1974 German repeaters should have been "requartzed" to the IARU (and British) standard of 600kHz spacing, a decision made by DARC by a narrow vote, G8CEA tells us.

German repeaters carry the distinctive callsign prefix DB0, not to be confused with DL0, which indicates a club station. The equivalent of our GB2RS is the Sunday "Rundspruch", when clubs broadcast their local news over a linked repeater chain.

Visitors wishing to access German repeaters will need a 1,750Hz tone. Over-deviation will cause the device to switch off. It will continue to radiate if short breaks are taken to admit newcomers to a net.

The lurking record

More documentation on the possibility that a UK distance record for the 2m band may be lurking somewhere in Wales comes from G4LU. Stan Brown vividly recalls the events of the July 1965 opening: with G3BA, G3EJO and G3RJR, he was at the summit of Bryn-y-Fedwen, 14 miles east of Aberdovey, waiting for the RSGB 2m portable contest to start. The team's opening shot was GW4LU/P to HG2RD for the first Wales-to-Hungary contact on 2m, at 1,100 miles.

Then followed GW3BA/P to YU1EXY/P at 1,200 miles, to YU3ZW at 1,050 miles, to YU2JH at 1,020 miles and finally at 1,270 miles to YU1IOP/P. ". . . with Tom Douglas himself breathing his best Scottish accent into the carbon granules," as '4LU puts it. That was at 1110gmt. "After that, mundane Gs and GWs!"

The GW4LU/P log for that memorable day records GD2CZM/P as being on from the Isle of Man at XO66A (possibly the station to whom GD2HDZ referred on this page a couple of months back). Unhappily, G2CZM is no longer QTHR, although G3SEK, who was holidaying on the Isle of Man at the time of the July 1965 contest, remembers visiting the portable site of GD2CZM/P and noting from the log that a YU had been worked. This still may not be the UK record: it is believed that GI worked into east Europe that 4 July, and this could represent an even longer QRB. The plenitude of dx worked that day, and reported in the *RSGB Bulletin* of the time, makes it difficult to detach any specific distance record from the mass of reports: but if a claim comes in it can go in the "2m records" box . . . until bettered!

Could be, of course, that the UK record was established not on 4 July 1965, nor by sporadic-E. . . .

Long haul via m-s

Writing from Scunthorpe, G4CDF suggests that his neighbour Johnny Stace, G3CCH, may possibly have lifted the 144MHz record to 1,350 miles on 13-14 August 1971 with a meteor scatter contact with LZ1BW in QRA LC37H. There is even the chance that this QRB in turn will be exceeded if present tests which G3CCH is conducting with OX3EL at a QRB of 2,000 miles should bear fruit.

From Bridgend GW3ZTH continues the Sunday morning m-s schedule with SM7AED. Pings and part-reports have been consistently received both ways. Then during the big tropo opening at the end of July things were made all too easy: S9 plus to each! Joe Ludlow has set up a series of m-s skeds with HG5AIR, OK3CDI and UT5DL.

Fixing the pirates

Members of the North London 2m Net, which includes 50-plus operators from north and east London, tell us that they go along 100 per cent with the first comment in "QTC" about operating behaviour and in particular the treatment of pirates (see p 452, July).

Because buying ready-made equipment is easy, becoming a pirate is easy (or easier than it once was). But if after spending a lot of cash on a ready-talk box the bootlegger finds that nobody takes any notice of him when he puts it on the air, the fact may dawn on him that he should go about his amateur radio as every genuine transmitting amateur does, and try to pass the RAE.

When a pirate pops up on the North London Net (not often but it does happen) he is totally ignored. It is recognized that the amateur's role is more to deter than to detect, and that the latter is better left to the authorities who can fix, find and fine in short order.

The problem is not specific to 2m. But the above remedy is. And the North London men find it works.

Microwaving in Rutland

It all happened three months ago (during the RSGB Microwave Contest) but the recollections of the Rutland expedition remain vividly—and gratefully—in the minds of all 23cm men who were thus enabled to collect this rare county for their three-plus-20 claim (still only one has been issued).

"They must have put in considerable work to come on the air from the portable site at 5.30am on the Sunday morning to take advantage of the early morning lift," says G8ARM, of SE London, one of many who that day were able to work real dx (well over 100 miles) on 23cm thanks to the efforts of G4ALN, G8FJG and company and their long safari into RD from Essex.

Skedspots

The elusiveness of G signals in Scotland, mentioned here last time, is confirmed by GM8HBU of Glasgow. "I have noticed the apparent lack of regular contact by GMs with stations south of the Border," says Michael Parks. More regular schedules at fixed times and on known frequencies would increase the inter GM-G traffic, he believes, and as secretary to the West of Scotland ARS he finds many vhf workers share this view. He and GM8HEY of Crossford in Fife (they have a regular link-up every Thursday at 2200gmt) would welcome long-haul schedules. Write to Michael Parks at 18 Netherplace Crescent, Newton Mearns, Glasgow G77 6BT.

BRS and "A" listeners will like to know that GW3ZTH keeps the following schedules on Sunday mornings: with GC2FZC at 0800gmt 144·35, with GW3NNF at 0930gmt 145·38 ssb, and with F5JY of Cherbourg at 1000gmt on 145·405 ssb.

Metre-wave meetings

Leicestershire VHF/UHF Group: starts autumn season at new venue, Charles Keene College, Belgrave Road, Leicester. Thursday 20 September, 7.15pm, visit by Lowe Electronics. Especially for the occasion the big hall has been taken. Admission 5p (no formal sub).

Southern FM Group: Wednesday 5 September, 8pm, lecture "FM and pm techniques", by David Gleed, training officer to Racal Communications. Chineham House, Popley, Basingstoke.

Listen (or look) specially for . . .

. . . G3ZJO of Northampton on slow-scan television, 145·41 any evening at 1800gmt and weekends at 1000gmt. . . . G8CBZ, experimental sideband transmissions on 2m from Brixham (a useful opportunity to work Devon if you have never done so).

For framing

Many claims for the Four Metres and Down Certificate carry their own stories of unique circumstances surrounding the occasion, eg "All done on QRP single sideband" or "Had to wait 10 years for the last card". Here is another: "All the contacts were made in a 7½-week period in the late summer of 1972 when I was recovering from my climbing accident: the certificate will be one of the more welcome souvenirs of that episode!" Thus G3SEK. Now Ian White has 144MHz Certificate No 332 on the radio room wall at his home in SW London. Most of the needful contacts were on ssb, with a sprinkling of cw on 145·41. Unlike many, 'SEK said QSL returns were far better than expected. He gives particular thanks to the GM3JFG/8AGU team and to GM8FFX for their reliable QSLing.

Other certificate applications approved at the August meeting of the Society's VHF Committee were: *144MHz Transmitting*, No 333 to G8GPR of Carnforth (R. M. Crossley has the distinction of being the first G8G-man to earn the award), No 334 to G8EUI near Chester, No 335 to GW8EHK (operating A3J very potently from a none too good sea level site at Aberavon), No 336 to G8ATY (a prominent member of the lively North Bucks VHF Group).

A reminder to claimants: send cards to the VHF Certificates Manager, not to RSGB headquarters, pse OMs!

Eighth award for 3cm

Another certificate (No 8) for a microwave first has just been issued. On 10 June from Okement Hill on Dartmoor G8CVS/P worked GW3WDG/P across the Bristol Channel on the Prescelly Mountains, using the 10GHz band. The path distance was 153·6km. At 10GHz any "first contact" of 150km or more rates for a Four Metres and Down Certificate.

At G8CVS/P a KS9-20 klystron, similar to the 723A/B, fed a tinplate horn aerial with a theoretical gain of 25dB and a WG16 waveguide switch. In spite of damp and murky conditions signals were S9 both ways.

G8CVS is one of three members of the Bristol University ARS who have been active on the 3cm band for the last couple of years.

". . . and let live" (again)

What looked like a shouting match between a man who wanted to work dx through Oscar and a group which wanted to use the same frequency for a local net (this page, July) comes to an amicable conclusion. Each recognizes that nobody—as has been said often enough in *FMD*—holds a prescriptive right to any frequency.

Now the group says it will check Oscar orbits before using the frequency, and hold off when the satellite is within UK range. It accepts the fact that though Oscar is a minority interest it has a big scientific value.

There are many nets up and down the country which quietly mind their own business on or around the Oscar area at the top end of 2m. They simply ask that if the frequency is wanted for a satellite pass when they happen to be on, they would just like to be told (on phone) a few minutes in advance, to enable them to leave it clear. When the cw on 145·93 subsides they will know it is in order for them to resume the local net.

Any attempt to wield the big stick is naturally resented, and is out of character with the live-and-let-live ethic which typifies the majority of metre-wave men.

The QSL problem

More statistics to add to those already printed here about the return rate for QSLs: from GW3ZTH a total of 800 cards sent via the bureau elicited only a 25 per cent response. Being within striking distance of the FMD Senior for 2m he prefers QSL-direct-with-sae, but like many other intending claimants, he is disenchanted with others' laxity. His star turn is the GI man who was sent two cards via the bureau and two more with sae direct—but no response.

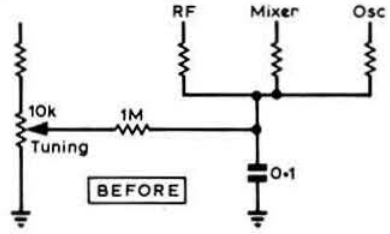
Tech Corner

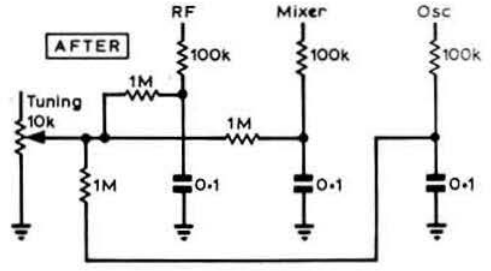
From BRS8808 (R. K. Quigg, 101 Belvoir Drive, Belfast BT8 4DN).

Further to the G8ADP recommendations for modifying the Telford TC7 tunable i.f. unit, it may not be easy or cheap to get the 2-gang 10Ω + 10kΩ pot specified, especially one with good law matching. The solution with my own TC7 is shown in the accompanying before and after diagrams. This mod entails removing two 2in wires and adding two 1MΩ resistors and two 0·1μF capacitors, the latter preferably polyester and not ceramic because of the latter's low leakage resistance.

Any microphony experienced with the unit can be cured by fitting a 10μF non-electrolytic across the tuning meter.

If any user has modified the single-tuned rf and mixer circuits into coupled circuits to help rejection of strong local vhf signals I should be interested to have details at the above address.

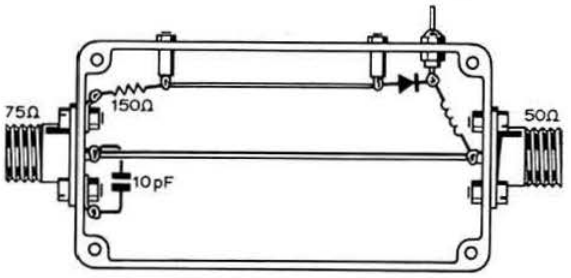




From G6CJ (F. Charman, Gillingham, Dorset)

I had the problem that my 6-over-6 aerial for 2m was well matched to 75Ω but my best piece of cable was 50Ω impedance. This obviously called for a transformer; the simplest one is the L-transformer on page 13.28 of *Radio Communication Handbook*. It was calculated that 10pF would be required in shunt at the 75Ω end and 38nH in series with the 50Ω line. The 10pF presents no problems, but it is not easy to make accurately the small inductor in the form of a coil. A more practical inductor for vhf is a short length of line of suitable impedance.

The transformer was made up in a 4in by 2in Eddystone box. The line has an internal length of 10cm. Now the inductance of a transmission line is Z_o/30nH/cm, and for 38nH in a 10cm line this calls for $Z_o = 114\Omega$. An estimate of wire size for the rectangular section was 16swg, but with this unit matching was better with the lid off, so a smaller wire was needed: 18swg produced a very good match both ways.



With the box up on the mast it is useful to incorporate a detector to show that the power is actually getting there. This was made in the form of a forward directional coupler, using about 2in of 20swg spaced 5/16in off one wall. It matched nicely with 150Ω. The diode, a 1N914, was decoupled through an ft capacitor for external connection, but its output fed via the coaxial with a small choke, 1–2μH. With a load of 330Ω this gave 1·25mA with 20W passing the detector. A blocking capacitor may be needed at the aerial terminal to prevent dc short circuit.

Here and there

Reports for *FMD* direct to G5UM, please, and not to RSGB headquarters—and as soon as possible after you receive your latest issue of *Radio Communication*.

As the autumn equinox approaches look for ZB2VHF on 70·26MHz. Even as early as 21 July it was 599 with GW3XYW of Swansea from 1400 to 1430gmt, which seems to be the optimum time to listen. Now ZB2BL has facilities for listening on 4m and 2m; he will do so on request when worked at hf.

25 YEARS BACK

". . . some further good news. As from October 1 next the band 420-460Mc/s will be opened to the amateurs of the UK. Initially power must be restricted to 10 watts input . . . it is now up to us to prove that in spite of the low input power permitted we can yet achieve some measure of success on this band. *Occupancy of all amateur allocations is vitally important*".

RSGB Bulletin, September 1948

THE MONTH ON THE AIR

by JOHN ALLAWAY, G3FKM*

REMARKS made by A. Prose Walker (Chief, Amateur and Citizens Radio Division, FCC) before the Western New York Hamfest on 12 May have been printed by ARRL and make most interesting reading. Some are only relevant to the present situation in the USA, but a number of points raised are equally applicable to all amateurs throughout the world. One question asked was—how would *you* answer the hard questions concerning justification of valuable spectrum space being allocated to amateurs unless we can prove that we can use it efficiently, in a technical manner consonant with the state-of-the-art? Another was—after 50 years of technological progress and the shift from home-brew to commercially-made equipment should we not now have technical acceptance standards for such equipment, taking into account probable future congestion and the problem of accommodating the maximum number of signals within the minimum space? Such standards could include occupied bandwidth, harmonic distortion, spurious emissions and related criteria, and perhaps involving incentives for having a clean, narrow-band signal, such as a "power-bandwidth" relationship. Is it necessary or desirable for amateurs to communicate any better than they do now, and if so, for what reasons other than a pastime? What contributions to scientific knowledge could be made by the addition of some more amateur bands? What contributions to international relations would be realized? How? It is forecast that by 1980 there will be about 1,000,000 amateurs—in 100kHz of hf band it is possible to accommodate 1,000 cw, 333 narrow-shift rtty, 100 wide-band rtty, 33 ssb, 16 dsb, 16 nbfm, or three wbfm stations!

Would readers please note that the Isle of Man now issues its own stamps and that it is no longer possible for GD stations to use UK stamps sent for return postage.

Top Band news

A full report from VP8KF of his activities between 18 June and 8 July indicates that the mid-summer tests have been very successful. John heard signals from the UK on many nights and on the night following the solar eclipse worked G3RVM, G3YUV, G3IGW, G3RPB and G6BQ between 0013 and 0043—receiving reports of up to RST 579. Other Europeans contacted during the period include EI9J (six times), HB9NL and OK1ATP. JA1MCU/C21 was John's last continent for WAC, and VK3CZ replied to a "CQ VK" call although VP8KF had never heard a VK before! ZL1MQ was worked several times and on one occasion said that 8KF's signal was peaking at RST 599. JA9BOH, JA2UEO, JA5BIN and JA1AHZ (?) have been heard—quite a feat as they are some 11,000 miles from the Falkland Is. The equipment used is a KW2000A with 100W input to an inverted-V, the centre of which is 40m above ground. The transmitter is modified with an external crystal oscillator enabling split frequency working—frequencies are 1,805 and 1,826kHz.

There will be a special "equinox period" activity weekend in mid-September during which stations in all four New Zealand call areas will operate on 160m, both on cw and on ssb. Special efforts will be made from ZL4 where aerials many wavelengths long, close to the sea and with good earthing facilities available, will be used. Advice concerning best times and frequencies for dx contacts is urgently required and Mr Bernie Smirk, ZL4IS, 68 Cannington Road, Maori Hill, Dunedin, New Zealand, would be pleased to hear from interested parties.

JA7AO has now worked all continents except Europe and will be looking out for European signals during September as follows: 1-10 September, 1940—2030; 11-20 September, 1950—2040; and 21-30 September, 2000—2050. He will listen between 1,825 and 1,830kHz and will transmit between 1,908 and 1,912kHz. These times are sunrise in Japan and should be the best for JA-EU contacts. Tok's letter gives the impression that he may only be on on Fridays, Saturdays and Sundays during the above periods.

DX news

Alf Wilson, EP2TW (GI3PGG/EI6BE), has given details of an EP Activity/Field Day which will be held on Friday 28 September. The Iranian PTT has been asked for special callsigns and it is hoped that something of interest to WPX hunters will be issued. Frequencies and times are likely to be 14,195 and 21,295kHz during the hours of daylight in Iran—0500 to 1500—and it is hoped to have two transmitters on the air.

Peter Allison, VP2VAM, closed down from Tortola on 13 July. Anyone needing QSLs for past contacts can apply (with sae) to the address in *QTH Corner*.

Anyone wanting a ZM4 QSL card for WPX is invited to look for ZM4NH who is to be found around 3,507, 7,005 and 7,027kHz. He promises 100 per cent confirmations to those who request cards and will send them via the bureau.

The Netherlands authorities have given permission for the special prefix PA25 to be used by stations in Holland between 24 August and 17 September. This is to celebrate HRH Queen Juliana's 25th anniversary as head of state.

Maurice Caplan, formerly VS6AA/DA2YW, has returned to Brunei and will be there for six months. He has been heard as VS5MC on 14MHz cw, asking for QSLs via the bureau.

K5QHS now has licences for ZF, PJ7 and VP2A. He is also thinking about visits to PY0 (Trindade), TI9 and CE0 (Juan Fernandez). His original plans to visit Africa seem to have been thwarted by inability to obtain licences on that continent.

WB6IKI has been on the air as KB6BU and VR1AC, and has been heard on 14MHz ssb.

G3HB has received a letter from DJ6SI saying that he is able to send out QSLs for contacts made by himself from SV1DB/A during the following periods *only*: 21 April, 1850–2050; 22 April, 0530–0830 and 1630–1720; 23 April,

* 10 Knightlow Road, Birmingham B17 8QB.

HRH Tunku Rahman Muar, 9M2TR, of Johor State, Malaysia

0000–0210 and 2305–0005; 24 April, 1005–1200; 25 April, 0010–0420. All other contacts will be QSLd via SV1DB.

Signals have appeared again from Turkey. TA1MB has been heard on 14MHz cw, and TA1TS should have a 150W transmitter available by now for use on all bands 3·5 to 28MHz, especially at weekends. TA2BK/1 has been worked on 14MHz ssb. All three stations have QSL managers and it is suggested that it would be prudent to address amateur radio correspondence only to these individuals and not to send anything direct.

XU1AA has been very active lately around 1700 on weekdays and from 1600 on Sundays, usually between 14,100 and 14,155kHz on ssb and 14,050 and 14,085kHz cw. The cw operator of XV5AC says that Chester (who uses ssb) was due to return to Saigon in mid-July. HS4AIA may be on the air from Laos with the callsign XW8FX. Contrary to previous rumours there is not likely to be any more activity from Macao until early in 1974. Fern, operator of CR9AK, is the only licensed amateur in the territory and is in Portugal until that time. SU1IM is frequently to be found on 21MHz around 1500, and his daughter SU1MI seems to favour 14MHz cw between 1200 and 1600.

DX News Sheet reports that FK8 stations are often to be found between 14,115 and 14,120kHz at 0600 and 1900, and FK8KAA is on 14,050kHz almost daily. There is an award for contacting six FK8 stations and a certified list (whether of contacts or QSLs is not certain) and 12 IRCs should be sent to FK8AU, BP 637, Noumea, New Caledonia.

The latest information on the VK9JW situation is that ARRL have confirmed from WIA that some of the contacts logged were valid and some not. More details are awaited and in the meanwhile those who did have genuine contacts would be appreciative if WIA would rapidly clarify the situation which has existed since October 1972.

News from overseas

VP8HF (see "Top Band news") continues to be active on the hf bands running an FT101 + HA14 with Hy-Gain TH4 for 14, 21 and 28MHz, and inverted-Vs for 3·5 and 7MHz. He received a visit from SM2AGD who operated his equipment using the callsign VP8NI. Other recent visitors have included G3VKM, G4AVM, LU2CG and DJ0KU/LU2-HBU.

In a letter to your scribe, Tom Cheesley, ex-MP4TEE/A6XF, mentions that there have been problems over the distribution of his QSL cards through his manager G3LQP. He believes that many who applied have not so far received a card and apologizes for any inconvenience caused, at the same time promising to deal with any card sent to him, direct or via the bureau, to his new G4CHP call (see *QTH Corner*).

Keith Orchard, ZD8KO/G3TTC, leaves Ascension Is on 7 September and is returning home to Dorset. QSLs sent to the island after he leaves will be forwarded but Keith's new address will be found in *QTH Corner*.

Mr John A. Fuge has written from Bahrain to say that he is currently seconded from Cable and Wireless Ltd to the Permanent Frequency Committee for the Gulf Area and Sultanate of Oman as its secretary general. One of his responsibilities is the issuing of amateur licences for the State of Bahrain, and his office also has records of all licences issued in the United Arab Emirates and Oman (Qatar does not issue licences at the present time). He invites anyone who wishes to receive information concerning licensing in the area to contact him at PO Box 831, Manama, Bahrain.

Awards

The Bamberg Award

Issued by the Bamberg area of DARC to mark the 1,000th anniversary of the city of Bamberg in 1973. European stations need five contacts with Bamberg stations between 1 January 1973 and 30 June 1974, non-Europeans need three. There are no band or mode restrictions and the same station may be worked on more than one band. Send QSLs for the Bamberg stations and 10 IRCs to DL8NG, Wolfg Graf, D86 Bamberg, Michaelsberg 4, Germany.

The Rota do Sol Award

For contacts since May 1973 in the Portuguese "counties" of Batalha, Fatima, Leiria, Marinha Grande, Porto de Mos and Vila Nova de Ourem. Known stations in these areas are CT1s BY, DG, EV, FAT, JD, MO, MP, NP, OE, QM, RO, SM, UC and XQ. European stations outside EA and CT require four contacts to qualify. Send certified list of QSLs and five IRCs to PO Box 148, Leiria, Portugal.

The Fatima Award

For contacts with the Leiria district between 0001 12 May and 2359 13 October each year. QSOs with CT1s BY, CS, DG, EV, JD, KB, MO, MP, NP, OE, QM, RO, SM, UC, XQ and ZP count one point; with CT1FAT two points. European applicants need four points. Send certified list of QSLs and five IRCs to the address above.

The Hong Kong Firecracker Award

Issued to licensed amateurs and listeners in "CQ" zones *other* than 18, 19, 24, 25, 26, 27 and 28, who have contacted (or received reports from) six different VS6 stations since 31 December 1963. Those in the zones listed require 10 contacts. A certified list of QSL cards or log extracts plus 10 IRCs should be sent to the QSL Manager, HKARTS, PO Box 541, Hong Kong. All cw, all phone, or mixed endorsements are available.

The Romania Award

For certified list of contacts with at least 30 YO stations, each in a different county and including one in Bucharest. All YO districts (YO2-YO9) must be represented.

The Bucharest Award

For contacting ten YO3 stations in Bucharest.

The YO-All Districts Award

Applicants in "CQ" Zone 14 (eg the UK) require: Class 1—six QSOs with each of the eight YO districts. Class 2—four QSOs with six districts. Class 3—two QSOs with three districts.

The last three awards require contacts after 23 August 1949, and a certified list plus seven IRCs should be sent to the Romanian Radioamateur Federation, PO Box 1395, Bucharest 5, Romania.

The P75P

This may now be applied for by listeners as well as transmitting amateurs. The requirements are based on confirmed contacts (since 1 January 1960) with 50 (third class), 60 (second class), or 70 (first class) ITU zones. The zones are shown on a special map and list of zones and countries which are available from: Central Radio Club, Awards Manager, PO Box 69, 113 27 Praha 1, Czechoslovakia. QSL cards need not be sent if a certified list is obtained from a national society—this should include the locations of all stations worked. The fee for this award is 10 IRCs.

The S6S

Another Czechoslovak certificate, this one for confirmed contacts with at least one station in each of the six continents since 1 January 1950. Only issued for all one mode—phone, cw or rtty. All ssb and band endorsements are available. The award costs five IRCs from the CRC in Praha (as above).

Contests

Results of the **1972 CQ WW DX Contest** (phone section) have been received from W1WY and are as follows:

SINGLE OPERATOR, SINGLE TRANSMITTER

	Points	All bands		Points	
G3LNS	**2,175,173**	"	**GW4BLE**	**102,885**	**(28MHz)**
GM3BCL	**487,890**	"	G3RZI	47,440	"
G3SEM	258,840	"	G3XKV	45,520	"
GC3YIZ	**196,636**	"	**GM4BIT**	**30,723**	"
G3YBH	193,245	"	**G3HCT**	**629,847**	**(21MHz)**
GM5AZS	132,821	"	G3WJN	483,735	"
GI4AHP	**109,000**	"	G4AMJ	95,445	"
G2AJB	65,124	"	**GM3XNJ**	**16,740**	"
G3MWZ	30,996	"	GM5AXY	6,426	"
G3RUI	25,025	"	**G3FXB**	**539,002**	**(14MHz)**
GC3XZE	**24,220**	"	G3NSY	165,416	"
G2MI	23,782	"	**GW3ZQH**	**38,709**	"
G5BAU	**272,165**	**(28MHz)**	**GW3ZQN**	**11,088**	**(3·5MHz)**
G2BOZ	154,940	"	**GM3YCB**	**2,128**	**(1·8MHz)**

MULTI OPERATOR, SINGLE TRANSMITTER

G3WYX	**3,622,880**	**points**	G3RRS	616,920	points
G4ANT	2,935,728	"	G3RCV	580,839	"
GD5BBG	**1,352,026**	"	G3YXR	502,280	"
G3FVA	1,010,128	"	GM3YOR/P	354,878	"
G8JC	936,500	"	G3VUM	324,216	"
G3KMI	724,477	"	GM4AFF	110,696	"
GM5AXO	**717,309**	"	**GW3UCB/P**	**1,937**	"

In the multi-operator, multi-transmitter section **GB3MAN** scored 582,131 points and came eighth in Europe. **G3HCT** was world top score on 21MHz, **G3FXB** top European on 14MHz, **GM3YCB** world second on 1·8MHz, and in the multi-operator single-transmitter section **G3WYX** was world fifth. Congratulations to all these and also to all other certificate winners (listed in bold type).

QTH Corner

ex-A6XF	G4CHP, 2 Willow Close, Upper Tasburgh, Norwich, NOR 66W.
C31FO	via F3BW, Yves Prat, Ecole Preparatoire de Gendarmerie, 86 Chatellerault, France.
C31GX	via G4BIA.
CN8BO	via W4GKF, 535 Windsor Parkway NE, Atlanta, Ga, 30342, USA.
EI0DI	via EI7CC, 3 Glengeary Terrace, Dun Laoghaire, Co Dublin, Eire.
EI0MIC	via EI7BM, 119 Mellows Rd, Finglas West, Dublin 11, Eire.
GC5BDX/P **GC5DBD/P**	via F6BSW, 17 Av du Dr-Rappin, 44 St-Herblain, France.
KB6CU	via WB6IKI (see VR1AC).
PY0ZAH/0	via WB8FDF, 15346 Helen St, Southgate, Mich, 48192, USA.
TA1MB	via DK3GL, Helmplatz 2, 8510 Fuerth Bay, Germany.
TA1TS	via WA0ETC, 4333 Lakewood Drive, Lakewood Norwalk, Iowa, 50211, USA.
TA2BK/1	via DJ0UJ, Kastenbauerstr. 5, 8000 Muenchen 80, Germany.
VK9ZC	K. Collins, c/o Post Office, Croydon, Vic, 3136, Australia.
VP2VAM	P. Allison, 596 Huddersfield Road, Waterhead, Oldham, Lancs.
VP5BN	via DL8UI, Obere Ellerburgstr. 30, 3430 Witzenhausen, Germany.
VR1AC	via WB6IKI, 2263 Anthony Drive, Ventura, Cal, 93003, USA.
WP1ORT	PO Box 1973, Portsmouth, NH, 03801, USA.
ex-ZD8KO	K. Orchard, Devonshire Hse, Gold St, Stalbridge, Sturminster Newton, Dorset.

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

The Ex-G Contest

0000 10 November to 2359 11 November.

Only 24 hours operating time may be used and stations may be worked on any band or mode but only one contact with each one counts for points. Suggested frequencies are given as 3,950, 7,250, 14,347, 21,415 and 28,650kHz. The scoring is somewhat complicated but UK entrants appear to gain two points for each holder of a reciprocal licence they contact—the latter will give RS/T, serial number of QSO, whether Ex-G Radio Club member, and his original callsign. UK stations should give RS/T, QSO number, if member, original call (if reciprocal licence holder), and name of favourite football team! The multiplier is the number of club members worked. Entries should be sent before 25 December to: Contest Committee, Ex-G Radio Club, 1701 East-West Highway, Apt 205, Silver Spring, Md, 20910, USA.

The VK/ZL/Oceania DX Contest

1000 6 October to 1000 7 October (phone).
1000 13 October to 1000 14 October (cw).

Two points for each contact with VK/ZL station and one point for a contact with an Oceania station outside VK/ZL. Final score is total QSO points multiplied by the sum of VK/ZL call areas worked on all bands (the same worked on different bands counts as separate multiplier). Exchange serial numbers consisting of RS/T plus serial QSO number starting from 001. Logs should show date, time, callsign of station worked, band, number sent, number received. Each new VK/ZL call area worked should be underlined, and a different log should be compiled for each band. Summary sheet should show callsign, name and address, details of equipment used, and for each band QSO points and details of VK/ZL areas worked. Entries may be all-band or single-band and attractive certificates will be awarded to the top scorer multi-band and single-band (phone and cw) in each country. Other certificates will be issued depending on activity. Listeners may enter and should log VK/ZL stations only, noting the serial number being sent. All logs should reach WIA, Box N1002, GPO, Perth, WA 6001, Australia, before 22 January 1974.

In the **1972 WAE DX Contest** (cw section) **G2DC** (87,870 points) and G2AJB (2,346 points) were the only UK entrants. In the phone section **GC3YIZ** (34,776), **G2FNK** (30,464), G2AJB (1,152) and GC3ZIP (520) represented Britain.

Odds and ends

Official Bulletin No 436 from ARRL included the information that the elimination of the separate phone DXCC has been postponed for one year to permit further study.

G3DRN has received a telephone call telling him that his callsign is likely to be used by a pirate. The genuine G3DRN spends most of his time on 3·5MHz ssb. G4CCN reports that his call is being heard on 3·5MHz ssb although he is at present confined to cw and a.m. G3FUJ has received a QSL for a fictitious 21MHz contact in February.

Band reports

The sunspot cycle continues to decline and with it the number of good dx openings on the hf bands. Your scribe wonders whether propagation was as good as it is now at the same stage in the last cycle or whether equipment and aerials have been improved to such a degree that this minimum will not seem as poor as the last. In the *West Coast DX Bulletin* of 31 July it was reported that W8ZOK had been unable to see any sunspots of significance since 11 July.

Many thanks to the following for sending in reports and information used in compiling this section: G2HKU, G3DO, G3HB, G3LP, G5JL, G6GH, G3GVV, G3NKQ, GW3NJW, G3RHL (?), G3XWZ, G3ZDF, G3ZUJ, BRS17567, BRS34075, A7511, A7951 and A8312.

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

1·8MHz 0000 *PY1RO*. **2100** HB9ANW.

3·5MHz 0000 C31GN. **0300** WA1ABV/MM/R2. **0400** HC2LW, KP4BNO, OA4OS, PY2FQK, VE3s, W3s, XE1KB, ZS6TE. **0500** *CP1JV, PY6AHV, YV4NQ, ZL2VI*. **2100** C31FQ, 7X2MD. **2200** PY7VNY, TF3EB, 4X4NJ. **2300** A2CCY, 9H1CW, 9J2DT.

7MHz. 0400 *XE1s SSF, VB, YV3YD*. **0500** *CM2JA*, CP2BRS, LU1ADT, LU7TD, PYs, YVs, ZL1, ZL2, ZL3, ZL4, *ZS5s AN, LB*, ZP5KT. **0600** HC1SZ, HC2NW, *HI7OMR*, OA4OS, TG8KT, VK2WC, VK3XI, *VU2OA*, ZP5VP. **0700** *9H3RUM*. **1900** *9M2CJ*. **2000** *CR6AI*. **2100** *FG7XC, ZS6BT*. **2200** *FM7AD, HC1FM, LU3AU, VK2EO, VK3MR*. **2300** *CR7IZ, KV4CI, OX3XX*, 6Y5MJ, *8P6DR*.

14MHz. 0300 A6XF. **0400** CP6GI, *WB4SIT/VP7*. **0500** JY3ZH, *KH6IJ*, OX5NA. **0600** KZ5JF, XE1IIJ, *ZF1AP* (QSL to Box 471, Grand Cayman), *7X2KO*. **0700** HK0BKX, KH6s, KS6ER, W6/W7. **0800** K3CIT/KH6, OJ0AM. **0900** ZK1AI, ZK1TA. **1100** HV3SJ, MP4BJP, *VP9CB*. **1200** *ZB2AZ*, 3A2CP. **1300** W6JER (LP), YA1AH. **1600** ET3FF, TA2BK/1. **1700** *JT1AO, VS6DD, 9M8FDS, 9V1RS*. **1800** VQ9MC. **1900** *CN2AQ, DU1OR*, HS4AJF, *JY9FOC*, XT2AK, ZD7SD, *ZF1JA*, 5T5MG. **2000** *KG6AAY*, XU1AA (Op Jack, fast QSL via Box 59, Phnom Penh), ZD7FT. **2100** *C31CQ*, C31GX (QSL to G4BIA), FC3US, JY9VO, 5U7AK, 5V7GE, 9L1BW. **2200** ET3USC, FG7XL, *TA1MB*, VP2s, LSY, *VAM*, VBU, VU2MK, *ZL2ACN/4*, 7X2BK (QSL to CN8CG). **2300** *OA4XK*, TG0AA, *VK2EO*, W7s, YS1WPE.

21MHz. 0800 *VK6SA*. **0900** A4XFE, 5N2ESH, 9G1AR. **1100** OJ0AM, *TN8BK*, ZD7FT, 5U7BA. **1200** CN8BO, VP9CB, ZS3AK, 9G1HF. **1300** CX8BZ, M1D. **1600** *YA1RY* ZC4BI, 6W8FD. **1700** EA8s, PYs, 9X5MV. **1800** 5Y4XNY. **2000** CE3JU, LUs, 5U7EZ, 9Y4EH. **2100** HK3AV, VP2SQ, WB2HWP/YV1, XQ3ED. **2200** FG7TG, YV3VU.

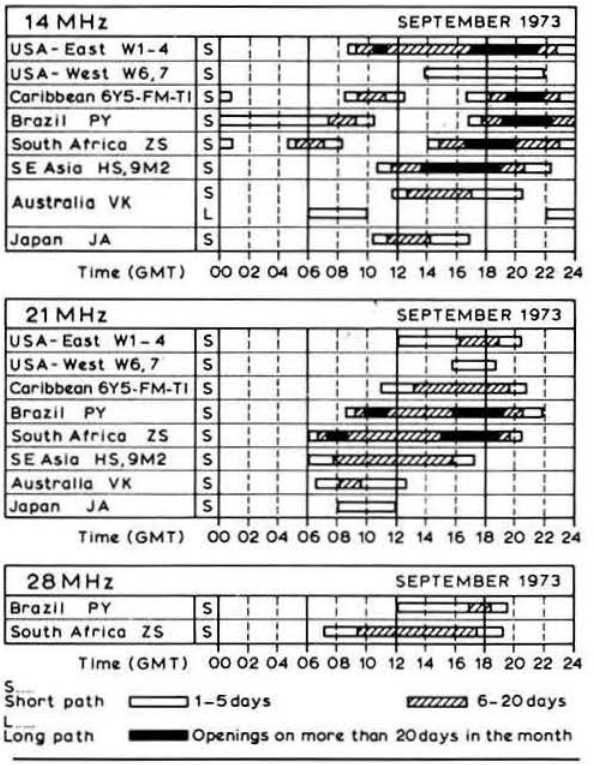
28MHz. 0700 *ZC4CY, 9H1CH*. **1000** LX1PD, M1C. **1300** 9J2DT.

Propagation Predictions

After the low F2 MUFs of the past few months, a slow increase will start in September. For this reason only a slow improvement on the hf bands (**28** and **21MHz**) will occur, reaching its maximum at the end of October or beginning of November. As we are at present in the declining phase of the sunspot cycle (next minimum about 1975), the maximum improvement will be lower than that of 1972.

On **28MHz** no noticeable improvements will occur in September until the end of the month. A slight improvement in communication with Central America, South-East Asia and Australia will be noticed on **21MHz** during the course of the month. With the longer nights, chances of dx on **14MHz** will lessen during the second half of the night. This will give more importance to **7MHz** as the main carrier of dx traffic in the second half of the night. Basically traffic on this band and on **3·5MHz** will be possible when the greater part of the path lies in darkness. The longer autumn nights and the temporary decline in static level will improve dx possibilities on both **7** and **3·5MHz**. Local traffic on **3·5MHz** will be interrupted by the dead zone at various times.

The provisional sunspot number for July 1973 was 20·4, with the second half of the month exhibiting a very low degree of solar activity. The predicted smoothed sunspot numbers for November, December and January 1974 are 26, 24 and 22, respectively, as advised by the Swiss Federal Observatory at Zurich.



Very many thanks to all correspondents and specially to the following for information obtained from their publications: the **29 DX Club Newsletter** (*George Allen*), **QUAX** (*G3DME*), the **DX'ers Magazine** (*W4BPD*), **NARS Newsletter** (*W4BPD*), **Long Skip** (*Nick Sawchuk*), the **West Coast DX Bulletin** (*WA6AUD*), the **Ex-G Radio Club Bulletin** (*W3HQO*), **DX'press** (*PA0INA/PA0TO*) and **DX News Sheet** (*Geoff Watts*).

Please send all items for **October** issue to **reach G3FKM** no later than **5 September,** and for **November** issue by **10 October.**

Down came the rain — and the marquees

THE Woburn Rally and the rain are not strangers, but events this year were enlivened in the early stages by the threatened collapse of the two 140ft marquees when the canvas, heavy with water, and buffeted by gale force winds, proved too much for the supporting poles. Members of the Dunstable Downs Radio Club and other helpers were busy on the Saturday evening preparing for the next day when a tremendous crash from the top of one marquee sent them running for cover in a most undignified manner. Later in the night the second marquee gave way under the strain and matters were not put right until the Sunday morning was well advanced.

Despite this unfortunate beginning and the continuing heavy rain, the rally was highly successful. More than 700 members signed in and the total number of visitors at the peak period was thought to be double this figure. The dealers reported satisfaction with the day's business and obviously many visitors had a yen for new equipment.

The bring and buy stand

Notwithstanding the uncomfortable conditions, the reception personnel issued more badges than ever before, and, once inside, a favourite first port of call for the visitors was the bring and buy stand staffed by G3PED, G3VPK and G3ICI. The RSGB stand did a brisk business in publications and the new *Amateur Radio Awards* book, on sale for the first time, proved a best seller. Responsible for the bookstall were G8AXA with yl Sue and G3GJW, whose efforts produced higher takings than at any previous rally. Nearby, the Raynet stand with G3BPT and yl Jane in charge attracted many visitors, while at the far end of the second marquee the multiband talk-in stations manned by the Dunstable Downs club were continually in action and reported a heavy demand for QSL cards. Offering competition to the /M contacts were the activities of BARTG and the GB3PI group, the latter area giving forth such ominous phrases as deviation, bandwidth and distortion.

The raffle is one of the main attractions at any rally and this year G3KGU and his assistants excelled themselves with a dazzling display of prizes for the lucky ones. Somebody must now be very happy while looking at a television set obtained for the price of a raffle ticket.

SWL D. Rhodes from Crystal Palace who won the television set in the raffle

Some 30 dealers were present and the roll call has the appearance of the advertisers index in *Radio Communication*. For their continued and valuable support the Society must be grateful. The scene at one time was improved by the appearance of a charming lady from Japan. However, the moment was rather spoilt when she asked to see examples of radio equipment manufactured in the UK. Some excellent vhf gear was on display but seemingly nothing for use below 70MHz.

It is regretted that the weather prevented full enjoyment of the Woburn Abbey facilities by families left to fend for themselves while the radio amateur father disappeared into the marquee area. Surely on the law of averages if must be better next year, but the organizing committee does not intend to take any chances.

That Woburn was again a successful event is due to the efforts of Norman Miller, G3MVV, and the members of his Mobile & Exhibition Committee, to the Dunstable Downs Radio Club who provided both brawn and brain for the occasion, and to the many other willing helpers. To the dealers—thank you for your support, and last but not least, to the members without whose presence the event would have failed.

The RSGB bookstall

Total eclipse

by W.A. SCARR, MA, FBIS, G2WS

THE *Monte Umbe* sailed from Liverpool on 22 June carrying about 340 passengers, mostly scientists, on an expedition to observe the total eclipse of the sun off the coast of Africa. The path of totality, some 250km wide, would extend across the central Atlantic and over the whole of Africa to Somalia, where the eclipse would be seen at sunset. To ensure the longest possible period of totality, about 6½min, the ship was to anchor off the coast of central Mauretania. The outward passage was completed in good weather and included a day and a half in Las Palmas.

Equipped with an XCR-30 Barlow-Wadley receiver kindly loaned by Radio Shack Ltd, the author lost no time in exploring the hf bands and, using the set's whip aerial on deck, was more than pleased on 23 June to pick up signals from Oscar 6 on 29·5MHz, including G6RH, GW3FSP and several Continentals. From then on, a special watch was kept for the 28MHz beacons, and GB3SX came in particularly well when the ship was off north-west Africa.

At this time, many of the astronomers on board were busy setting up their apparatus and a tremendous amount of sophisticated equipment was available for inspection on the decks. All deck space was allocated before the great day and the author was able to erect a long-wire aerial in a quiet spot between two lifeboats.

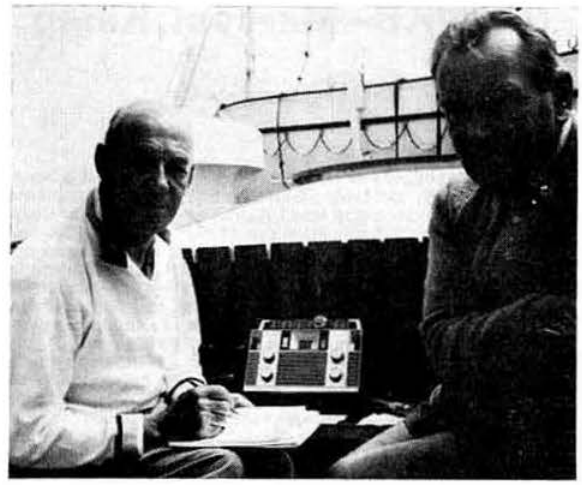
In the early hours of 30 June the ship reached its destination and was soon at anchor in a smooth sea some 30 miles out from the Mauretanian coast, at approximately 19·5°N 17°W.

Slight haze enveloped the sun as it rose above a calm sea, and everyone was in position long before the shadow began to appear at the top of the disc at 0930ut. By 1015, with three-quarters of the sun obscured, a quiet gloom pervaded the scene as the light slowly faded. For some time, GB3SX and DL0IGI had been coming in faintly on 28MHz, and F6BUL was heard calling CQ on 28,045MHz at 1015.

Subdued excitement was evident as the great moment drew near, and at 1036 the last golden remnant of the sun's glare suddenly disappeared, darkness enveloped the ship and an audible gasp went round the deck as the sun's corona appeared in all its splendour. In a moment all our hopes were realized and the whole purpose of the voyage was fulfilled.

Among those on board were Dr Arthur Gee, G2UK, and he and the author continued their watch on 28MHz during the 6min of totality, but it was necessary to use a flash-lamp to read the figures on the dials. The star Sirius was clearly visible.

Though conclusions must be drawn with great caution, it was interesting to note that no signal was audible in the 28MHz band between 1025gmt and 1102gmt, when DL0IGI became faintly audible. At 1106 PY2FDU was heard on 21·03MHz, but DL0IGI had by then disappeared and neither this station nor GB3SX was heard again. Rather surprisingly, however, the Mauritius beacon (3B8MS) on 28·2MHz appeared at 1150 and gradually increased in strength to RST 579 at 1300gmt, after which it faded and



G2WS and G2UK logging signals on board the *Monte Umbe*

was down to RST 229 by 1500gmt. The only other signal heard in the 28MHz amateur band after the eclipse was ZE3JO on 28·02MHz, logged at 1240gmt, peaking to S5.

The above results, while of little value in themselves, should add to the many reports which are being submitted to and analysed by F8SH.

G2UK and the author completed their radio log on 5 July, when there were two excellent Oscar 6 passes (orbits 3,294 and 3,295) while they were near the north-west African coast. With a long-wire aerial passing through the cabin window to the deck above, many stations were received at extremely good strength via the satellite, including G3HAZ, G3IOR, G3PNI, G6RH, GW3FSP, GW3NNF (ssb) and VE3CUA.

HF BEACON STATIONS

Callsign	Frequency (MHz)	Location	Reports to
DL0AR	29·000	Hiddesen	DL6TC, Paul Nipkow Weg 5, 4930 Detmold, FR of Germany
DL0IGI	28·195	Mt Predigtstuhl near Salzburg	DJ5DT, Kollwitzweg 1, D 6100 Darmstadt, FR of Germany
GB3SX	28·185	Crowborough, Sussex	G3DME
VE3TEN	28·175	Ottawa, Canada	VE3QB, 59 Westfield Crescent, Ottawa 5, Ontario, Canada K2G 0T6
VP9BA	28·165	St Catherines	VP9BY, PO Box 73, Devonshire, Bermuda
ZC4CY	28·180	Limassol	CARS, Box 216, Famagusta, Cyprus
3B8MS	28·190	Signal Mount, Mauritius	3B8DG, PO Box 44, Port Louis, Mauritius

Reports for any of the above may be sent to RSGB HQ (Attn IBP). At present only DL0IGI switches to 28·200 at 00-05 and 30-35min past each hour.

GB3MKB—Marconi Kemp Ballycastle

On 30 June a cavalcade of seven cars loaded with almost a ton of amateur radio gear and towing GI3TLT's 50ft mobile tower arrived in the quiet and picturesque North Antrim seaside resort of Ballycastle. These new arrivals, members of the Belfast YMCA and Ballymena Amateur Radio Clubs, had come to establish and operate a station in the local school as part of the town's plans to commemorate the 75th anniversary of the wireless link established between Rathlin Island, seven miles off shore, and Ballycastle by Marconi and Kemp in 1898; set up for Lloyd's of London to enable reports of ships passing Rathlin to be passed on to them.

The first set-back was the discovery that two of the traps on the TA33 were not functioning properly, fortunately before the tower was erected. However, six months spent on careful planning paid off and a stand-by 3-band mini-quad was pushed into commission. This and an inverted-V KW trap dipole completed the main aerials and with a quick CQ from GB3MKB at 1625gmt, a 5 and 9 report from GM3VAR, Paisley, we had the first of more than 1,000 contacts with over 60 countries we were to have in the following week.

No sooner had the aerial erection team finished when the rain came, the first for weeks, and welcome as it was by the local people suffering from water rationing we got the blame for bringing it on!

The station was officially declared open on Sunday afternoon by the chairman of Ballycastle UDC, Mr J. McAfee. This was followed by a QSO with the Bologna radio amateurs, II4FGM, operating from Villa Griffone where Marconi was born. A second sked was kept with the members of the Southampton University Radio Club, G3KMI, operating from Kemp's birthplace. The afternoon programme for the public ended with the playing of a recent BBC schools tape recording entitled *Ballycastle and the early days of radio.*

On 4 July the first outside broadcast test of video was carried out from the caravan park above the town to GB3MKB. The distance was approximately one mile, and while a picture was received the definition was poor in that we could distinguish Frank's car but not Ian standing beside it! The big question then was: could a reasonable quality picture be transmitted from Rathlin Island on Friday? Ian Kyle and Frank Campbell never lost confidence and worked all evening on the equipment, being joined by Trevor Huddleston at their portable workshop.

Friday 6 July was the climax of the week and all the planning of the previous months, with the dedication of the council's memorial to Marconi and Kemp's work, our special activities at GB3MKB and a civic luncheon. When Doug Findlay, G3BZG, and Bill McGonigle, GI3GXP, arrived at 10.30am the sun was beginning to break through. At 1115, in bright sunshine and before a capacity crowd, the chairman of the council unveiled the plaque by the memorial.

Shortly afterwards tension in the school mounted . . . Ian called us from Rathlin Island, S9 on 144MHz and announced "Video on now" . . . We had a blank screen . . . 5 seconds passed . . . 10 seconds . . . and a feeling of failure began to pervade the air when suddenly GI6AHU/T RATHLIN flashed on the screen, as clear as the proverbial bell, to a thunderous burst of applause. Next, shots of the island appeared and the members of the victorious team were clearly seen in the foreground. Television transmissions over, we came down to earth again while G3BZG passed his 73 to Tim Hughes at GB3RS, the RSGB Diamond Jubilee Station at Tonbridge, Kent, in a 5 and 9 contact both ways.

Reluctantly we started packing up on Saturday morning. First the lf bands station closed at 1104gmt and we literally had to lift the op away from the hf station which had Ws queueing up for QSOs. To W3BLC in Washington DC goes the honour of the last QSO with GB3MKB at 1121gmt. It had been a marvellous week, one of tremendous team-work, a wonderful sense of fun and humour, always prevailing, and perhaps this remark by Tommy, GI3UHL was typical of the repartee. As we closed the front door of the school for the last time he said: "All that hard work and effort just to commemorate the work of an Italian pirate!" *GI3GTR*

Doug Findlay, G3BZG, in QSO from GB3MKB with Tim Hughes, G3GVV, at GB3RS, the RSGB Diamond Jubilee station at Tonbridge School. Listening in, l to r: Eric Tucker, GI5DX; Bill McGonigle, GI3GXP; John McCullough, GI4BWM; Jack Smythe, GI3AOB; (seated) Bill Snodgrass, GI3CVH; Frank Campbell, chairman GI6YM radio club; Jim Cullingworth; and Bob Barr, GI5UR, vice-president of GI6YM radio club.

GB3RS, RSGB Diamond Jubilee Station at Tonbridge School. Tim Hughes, G3GVV, with Gordon Sinclair, G4BWH, Kevin Woods, G8HAS, and Jonathan Tullett. The all KW equipment included the KW2000D, the prototype digital read-out version of the KW2000E

YOUR OPINION

The Editor,
Radio Communication
Sir—It has been my privilege to have been a Council member since 1968, culminating in the honour of being President of RSGB for 1972.

I have decided that it is my duty not to seek nomination for re-election for two reasons: firstly, because I hope that my place will be taken by a young man; secondly, in order that there may be new blood in Council.

My enthusiasm for the Society remains undiminished. I hope that I may be able to work for it for many more years. I will continue to be one of its staunchest supporters, as well as one of its sternest critics.

This letter is written with the knowledge of my friends on Council, all of whom devote countless hours to the furtherance of RSGB aims and amateur radio ideals.

Tim Hughes, G3GVV,
Immediate Past-President

The Editor
Radio Communication
Sir—May I through your columns express my grateful thanks to the RSGB Interference Committee for their assistance in the recent case of tvi in which I was involved.

A neighbour tried by way of his solicitor to have my station closed down, even though clearance had been given by the Post Office. The RSGB nominated a solicitor to act for me and throughout the period of the case advised and liaised with all parties in the action. Also, members of the committee visited my QTH in an endeavour to find a solution to the problem.

I hope that this letter will give hope to those at present trying to clear their problems, and drive others accused of causing interference to contact the Interference Committee to seek assistance in solving their problems.

D. A. R. Poulter, G3WHK

The Editor
Radio Communication
Sir—I was very interested to see the note on long delay echoes in *Radio Communication*.

In 1928 I was working with Professor Appleton at Kings College and carried out all the work there concerned with long delay echoes. As reported in *Nature* by Appleton I did succeed in getting the only known record of an echo of long delay using an Eindhoven galvanometer and a moving strip of bromide paper. I made observations over a period of a year of the transmission from PCGG and heard a number of long delay echoes. I also had the interesting experience of discussing the phenomena with Van Der Pol.

I also had a short discussion with the late Sir Edward Appleton some years ago and he told me that so far as he knew no further progress had been made on solving the problem.

I have not heard of any of these echoes for many years now but this is not surprising since during the trials in 1928 I only heard about 10 echoes in the course of over 100 hours of observation.

I would be interested to hear of any more recent work on this subject.

R. L. A. Borrow, G3ZTK

The Editor
Radio Communication
Sir—The letter in the August issue from Mr G. R. M. Garratt, G5CS, was noted with interest, but I would like to answer some of the points raised in this letter in the hope that I can show that his fears are unfounded. Taking his points in turn:

(*a*) The Council of the RSGB have backed a recommendation of its VHF Committee that there should be an extension of the present experiment. This will be part of a continuing experiment with wider objectives; it will not, even in the medium term, become a full-scale repeater service.

(*b*) Each repeater that is licensed by the MPT, including GB3PI, will be financed by the group carrying out the implementation. The only cost to the RSGB has been, and will be, the repeater licence fee, since the licence is held by the Society.

(*c*) The comments that a channel spacing of 1·6MHz "gave very satisfactory results with very little receiver degradation" has, I fear, been taken out of context: this comment refers to an initial, very make-shift, set-up that was used to check the feasibility of certain ideas. I should add that by word "degradation" I refer to the worsening of the signal-noise ratio of the receiver by the transmitting signal. In performing these initial tests none of the usual precautions necessary to the operation of a repeater were observed, such as aerial filter and careful isolation of the receiver from the transmitter. The receiver degradation of GB3PI by its associated transmitter is of the order of 1dB, which is virtually unnoticeable. Professionally I have encountered a frequency separation of 360kHz at 160MHz and, although it becomes more difficult, closer separation is possible; even down to 12·5kHz if separate sites are used for the transmitter and receiver with a land line or UHF link between them. Regardless of channel separation, 1dB is a target figure for receiver signal-noise ratio degradation.

I believe that the dangers of going ahead too fast are well realized by the RSGB Council. Also that the wishes of the membership are regarded as of paramount importance, hence the final paragraph of my article in the June issue.

Richard J. Baker, G3USB

OBITUARIES

The society records with regret the deaths of the following amateurs

Mr D. P. Baker ex G2OQ, ZXS
Douglas Baker, of Perton, near Wolverhampton, died on 28 July at the age of 76—60 years after receiving his first transmitting licence. In 1922 he was a founder member of the Wolverhampton and District Wireless Society, and in 1929 became the first provincial member to serve on the RSGB council. Douglas allowed his licence to lapse just before the last war, but in the last two years provided much editorial and pictorial assistance in the production of the Wolverhampton Society's 50th anniversary booklet.

Mr H. E. Daft, G5NP
Hugh Daft, of Peterborough, died on 3 July at the age of 67. His first callsign was 6HM, issued in 1923.

Mr H. W. Dobson, G8OG
Bert Dobson died on 29 June. Although inactive in recent years, he was well known on 20 and 40m.

Mr T. R. Moore, GD3ENK
Tom Moore died on 30 June at the age of 65. He was a founder member of the Isle of Man Radio Society, and from 1948, when he was first licensed, up until his death, he was QSL sub-manager for the Isle of Man.

Mr B. C. Oldham, G3CKQ
Bernard Oldham died on 26 July at his home in Leicester. He was widely known on the vhf bands, on which he was a pioneer in the east midlands.

Mr R. A. Ormerod, GD2CMO
"Frank" Ormerod died in March. He moved to the Isle of Man after his retirement from the electronics industry, and was regularly active on the hf bands.

Mr L. Tranmer, G6TG
Leslie Tranmer died recently in a car accident at the age of 66. He had not been active on the air in recent years.

Mr W. Turner, GW3YPH
Wallace Turner died at his home on 29 July following an electric shock. He was a keen dx worker and was well known in the area.

We have also been notified of the death of **Squadron Leader K. S. J. Rancombe, G3JKR.**

RAYNET

by S. W. LAW, G3PAZ*

Surely the elements must have foreseen the record Raynet attendance at the RSGB Woburn Rally this year? What with the danger of a near collapse of one tent consequent on the force nine gale of the night before followed by the blocking of one of the main exit routes to the south by a fallen tree (announced during the show) there was no shortage of possibilities for an incident build-up. However, all went well thanks to the great work of the stalwart helpers concerned. We feel that this must have been the greatest show to date if our trouble in finding a corner to park was anything to go by!

The Raynet stand was a positive hive of activity all day and the briefing session held by Raynet Committee Chairman G3BPT and the indefatigable G3MBQ, our Midlands liaison officer, was well attended. A number of the controllers present had their Exercise Diamond outlines well in hand for the event to be held on the 22/23 September and these were handed to G3MBQ as a nucleus for the programming. May we ask all controllers who have not already done so to send the date, time and details of their proposed exercise for these dates to G3MBQ at the first available opportunity in order that a complete overall picture of this Jubilee event can be obtained in good time.

In the unlikely event of your having not yet received a briefing sheet, please inform the hon registrations secretary at once so that one can be sent to you. Remember, we want this to be a country-wide exercise worthy of both Raynet and the RSGB who were responsible for our inception nearly 20 years ago and who have given us their support ever since.

Since we wish Exercise Diamond to be in the nature of a showcase for Raynet, we would impress on controllers the need to initiate the greatest possible local publicity for the event by whatever means are available in their area. Since it is rather impracticable for HQ to be aware of the editorial policies of each and every local newspaper in the country we must leave the method of approach and style of presentation of reports to those members of individual groups who are familiar with the type of matter which is acceptable for print in their areas. Study the style, then see that your report conforms to the accepted format; make sure the facts are not capable of undue distortion; if the preferred style is flowery by all means make it so, but if it is terse and precise stick to the facts and keep it sharp and keen. In short, use your own judgement.

Remember that the exercise is based on the premise that at least 10,000 evacuees will be directed to your area and have to be accommodated and fed plus any medical attention and possible supply of clothing, toilet essentials and child care. Explain the objects to your user services and solicit their co-operation in the exercise if you can. In any case, base your message structure on the general objective, not forgetting that a number of enquiries from relatives and friends might be handled in the "slack" periods. Note any difficulties with frequencies and/or QRM and include this and any other relevant data in your ultimate report to G3MBQ as this will be of the greatest assistance to RSGB committees for such subjects as future band-planning and advice on group liaison.

General news

The Raynet committee met at RSGB HQ on 21 July for a very busy session. New registrations were quoted at 55 and re-registrations at no less than 170 since the last meeting. Woburn and "Diamond" were top priority but other matters were also attended to, not the least being the copious correspondence for which we thank all writers concerned. It was pointed out that the recent comment on the use of the term "emergency radio" was not intended to condone the indiscriminate usage of this term by certain bodies having no connection with Raynet, whether acting within the terms of the amateur sound licence or otherwise.

A word of commendation to the Cannock Chase group under G4CHI who were "thrown in at the deep end" when the newly formed group were called upon by the Stafford police to monitor a corridor some 10 miles in length for their very first exercise. Not to be daunted, four mobiles covered the area and the group earned a well deserved commendation from the Superintendent. Would that the efforts to form a group in Northampton could meet with more success; are you in that area? Send for a form. The same applies to Bedfordshire and Dorchester, to say nothing of Devon. And a final word. Two radio clubs who happened to be /P in the Isle of Man during the recent fire disaster have every sympathy for GD3YUM who has been trying for so long to get a group together. Perhaps the example set by the non-Raynet types who tried so hard to relieve the blocked channels to reassure anxious relatives on the mainland will provide the necessary spur?

* 130 Alexandra Road, Croydon, Surrey, CR0 6EW

Honorary registrations secretary: **Mrs Jane Balestrini, "Merrivale", Willow Walk, Culverstone, Gravesend, Kent DA13 0QS.**

RSGB Diamond Jubilee home-constructed equipment competition

In order to stimulate interest in home construction during its Diamond Jubilee year the RSGB is holding a competition for the design and construction of three types of equipment.

1. A cw and ssb transmitter designed for operation in the band 1·8 to 2MHz. The equipment shall be vfo controlled and comply with the current licence conditions.
2. A single-conversion vhf/uhf receiver covering any or all of the bands at 70, 144 and 432MHz. The receiver should be tunable over the selected band(s) and have a fixed hf or vhf i.f. (eg 10·7MHz). Provision should be made for selection of all or several of the usual operating modes.
3. An item of test equipment of unusual design with applications in the normal amateur station. Professional standards should not be required for calibration.

The following points should be noted:

(*a*) Credit will be given for technical merit and ease of construction. The use of industrial methods and processes not readily available to the home-constructor may lead to a loss of marks.
(*b*) Readily available components shall be used and attention shall be paid to the cost involved.
(*c*) The Society may ask for loan of equipment for test and evaluation.
(*d*) Any entrant shall supply, on request, a technical article on the equipment or sufficient information from which such an article for *Radio Communication* may be prepared.
(*e*) Entries will be judged by nominated members of the Society's Technical and Publications Committee, whose decision shall be final.
(*f*) The closing date for entries is 31 December 1973.

The method by which judging of entries from any part of the UK is to be made will be detailed later.

In each category of the competition there will be two prizes consisting of cash, publications or RSGB membership equivalent to the cost of a five-year and three-year subscription respectively.

It is hoped that many members will take part in this competition. We shall be pleased to receive a preliminary notification of the intention to submit an entry. Correspondence should be addressed to the chairman of the Technical and Publications Committee at RSGB headquarters.

CONTEST NEWS

1973 June Microwave Contest results

This event proved as popular and successful as last year and attracted the same number of entries.

For most contestants, conditions were slightly above average on Saturday evening but normal on Sunday. However, an exceptional event occurred for G8BGQ of Rickmansworth, Herts, who worked F8OD on 1,296MHz at 2330gmt. F8OD is located in ZH63A 5km SW Nantes and the distance is 491km. Apparently there was some good but elusive ducting around midnight but conditions were unstable No one else appeared to find the duct to France. The transmitter at G8BGQ consisted of two 2C39As at 150W input, receiver mixer two HP 2811 diodes, aerial 4ft parabola at 36ft, QTH 400ft asl.

No exceptional events occurred on the two other bands in use, the best two-way contact distances worked being 77km on 13cm (G3BNL/P to G3LTF/A) and 78km on 3cm (G3ZGO/P to G3KSU/P). Highest power stations on 13cm were G3LTF/A and G3ZEZ/P with 1W output from varactors. On 3cm G3VPF used a V58A with 1W of rf output, with this he achieved an 89km cross-band contact with G8FWM/P who was on 2m.

A disappointment was that other than F8OD no Continentals were heard. G3LTF was well prepared for contacts with PA0 but none materialized. Perhaps better publicity for the event throughout IARU Region 1 would help. The VERON *VHF Bulletin* carried details of the contest but nothing was seen in other society journals. Earlier publication of the rules in *Radio Communication* may also be advantageous.

This event has now really earned its place in the contests calendar and with the increasing interest in microwaves entries can be expected to increase steadily year by year.

G.M.C.S.

Posn	Callsign	Total score	23cm Score	23cm QSOs	13cm Score	13cm QSOs	3cm Score	3cm QSOs	Cnty	Feet asl
1	G3LTF/A*	4,192	3,478	21	714	5			EX	330
2	G3BNL/P*	3,703	1,892	11	496	3	1,315	4	GR	1,080
3	G3WDG/P	3,354	1,772	13	657	6	925	6	BE	800
4	G4ARD	2,864	2,159	22	705	5			BD	800
5	G3RPE/P	2,724	1,314	13	260	3	1,150	5	OX	647
6	G8AKE	2,380	2,380	16					LR	320
7	G8BGQ	2,286	2,286	19					HE	400
8	G3ZGO/P	2,141	321	5	545	4	1,275	6	BE	974
9	G3ZEZ/P	1,813	1,516	17	297	3			HF	470
10	G3TTV/P	1,618	1,618	17					BS	850
11	G8ACE/P	1,608	1,386	15	222	2			HE	547
12	G8ARM	1,334	1,334	14					LN	150
13	G3KSU/P	1,305					1,305	6	HE	470
14	G8ATD/P	894	894	13					BD	640
15	G3VER/P	862	862	11					HE	816
16	G4BYY	656	656	4					NK	155
17	G3EHM	518	518	3					SD	850
18	G8CIT	459	459	7					MX	53
19	G8ECR	300	300	2					SX	?
20	G3UBX	292	292	4					SD	?
21	G3VPF/P	223					223	1	DT	777

* Band leaders

June 1973 70MHz Open Contest results

Once again the 70MHz Open was a popular event dominated by familiar callsigns operating portable. Although conditions were generally good, with some sporadic E, only three stations realized the century. There is now some doubt whether or not the present level of 4m activity is sufficient to support a 24-hour event, and the VHF Contests Committee may be well advised to limit next year's Open to eight hours. The alternative, which would be popular with many contestants, would be to re-introduce the six-hour break during the hours of darkness.

The current trend towards ssb has not yet embraced 4m to any appreciable extent and most of the leading stations attributed their success to good operating and a high proportion of contacts on cw. Certainly few stations could claim any technical superiority, although it is evident from the results table that the effort of establishing a site above 750ft asl did pay higher dividends than usual.

The contest was won by the Westmorland VHF Group who operated from a high site in Co Durham. Mike Gibbings, G3FDW, and Bill Capstick, G3JYP, two of the 4m band's most ardent enthusiasts, are to be congratulated upon winning the VHF Manager's Trophy by a very considerable margin.

The runners-up were the Golden Valley VHF Contest Group, who operated under their club's callsign, GW4ABR. This group made a determined bid for the trophy, but were beaten into second place more by the geography of their site than by any shortcomings of skill or equipment.

Certificates of merit will be awarded to both the winning station and the runners-up.

C.S.

Posn	Callsign	Score	QSOs	Cnty	Best dx	km	Feet asl	Pwr
1	G3FDW/P	973	91	DH	G3VPF/P	454	2,200	24
2	GW4ABR/P	877	101	MG	G3DAH	365	1,700	40
3	G3OHH	753	115	SD	GI4AOD/P	340	1,000	50
4	GW3UCB/P	733	81	AG	G3DAH	440	750	50
5	G3TDM/P	643	77	ST	GM3WOJ/P	488	1,260	22
6	GW4KF/P	599	87	MH	G3FDW/P	325	1,650	25
7	G3VPF/P	419	67	DT	G3FDW/P	454	777	30
8	EI2VFZ/P	405	43	—	G3VPF/P	465	640	10
9	G3VER/P	392	100	HF	EI2VFZ/P	450+	405	10
10	GM3WOJ/P	381	31	PB	G3DAH	542	2,754	50
11	G3ZTZ/P	353	63	DT	G3FDW/P	417	800	30
12	G3WMR/P	343	61	WR	GM3WOJ/P	380	1,000	20
13	G3PFM/P	327	68	WE	G3FDW/P	422	862	22
14	G3NHE	286	40	YS	EI2VFZ/P	320	425	12
15	G3KUE/P	271	47	LE	G3VPF/P	348	900	20
16	G3KSU/P	268	50	HE	G3FDW/P	445	400	10
17	GD2HDZ	267	29	IM	G3VPF/P	405	350	40
18	G6HD	239	64	KT	G3FDW/P	399	67	34
19	G3ZMD	215	41	BD	GM3WOJ/P	435	540	12
20	G3ZHJ	199	52	BD	GD2HDZ	380	530	50
21	G5UM	193	37	LR	GM3WOJ/P	370	560	20
22	G5DF	192	30	BE	GM3WOJ/P	540	350	25
23	G4ASR	186	42	EX	G3FDW/P	363	364	30
24	G4BEG	180	30	SY	EI2VFZ/P	423	35	30
25	G3FIJ	163	25	EX	GW3UCB/P	410	150	25
26	G3KTA/P	158	52	SY	GW4ABR/P	280	712	12½
27	G3HBG	153	33	SY	G3FDW/P	425	400	30
28	G3RDQ	149	27	BS	GM3WOJ/P	461	720	4 o/p
	G3ZLQ/P	149	29	ST	G3FDW/P	420	600	10
30	G3CDG/P	145	25	GR	G3FDW/P	320	1,040	17
31	G3SVL/P	119	33	SY	G3FDW/P	417	506	8
	G3ZTQ	119	25	BD	G3FDW/P	195	150	8
33	G4CDY	86	43	SY	GW4KF/P	215	300	20
34	G3GOX	50	12	—	GW4ABR/P	—	70	25
35	G3UVS	38	8	DN	GW3UCB/P	312	600	15
36	GM3ZVB	11	5	MN	GM4BGS/P	82	400	10
37	G4BFT	5	3	SD	G3OHH	64	420	0·2 o/p

Check logs gratefully acknowledged from G3ZYS/P and G3ZRH

70MHz Cumulative Contest rules

Dates: 30 September; 14, 28 October; 11, 25 November; 16 December; 6 January.

Times: 1000–1200 local time.

All entries and checklogs to: VHF Contests Committee, c/o 20 Harcourt Road, Wantage, Berkshire, OX12 7DQ.

The following General Rules, published in January *Radio Communication*, will apply: 1, 2, 3, 5a, 6a, 7a, 8b, 9a, 10b, 11-24; 4. Awards will be made to the highest-scoring station in each RSGB zone (see p272, April issue).

432MHz Cumulative Contest rules

Dates: 13, 21, 29 October & 6, 14, 22, 30 November.

Times: 2000–2200gmt.

All entries and checklogs to: VHF Contests Committee, c/o 11 Rington Avenue, Poulton-le-Fylde, Blackpool, FY6 7NR.

The following General Rules, published in January *Radio Communication*, will apply: 1, 2, 3, 5a, 6a, 7a, 8b, 9a, 10b, 11-24; 4. Awards will be made to the highest-scoring station in each RSGB zone (see p272, April issue).

High Wycombe DF Qualifying Event results

For the third qualifying round in 1973 the weather was again fine and warm when on, 10 June, 15 competitors assembled at the start near West Wycombe. Good signals were heard from both stations

but, rather unexpectedly, all but one competitor decided to go for Station "B" first. Bill North chose the reverse order and later won the contest.

The "B" transmitter was well hidden in a small cave under the roots of an old tree on an extensive common near Nettlebed, some 7¼ miles south-west of the start. Several "old hands" were convinced that it was very near the start and took a long time to find out the hard way that their hunch was false. One competitor, having found the transmitter successfully, got lost on the overgrown common and took an hour to find his car. Station "A" was some 10 miles east of the start, concealed in a cunning-hide-out in a dense wood, but the hide-out was soon demolished when competitors arrived from all directions. Mrs G. T. Peck presented the High Wycombe Challenge Trophy to W. North, and prizes to the successful competitors; W. North and I. Butson qualify for the Final.

Thanks are expressed to Mrs J. Mollart and her willing helpers who provided tea, to G3OUV and G3UJO who operated the two stations, and to many others whose help contributed to a popular and successful contest in which 12 out of 15 competitors found both transmitters. The event was organized by G. T. Peck for the Chiltern Radio Society.

			Time of arrival	
Posn	Name	Club	Station "A"	Station "B"
1	W. North	Chiltern	1430	1533
2	I. Butson	Chelmsford	1535	1434
3	T. Gage	Oxford	1536	1420
4	R. J. Pearce-Boby	Oxford	1536½	1435½
5	B. Bristow	Oxford	1540	1418
6	G. Whenham	Coventry	1540½	1419
7	R. Vickers	Stratford	1603	1416½
8	B. J. Mahony	Rugby	1610	1458
9	M. Hawkins	Chelmsford	1611	1504
10	A. Butcher	Chelmsford	1619	1457
11	E. Mollart	Oxford	1625	1441
12	P. Lisle	Oxford	1626	1435
13	D. E. Newman	Rugby	(1635)	1524
14	D. C. Holland	S. Manchester	—	1503
15	D. Nasey	RSGB	1620	—

Chelmsford DF Qualifying Event results

A record entry of 20 competitors assembled near Tiptree Heath on 24 June for the start of the fourth round of the 1973 series which was organized by M. Hawkins. The event proved extremely difficult and, as it progressed, it became clear that to get two qualifiers the contest would have to be extended; therefore, during the fixed transmission at 4pm, and in all subsequent transmissions, it was announced that the contest would continue until 5pm. Station "A" G3KPJ/P, was hidden in very thick undergrowth on a disused railway at Stow Maries, 10 miles south of the start. Station "B", G3WMM/P, was located in nettles and brambles on the edge of an old gravel working at Rowhedge, 9½ miles NE of the start.

All but two competitors decided to seek Station "B" first, and this was the way intended by the organizers. Although at the start both signals were quite good, later in the contest some competitors experienced difficulty from strong signals on adjacent frequencies. Both transmitters used aerials of approximately 1¼λ and this caused quite a few competitors to spend valuable time bush beating some distance away from the transmitter. Eric Mollart managed to make up lost time at the first station to be the first man in to two transmitters.

R. Pearce-Boby and D. Holland qualify for the Final.

			Time of arrival	
Posn	Name	Club	Station "A"	Station "B"
1	E. L. Mollart	Oxford	1651	1527
2	R. J. Pearce-Boby	Oxford	1658	1512
3	T. C. Gage	Oxford	1658½	1512
4	B. M. Bristow	Oxford	1659	1507
5	D. Holland	S Manchester	1659½	1507½
6	G. Whenham	Coventry	1700	1517
7	G. Foster	Stratford	—	1510
8	G. L. Mills	Chelmsford	—	1534
9	D. Beattie	Chelmsford	—	1535
10	B. Pechey	Chelmsford	—	1536
11	D. Newman	Rugby	—	1537
12	P. Lisle	Oxford	—	1551
13	B. Mahoney	Rugby	—	1617
14	P. Hudson	Dartford Heath	—	1619
15	M. Easterbrook	Dartford Heath	1634	—
16	P. Horner	Dartford Heath	1702½	—

Four teams failed to locate either transmitter

Coventry DF Qualifying Event results

Nineteen teams assembled at the west end of Stockton Locks on 15 July for the start of the Coventry Qualifying Event, the fifth in the 1973 series.

Although the weather was dry for the start, overnight rain and a thunderstorm half-way through the event ensured that most competitors were soaked to the skin by the end of the contest. The only consolation they had was that the transmitter crews also got drenched; the organizers would like to thank them for persevering to the bitter end in exceptionally arduous conditions.

Transmitter "A", G3XQE/P, was located on the edge of Crackley Woods approximately 10 miles NW of the start. Unfortunately, owing to the heavy rain, water penetrated into the pa and this station went QRT during the 4pm transmission, which ended the contest prematurely.

Transmitter "B", G2ASF/P, was hidden approximately half-a-mile east of the start on the side of a disused railway embankment. Most competitors tried to find this station first and, apart from Mike Hawkins, spent quite a considerable time searching the undergrowth before finding the transmitter. The rain had made the surface extremely slippery and the transmitter crew were amused to see the later competitors climb the bank and almost reach the transmitter, only to slide to the bottom again. By the end of the contest the conditions were so bad that the crew decided to leave the transmitter on site and retrieve it at a later date; it was thought unlikely that anyone would stumble across it by accident.

Congratulations to Roger Parsons, who qualified for the National Final, and Bob Vickers, who would have qualified were he not organizing the Final this year. The contest was organized by George Whenham on behalf of the Coventry Amateur Radio Society.

			Time of arrival	
Posn	Name	Club	Station "A"	Station "B"
1	M. Hawkins	Chelmsford	1505	1411
2	E. Mollart	Oxford	1437	1542
3	R. Vickers	Stratford	1439	1543
4	T. Gage	Oxford	1429	1544
5	W. North	Chiltern	1505½	1605
6	R. Parsons	Oxford	1507	1610
7	D. Holland	S Manchester	1611	1504
8	B. Bristow	Oxford	—	1536
9	B. Mahony	Rugby	—	1537
10	P. Tyler	Oxford	—	1537½
11	R. Smith	S Manchester	—	1538
12	P. Lisle	Oxford	—	1539
13	D. Newman	Rugby	—	1539½
14	D. Nasey	RSGB	—	1539½
15	A. Butcher	Chelmsford	—	1545
16	P. Moore	Banbury	—	1546

Three competitors failed to find either transmitter.

DF Qualifying Round—Dartford Heath

Date: 9 September 1973.
Map: OS Sheet 171 (London SE)
Assembly: 1300bst for start at 1320bst.
Location: Car park of the Beech Tree Inn Cafe, Seven Mile Lane, Mereworth Woods. The cafe is located on the west side of Seven Mile Lane (B2016) about two miles south of Wrotham Heath NGR 647546. Frequencies and callsigns will be announced at the start.

Intending competitors are asked to notify Mr P. G. Wells, 25 St David's Road, Hextable, Swanley, Kent BR8 7RJ, of the numbers in their parties requiring tea as soon as possible.

1973 BATC National Amateur Television Contest results

Section A No entries

Section B

Psn	Station	QSOs	Points
1	G6AIX/T	17	348
2	G6KQJ/T	9	229
3	G6KKD/T	6	200
4	G6GDR/T	5	178
5	G6AFV/T	10	173
6	G6AIN/T	8	166
7	G6AGT/T	4	85
8	G6AHJ/T	3	66

Section C

1	G8CTT	1	65
2	G3COJ	2	46

Other stations known to be active during the contest were G8EMX, G6MXW/T, G6AHR/T, G3RML, G6NOX/T, G8DJK, G6WJ/T, G6ADM/T, G4BBB, G8EIO, G6AHT/T, G6AFK/T, G8FAL, G6AJA/T, G8ARM, G8ADC, G8BCZ, G6AGE/T, G8CBU, G8EDY, G3XWS. *B.K.*

1973 International Amateur Television Contest rules

Organised by BATC with ATA and AGAF.

Dates and Times
Saturday 29 September 1973 1080–2300gmt
Sunday 30 September 1973 0800–1200gmt
Saturday 6 October 1800–2300gmt
Sunday 7 October 1973 0800–1200gmt
The same station may be contacted **once each day.**

Eligible Entrants. All amateurs licensed to transmit or receive amateur television. All entrants must operate within the terms of their licence.

There will be four sections
A. Fixed or /A stations
B. Portable stations
C. Licensed amateurs (other than /T licensees) who can transmit sound only and receive video.
D. Stations only receiving dieo.

Frequencies
Sound on 144, 432 or 1,296MHz.
Video on 144, 432 or 1,296MHz

Modes of transmission
A5 with either A3, A3J or F3.

Contest exchanges shall consist of:
(a) Callsign
(b) Vision signal report based on the BATC vision reporting chart of 0–5.
(c) Serial number commencing at 001 and increasing by one per contact throughout the entire contest.
(d) QTH (QRA) Locator.
(e) QTH or location.
(f) Vision frequency (to two decimal places). This must be sent **by vision only.** No points will be deducted if this is not received but the organizers envisage that next year this rule will have to be obeyed absolutely in order to gain full points for the contact.

Scoring. Stations entering Sections A or B, two points per kilometre. Contacts on 1,296 are scored at 12 points per kilometre. Incomplete or one way contacts should be claimed and will be allowed at the adjudicator's discretion. Sections C and D, one point per kilometre.

Contest entries should be accompanied by a cover sheet containing: name and address for correspondence; callsign used; section entered; brief details of station—height, power, input etc; best contact with distance.

The distance between two stations is the distance as measured between the centres of both QTH (QRA) locators. Parts of a kilometre count as being the next highest whole number.

All entries must be postmarked not later than 31 October 1973 and sent to: The Adjudicator BATC, 10 Pilgrim Road, Droitwich, Worcestershire WR9 8QA.

Contests calendar

9 September	—80m FD (Rules in August issue)
9 September	—DF Qualifying, Dartford Heath (Rules in this issue)
8-9 September	—WAE DX Phone
8-16 September	—5th BARTG VHF RTTY (Rules in August issue)
15-16 September	—SAC CW
15-16 September	—Cray Valley RS 5th SWL (Rules in July issue)
22-23 September	—SAC Phone
23 September	—DF Final, to be organized by Stratford Group
6-7 October	—VK-ZL-Oceania Phone
6-7 October	—UHF NFD
6-7 October	—IARU 423/1,296MHz (Rules in May issue)
13-14 October	—VK-ZL-Oceania CW
13-14 October	—21/28MHz (Rules in May/August issues)
20-21 October	—WADM CW
20-21 October	—7MHz CW (Rules in June issue)
27-28 October	—CQ WW DX Phone
3-4 November	—7MHz Phone (Rules in June issue)
3-4 November	—144/432MHz CW
10-11 November	—OK DX CW/Phone
10-11 November	—2nd 1·8MHz
10-11 November	—Ex-G
11 November	—70MHz Cumulative
24-25 November	—CQ WW DX CW
9 December	—144 MHz Fixed

For **70MHz Cumulative Contest** rules and **432MHz Cumulative Contest** rules see September issue.

SPECIAL EVENT STATIONS

Nazareth House Garden Fete, 8 September
A special station, callsign G3OXZ/A, will be on the air, operated by G3OXZ, G3KLY and G8HJF, throughout this fete which is held to raise funds for the convent. Operation is expected to be on 2m ssb, and possibly a.m./fm, plus 20 and 80m, with equipment including a Liner 2 and FT101.

UMIST Union Freshers' Week, 1-7 October
GB3MAN will be on the air throughout the month of October from the university. Operation will be on 80 and 2m ssb; further details may be obtained from Kevin Roche, G8GOS, secretary of the radio society, at the union.

World Ploughing Championships, 3-6 October
EI0WPO will be on the air from this event, as part of the farm crafts exhibition, from 0900 to 2100 on each of the open days. All bands including 2 and 4m will be in use, on cw, a.m. and ssb, and special QSL cards will be issued. In addition, a certificate is offered to any station contacting EI0WPO on any two days, any two bands, during the championships. The event takes place at Wellingtonbridge, Co Wexford.

MOBILE RALLY NEWS

Walton Mobile Rally, 30 September
Walton School, Mountsevern Avenue, Walton, is the venue of the rally, and is situated four miles north of Peterborough city centre. Talk-in will be available on 2 and 160m (callsign G3DQW); further information from J. Champman, 10 Bettles Close, Peterborough.

Looking ahead

21 September—RSGB Region 1 (Manchester) Diamond Jubilee Dinner, Post House Hotel, Palatine Road, Northenden, Manchester.

22 September—Region 10 ORM and dinner, University College, Park Place, Cardiff.

22 September—Region 13 ORM and Scottish VHF Convention Pollock Halls of Residence, Edinburgh University.

6 October—Region 7 ORM, "Winning Post", Whitton, Middlesex.

25-27 October—Amateur Radio Retailers Association Exhibition, Granby Halls, Leicester.

8 November—RSGB lecture at IEE by L. Moxon, G6XN.

16 November—RSGB Dinner Club, Royal Westminster Hotel, Buckingham Palace Road, Victoria, London.

18 November—South-east Counties HF Convention, Airport Hotel, Crawley, Sussex.

NFD 1973 RESULTS

THE total number of entries for the double-station section remains the same as last year with 19 accepted entries, but there was a drop of 10 in the single-station section. Generally conditions on the higher frequency bands were worse than in 1972 and, compared with recent years, very little dx was worked.

The vast majority of entrants seem to be satisfied with the rules which, as was mentioned last year, IARU Region 1 has recommended for EU NFD in 1974. Some clubs have expressed themselves quite forcibly in favour of the status quo, while on the other hand only a very few groups want the power limit done away with.

Weather conditions were certainly a lot better than last year, but even so some areas were unfortunate.

The results

The overall winner for the third year in succession is the Surrey Radio Contact Club/Croydon RSGB Group with a corrected score of 2,523 points. Their two stations, G3BFP/P, and G6LX/P, were operated by G3BFP, G3DCV, G3SWV, G6LX, G3IAS and G3MXJ (although G3MXJ and G6LX are members of the HF Contests Committee, neither of them were involved with the checking or adjudication of this contest). G3BFP/P used a home-brew transmitter on Top Band, and on 7 and 21MHz an SB401 with a 2E26 pa. The receiver, on all three bands, was an SB301. For aerials, on 1·8MHz they used an end-fed half-wave, on 7MHz a full-wave loop and an inverted-V, and on 21MHz a quad. G6LX/P had an SB401 (2E26 pa)/SB301 on 3·5, 14 and 28MHz. Aerials used were a full-wave on 3·5MHz, and an 8-element driven array and a TA33 on 14MHz; the latter was also used on 28MHz.

Runner-up once again is the Oxford & D ARC, with a score of 2,466 points. The stations were G2DU/P and G8IB/P operated by G3KLH, G3JLE, G3RBP and G4AZN. G2DU/P used a home-built transmitter and receiver linked as a transceiver, and on 1·8MHz their aerial was an inverted-V dipole, on 7MHz a two-wavelengths-long V-beam and an inverted-V dipole, while on 21MHz a 2-element quad was used. G8IB/P used an SB101 driver section into a 2E26 pa —the 101 pa valves having been removed. The aerial on 3·5MHz was unusual—a double inverted-V with the voltage points connected together. They had a 2-element quad on 14MHz and a single-quad loop on 28MHz.

In third place is the Glenrothes & D ARC with 2,056 points: a very fine performance which also wins them, once again, the Scottish NFD Trophy. They also take the Frank Hoosen (G3YF) Memorial Trophy for the highest score on 14MHz, and for good measure they are band leaders on 21MHz. Well done, indeed! It looks as though it will not be long before a Scottish station takes both NFD trophies. Glenrothes' stations were GM3OLK/P operated by GM3FXM and GM3PFQ, and GM3YOR/P operated by GM3OLK and GM3YOR. The equipment used by GM3OLK/P was a KW2000 with a 2E26 pa, and for aerials they had dipoles on 1·8 and 7MHz, a three-wavelengths long V-beam, and a full-wave loop on 7MHz as well, and a 2-element quad on 21MHz. GM3YOR/P had an SB101 (2E26 pa), a 3·5MHz dipole, and a TH3 Mk 3 for 14 and 28MHz.

Runner-up for the Scottish NFD Trophy, with a score of 1,524 points, is the West of Scotland ARS who ran GM3AXX/P, operated by GM3AXX, GM3GIJ, GM3UWX and GM4ASY; and GM3SSB/P (a good callsign for a cw contest?) keyed by GM3SSB, GM4ASY and GM4BGS.

The Bristol Trophy, for the highest-scoring single-station entry, goes to the Ariel Radio Group (Langham) (BBC), G3GDT/P, who were runners-up in 1972. Their score was 1,885 points from all bands except 28MHz. Their KW2000 (2E26 pa) was operated by G3KKQ and G3POI, and their aerials were: 1·8MHz—dipole and an inverted-L; 3·5MHz–dipole; 7MHz–two dipoles at right angles; 14 and 21MHz –2-element quad.

Second place in the single-station section is taken by the East Barnet ARCC (G5FA/P) with operators G3KTZ, G3RPB, G3UGK, G3XTJ and G3YDX.

NFD Trophy

Surrey Radio Contact Club/Croydon RSGB Group — 2,523 points

Gravesend Trophy

Oxford & D ARC — 2,466 points

Bristol Trophy

Ariel Radio Group (Langham) (BBC) — 1,885 points

Scottish NFD Trophy

Glenrothes & D ARC — 2,056 points

Frank Hoosen (G3YF) Memorial Trophy

Glenrothes & D ARC — 653 points

Leading scores on individual bands

1·8MHz	Kingston & D ARC "160"	592 points
3·5MHz	Veteran Operators Club	679 points
7·0MHz	Salisbury	758 points
14MHz	Glenrothes & D ARC	653 points
21MHz	Glenrothes & D ARC	363 points
28MHz	SRCC/Croydon RSGB Group	106 points

Overseas station giving most points to NFD entrants

Lusaka Region, Radio Society of Zambia, 9J5LA/P — 396 points

1·8MHz

Once again a large entry for 160m, including a number of stations who operated on this band only throughout the period of the contest. Lots of UK stations were on, but little activity from the Continent—the most distant being UB5.

Top scorer is the Kingston & D ARC "Kingston One-Sixty" station, G4AKA/P, with a checked score of 592 points. The operators were G3ZBT, G4AKA, G4AMH and G4BEG. A home-brew transmitter with a 6BW6 pa, and a modified HRO with a 500Hz mechanical filter, were used. The aerial was a dipole with the centre at 35ft and the ends at 20ft.

In second place is another single-band entry, that of the Mansfield ARC, G3GQC/P, who scored 494 points using a KW160, a modified Eddystone 840C and two dipoles, one E-W and the other N-S. Operators were G3DBF, G3DBZ, G3EQF, G3VDF, G3XWZ and G4AAH.

In third place is Sutton and Cheam RS Group A, G3LCH/P, with 486 points. They had a KW2000 (2E26 pa) and a ¾-wavelength Marconi and a counterpoise.

3·5MHz

What can one say about 80m except that, as usual, the going was fast and furious—especially as the dx bands were in poor shape. During the hours of darkness, European portables were workable by the hundred. A few groups even made contact with W and VE.

The leading group, as has been the custom in recent years, was a single-band entry: the Veteran Operators' Club for Telegraphists (G3VOC/P), operated by, presumably, veteran telegraphists G3ANK, G3TAA and G3VLT, with a checked score of 679 points. Their station consisted of a home-built transmitter with a TT11 pa, an SB303 receiver and a dipole. The station was powered entirely by batteries.

Maidenhead & D ARC, G3WKX/P, also a single-band entry, used another home-built transmitter (6BW6 pa) and a dipole at 44ft, to gain second place with 641 points.

Third place is taken by the Hartlepool ARC, G3IDV/P, with a score of 631 points.

Of the 84 entries for this band, 10 stations derived all their power from batteries alone, and a further three had float-charged batteries.

7MHz

Leading scorer on this band, for the third year running, is Salisbury, G3FKF/P, with a single-band entry of 762 points. Operators G2FIX, G3OBW, G3PAV, G3YIN and G3ZNH used a G2DAF (2E26 pa) tx, an FR400 rx, and two inverted-V dipoles at right angles. The only dx worked were Ws, VE1 and LU; most of the score coming from EUs.

Runner-up is the SRCC/Croydon RSGB Group, G3BFP/P, the NFD Trophy winners, with 756 points. In third place with 687 points is the Oxford & D ARC.

SINGLE-STATION SECTION

Posn	Club or group	Callsign	1·8MHz	3·5MHz	7MHz	14MHz	21MHz	28MHz	Total
1	Ariel RG (Langham)	G3GDT/P	408	471	462	442	102	—	1,885
2	East Barnet ARCC	G5FA/P	358	482	371	312	99	—	1,622
3	Guildford & D ARS	G3KMO/P	206	414	427	168	58	36	1,309
4	Verulam ARC	G3VER/P	96	617	322	174	61	5	1,275
5	Bristol ARC	G3TAD/P	272	474	254	196	61	—	1,257
6	Hartlepool ARC	G3IDV/P	—	631	376	185	63	—	1,255
7	East Notts CG	G3TBK/P	264	433	518	12	4	—	1,231
8	Stockport RS	G6UQ/P	286	364	275	295	9	—	1,229
9	Chelmsford ARS	G3KRZ/P	248	393	364	183	27	9	1,224
10	Gloucester ARS	G3MA/P	280	326	407	160	18	—	1,191
11	West of Scotland ARS	GM4AGG/P	—	67	536	399	146	—	1,148
12	Torbay ARS	G3NJA/P	338	323	220	176	80	—	1,137
13	Blackpool & Fylde ARS	G8GG/P	234	312	237	249	76	—	1,108
14	Echelford ARS	G3UES/P	258	365	280	126	77	—	1,106
15	Swansea RC	GW5ZL/P	—	427	243	373	57	—	1,100
16	Maidstone (YMCA) ARS	G3TRF/P	166	323	245	233	121	—	1,088
17	Chiltern ARC	G3CAR/P	378	297	14	238	99	57	1,083
18	Cornish RAC	G3OHB/P	242	213	232	237	125	20	1,069
19	Liverpool & D ARS	G3AHD/P	370	327	157	169	25	—	1,048
20	Sunderland ARS	G3RDI/P	212	339	275	193	9	—	1,028
21	East Kent RS and University of Kent RS	G3UKC/P	386	202	241	182	6	—	1,017
22	Conway Valley ARS	GW6TM/P	366	252	186	208	—	—	1,012
23	Worcester & D ARC	G3GJL/P	318	269	182	167	49	—	985
24	Crystal Palace & D RC	G3VCP/P	200	156	234	281	41	55	967
25	Southgate RC	G3SFG/P	152	345	274	188	—	—	959
26	Purley & D RC	G3ZRR/P	244	323	150	171	42	—	930
27	Verulam NFD Training Group	G2AIA/P	338	340	83	139	27	—	927
28	Swindon & D ARC	G3FEC/P	316	414	182	—	—	—	912
29	Bangor & D ARS	GI3XRQ/P	238	153	30	408	64	—	893
30	Barnsley & D ARC	G5IV/P	—	459	335	90	4	—	888
31	Ilford Gp	G3XRT/P	362	385	91	24	—	—	862
32	Horsham ARC	G3TNO/P	278	322	95	85	17	4	801
33	Leicester RS	G3LRS/P	304	261	69	145	6	—	785
34	Weston-super-Mare RS	G5DV/P	108	337	241	88	—	—	774
35	Cheltenham ARS	G5BK/P	134	479	120	38	—	—	771
36	Salisbury ARS	G3FKF/P	—	—	762	—	—	—	762
37	Bury & Rossendale RS	G3BRS/P	8	372	240	140	—	—	760
38	Wirral ARS	G3NWR/P	258	205	35	255	—	—	753
39	Edgware RSGB Gp	G3VW/P	—	374	303	74	—	—	751
40	Bromsgrove & D ARC	G3VGG/P	310	141	89	191	5	—	736
41	Havering & D ARC	G3TTB/P	282	367	85	—	—	—	734
42	Southend & D ARS	G5QK/P	310	368	44	6	—	—	728
43	Chippenham & D ARC	G3VRE/P	14	322	228	116	—	12	680
44	Veteran Operators Club	G3VOC/P	—	679	—	—	—	—	679
45	Hull & D ARS	G3AMW/P	—	374	97	194	12	—	677
46	Derby & D ARS	G3ERD/P	8	367	270	26	—	—	671
47	Cheltenham ARS	G3CGD/P	312	252	100	—	—	—	664
48	Bedford & D ARC	G3WTP/P	300	273	72	—	—	—	645
49	Maidenhead & D ARC	G3WKX/P	—	641	—	—	—	—	641
50	Worthing & D ARC	G3WOR/P	126	377	103	33	—	—	639
51	Kingsway Tech ARC	GM4AAF/P	—	149	119	367	—	—	635
52	Newbury & D ARS	G3WOI/P	300	250	27	51	—	—	628
53	New Forest RCG	G3OZT/P	—	402	105	103	—	—	610
54	Scarborough ARS	G4BP/P	—	185	258	160	—	—	603
55	Kingston HF	G3KIN/P	—	324	197	61	15	—	597
56	Kingston 160	G4AKA/P	592	—	—	—	—	—	592
57	Cray Valley RS	G3RCV/P	44	524	2	14	—	—	584
58	Colchester RA	G3CO/P	54	300	25	200	—	—	579
59	Eccles & D RC / Harlow & D ARS	G3GXI/P	—	—	558	—	—	—	558
		G6UT/P	—	286	65	151	35	21	558
61	West Kent ARS	G3WKS/P	—	181	8	341	—	—	530
62	Caithness ARS	GM3SFH/P	56	90	76	204	92	—	518
63	Mansfield ARS	G3GQC/P	494	—	—	—	—	—	494
64	Mid-Lanark ARS	GM3PXK/P	6	204	132	117	—	—	459
65	Ariel RG (BBC TV)	G3NTS/P	198	245	7	6	—	—	456
66	Standard RC (ITT Rect)	G3NIS/P	56	233	137	11	—	—	437
67	Loughton & D ARS	G8AB/P	8	407	—	—	—	—	415
68	South Dorset RS	G3EAT/P	—	277	124	12	—	—	413
69	Preston ARS	G3KUE/P	82	260	4	4	—	—	350
70	Sutton & Cheam RS (B)	G2DMR/P	—	—	—	—	150	—	150

DOUBLE-STATION SECTION

Posn	Group	"A" Station	"B" Station	1·8MHz	3·5MHz	7MHz	14MHz	21MHz	28MHz	Total
1	SRCC/Croydon RSGB Gp	G3BFP/P	G6LX/P	240	609	756	570	242	106	2,523
2	Oxford & D ARS	G2DU/P	G8IB/P	348	604	687	546	272	9	2,466
3	Glenrothes & D ARC	GM3OLK/P	GM3YOR/P	308	457	263	653	363	12	2,056
4	Crawley ARC	G2DP/P	G3TR/P	348	406	526	317	169	32	1,798
5	Harrow RS	G3EFX/P	G3HBR/P	358	528	451	303	66	70	1,776
6	Leyland Hundred ARG	G3XII/P	G3GGS/P	132	390	543	484	66	42	1,657
7	Sutton & Cheam RS (Group A)	G3LCH/P	G2XP/P	486	364	360	377	—	23	1,610
8	Reigate ATS	G3REI/P	G3NKS/P	372	552	260	224	116	62	1,586
9	West of Scotland ARS	GM3AXX/P	GM3SSB/P	214	161	286	599	264	—	1,524
10	Thames Valley ARTS	G3TVS/P	G8SM/P	386	327	252	285	118	42	1,410
11	Edgware & D ARS	G3ASR/P	G3GC/P	194	619	536	—	—	—	1,349
12	Clifton ARS	G3GHN/P	G3JKY/P	286	530	315	53	—	—	1,184
13	Ayrshire ARG	GM3NYG/P	GM3WIL/P	340	156	373	101	63	—	1,033
14	Addiscombe ARC	G3SJX/P	G4ALE/P	276	301	128	138	115	64	1,022
15	Garendon School RC	G3MKX/P	G3TKK/P	334	325	73	206	64	—	1,002
16	Shefford & D RS	G3FJE/P	G3DOT/P	328	379	84	166	—	—	957
17	Dundee Gp	GM4HR/P	GM3NHQ/P	124	411	138	204	79	—	956
18	Reading ARC	G3ULT/P	G3LFM/P	230	225	298	28	49	36	866
19	Grimsby ARS	G2VY/P	G3CNX/P	314	456	—	—	—	—	770

Overseas check logs

Posn	Call sign	Points to G stations	Posn	Callsign	Points to G stations
1	9J5LA/P	396	6	OL1AOH	56
2	EI1AA/P	388	7	OK1KVQ/P	24
3	OK1KSO/P	340	8	OK3CIU	20
4	OK2KLF/P	304	9	OL1API	10
5	F0ZZ	148			

British Isles check logs

Received with thanks from G3LLM, G3MMH/P, G3NYY/P, G3RAC/P, G3XOX/P, G4AFN/P and G8JM/P.

Entry disallowed

Greenock & D ARC. GM3LYI/P. NFD Rule 10.

Conditions for dx were not good, neither was there much short skip for inter-G working, and hence EUs provided most of the contacts.

14MHz

Conditions were well down on last year, so most of the scoring came from short skip EUs.

The band leader, and winner of the Frank Hoosen (G3YF) Memorial Trophy, is the Glenrothes & D ARC, GM3YOR/P, with a checked score of 632 points—well down on the 1972 winner's score of 928 points, which is a reflection on conditions. Glenrothes' winning score was made almost entirely by working EUs—their only dx being TI2, W2 and 9J5. This result is most interesting, and augurs well for the Scottish stations during the low sunspot years to come.

Scotland also came second on 20m with the West of Scotland ARS, GM3SSB/P, scoring 599 points. They worked a little more dx —CE, K1, PJ2, VE7, VK7, W3 and 9J5, and used a KW2000 (2E26 pa) and a ground-plane aerial.

In third place once again is the NFD trophy winner, SRCC/Croydon RSGB Group, G6LX/P, with 570 points.

The most popular aerial remains the quad, but there were many more 3-element trap beams in use than ever before. Other types used were verticals, trap dipoles and V-beams.

21MHz

Conditions on 15m were as to be expected at this time in the sunspot cycle—plenty of short skip, but very little in the way of dx. The band did not open to North America this year.

The short skip obviously benefited Scottish groups as the band leader is the Glenrothes & D ARC, GM3OLK/P, with 363 points. Oxford & D ARS, G2DU/P, scored 272 points to gain second place, but close behind is the West of Scotland ARS, GM3SSB/P, who made 264 points, using a ground plane.

There were only two commercial beams in the top 20 on this band; the most popular aerial in this group being, as in the past, the quad.

9J5CA/P and 9J5LA/P appeared in quite a few logs, while VP5BN/P and VP8KF appeared in only a few. Other dx worked included LU, ZD8, ZS and 9V1.

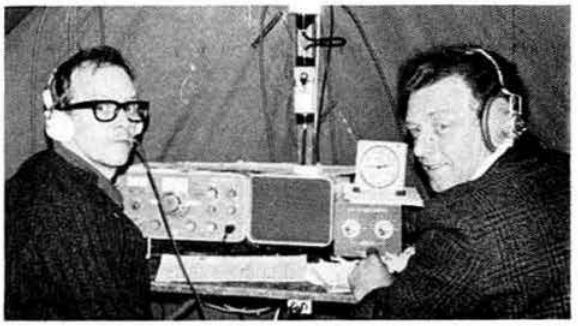
28MHz

Once again the 10m band award goes to the SRCC/Croydon RSGB Group, G6LX/P, the HF Contests Committee has now lost count of the number of successive years that they have secured this honour! G6LX/P keyed 106 points from 34 contacts using an SB301/401 (2E26 pa) set-up and a TA33. Harrow, G3HBR/P, take second place with 70 points made with the aid of G3HBW's transistorized transceiver and a quad. Addiscombe, G4ALE/P, with an FT277 (2E26 pa) and a quad, gained third place, just in front of Reigate, G3NKS/P, who used a sloping dipole and an FT401 with an outboard 5763 pa unit.

A fair number of European portables appeared in the logs, and many scores were boosted by the presence of VP8KF, 9J5CA/P and 9J5LA/P. As in the past few years, most of the activity on 10m took place during the Sunday morning.

Inspections

Once again representatives of the HF Contests Committee were out in force during the weekend. They visited about 30 NFD sites and attempted to find several more—but last-minute changes of plan had either forced groups to move site, or not participate, without notifying the committee accordingly. The committee regrets that certain inspectors undertook fruitless journeys and will endeavour to ensure that this does not happen in the future.



John, GM3PFQ, (left) and Bob, GM4ALK, with Glenrothes & D ARC station GM3OLK/P

Generally the inspectors were welcomed and given every assistance. However, one or two groups were reluctant to open up the transmitter to reveal their pa valve, preferring the excuse that the owner of the equipment was not available to do the deed. The HF Contests Committee reminds entrants that they, in returning the application form, consent to station inspections and that the rules demand that the pa valves shall be easily inspected. In future, groups who refuse to allow the inspectors to fulfil their duties are likely to be summarily disqualified. You have been warned!

The committee takes this opportunity to proffer its grateful thanks to all those members who undertook inspections on its behalf—we are glad to note that so many are willing to perform this onerous duty in order to ensure fair play in the contest.

Comments from competitors

"Only incident was a six from the cricket field landing in the tent—add crash helmets to list of gear for next year!"—Ariel.
"Lost first hour due to ac genny going berserk"—Torbay.
"Very happy with present rules"—Blackpool & Fylde.
"We like the rules as they are now, please keep them, particularly the power limit and cw only"—Chiltern ARC.
"Our best effort so far"—Sunderland.
"Same rules and fine weather next year, please"—East Kent & University of Kent.
"We heartily approve all the recent rule alterations—they are fine. Now let us see the 13·5W limit disappear"—Verulam.
"Why six points for VE, but only three for LU? Scoring needs radical change"—Salisbury.
"This was the year everything went wrong—but it was enjoyed by all"—Chippenham.
"G3RST and new xyl (married that Saturday) so keen on field day that they both paid us a visit before leaving for their honeymoon"—West Kent.
"Please reconsider the 160m multiplier"—Caithness.

The second Glenrothes station: GM3YOR/P, with George, GM4BFQ, (left) and Drew, GM3YOR

"Please restore tent, 1200 start, and 14swg aerial rules to give spirit to the contest"—Loughton.
"Somebody stole the Heaviside Layer"—Sutton and Cheam.
"Conditions abominable, luck worse"—Addiscombe.
"Lack of operators"—Reading.

Two groups commented that they were worried by having only four operators for two stations but found, however, that they achieved the best results ever.

Comments from the HF Contests Committee

Several groups commented on the difficulty of modifying popular transceivers to meet the requirements of the 13·5W pa dissipation rule. Indeed, those transceivers which use 11-pin line time-base output valves in the pa do present problems if one attempts to use the existing circuitry. An often easier solution is to build an outboard pa unit which can be driven from the transceiver output socket which is to be found on many modern transceivers. Such a unit can be powered by the transceiver itself and should normally present little design difficulty. A purpose-built pa unit will be far more efficient than a small valve in a high power, but reduced ht, pa stage. We feel that many transceiver owners would be much happier with an outboard pa unit, than with having their expensive rig modified for NFD, perhaps by someone else. No doubt the editor would consider publishing circuit details if one of the groups who use such pa units was to forward the necessary information to him.

The new style contest log sheets come in for some criticism. Yes, the callsign column is a little too narrow and when the existing plate is renewed the design will be amended.

Overseas check logs

The Lusaka Region of the Radio Society of Zambia, 9J5LA/P, provided the highest total of 396 points to competing stations. Their transceiver was a Drake TR3, and for aerials they had a TH3 at 35ft and a 40m folded dipole. The operators were 9J2BL, 9J2CL, 9J2EP, 9J2JN and 9J2SS. Runner-up with 388 points is EI1AA.

Mrs "Gee" Western, logging after canteen duties, and Andy Endacott, G3TLK, on the key, at the Torbay ARS NFD station

Final

Once again NFD is over for another year—for the HF Contests Committee as well as participating clubs. To judge by the comments added to the logs, it appears that most clubs very much enjoyed the contest. We are glad that they did, and look forward to receiving their entries, and comments, next year.

CLUB NEWS

RSGB Affiliated Societies are invited to submit items for inclusion in this section to their Regional Representatives (not direct to the editor), whose addresses appear on page 599 of this issue, for inclusion in the appropriate regional section.

Items of news and dates of forthcoming events should reach RRs by the following dates:

5 October for November issue
26 November for January issue

RSGB REGION 1 (Manchester)
Diamond Jubilee Dinner
Friday 21 September 1973
Post House Hotel, Palatine Road, Northenden, Manchester
7.30pm for 8pm
Price: £2.25 (inclusive of VAT)

Informal dress. **Ladies welcome.**

Inquiries to, and tickets from, (sae please): Wm Furness, G3SMM, 16 Coniston Avenue, Sale, Cheshire. Tel (061) 973 6676.

The hotel has excellent parking facilities and is situated five miles south of the centre of Manchester adjacent to Princess Parkway and M56. NGR—Sheet 101, SJ 824901.

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

Ainsdale (ARC)—Members should contact N. Horrocks, G2CUZ, for details of meetings.

Blackburn (ELARC)—First Thursday each month, 7.30pm. Edinburgh House, Shearbank Road, Blackburn. Secretary—W. E. Baxendale, G8FDG, "Juverna", Westland Avenue, Darwen, Lancs.

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

Bolton (B & DARS)—White Lion Hotel, Moor Lane, (private room), 8pm, on the third Tuesday in each month. 2m net every Tuesday night at 1900gmt—145·73MHz. Secretary S. Macdonald, G4AQB, 8 Archer Avenue, Bolton.

Bury (B & RRS)—From 11 September the Bury & Rossendale Radio Society will meet weekly, instead of monthly, at a new venue—the new Bury Community Centre. The second Tuesday of each month will remain the main lecture night, with the other Tuesdays of the month being devoted to RAE classes, morse classes, and an informal meeting (bar available). Will anyone wishing to join the RAE or the morse classes please contact the secretary as soon as possible. The first meeting in the new community centre (Tuesday 11 Sept) will be a lecture by G8EUM of Pye Telecommunications.

Carlisle (C & DARS)—Mondays, 7.30pm, Currock House, Lediard Avenue, Currock. Secretary, G8GSE, 6 Carlton Gardens, Stanwix, Carlisle GA3 9NP.

Cheshire (Mid-Cheshire ARC)—Wednesdays, 7pm, Technical Activities Centre, Winsford Verdin Comprehensive School, Grange Lane, Winsford. Nets on 160m, 7pm, Mondays; on 2m, 7pm, Tuesdays. On Tuesdays, RAE classes and slow morse transmissions are available. Please see secretary fo r details (G3SIQ). Chairman is G3JWK.

Chester (C & DARS)—Tuesdays, 8pm, YMCA, Chester, except the 1st Tuesday in each month which is a net night on 145·08MHz and 433·15MHz. Further details from G8AYW/G6AHC/T QTHR.

Isle of Man (MARC)—Secretary GD3YUM will be pleased to hear from any member who intends to visit the island.

Eccles (E & DARC)—Tuesdays, 8pm, Bridgwater School, Worsley, Manchester, Club 2m net 11am on Sundays on 145·65MHz. All visitors and prospective members welcome. Secretary, G4AEQ, QTHR.

Lancaster University (UoLARS)—Wednesdays, 7pm, Furness College, including RAE and morse classes. The society is active on the HF bands and 2m using G3ZBY and G8DOU. The rtty gear is also operational on these bands. Skeds and visits welcomed, enquiries please to Colin Pegrum, Department of Physics.

Leyland Hundred (LHARG)—Second Monday each month, 7.30pm, Rose & Crown, Ulnes Walton, Leyland. Net night Saturdays 2000gmt on 145·8 MHz. Details from F. Harrison, G3XII, 78 Lancaster Lane, Leyland, Lancs.

Liverpool (L & DARS)—Tuesdays, 8pm, Conservative Association Rooms, Church Road, Wavertree. Secretary, G3WCS.

Liverpool (NLRC)—Tuesdays, 8.30pm, informal meetings at the "Nags Head", Thornton, Crosby, Liverpool 23. Visitors welcome. Secretary, Alan L. Hart, G4BLI, 50 Strawberry Road, Liverpool, L11 7AD.

Liverpool University (LUARS)—Every lunchtime in the Radio Room, Students' Union. Please arrange visits with the secretary, Nigel Pope, G4AXA, c/o Students' Union, 2 Bedford Street North, Liverpool 7.

Manchester (M & DARS)—Wednesdays, 7.30pm. All meetings include morse classes. 203 Droylesden Road, Newton Heath, Manchester 10. Secretary, G3IOA.

Manchester (SMRC)—Fridays, 8pm, Sale Moor Community Centre Norris Road, Sale, Cheshire. The vhf lads meet on Mondays, 8pm, at the club shack. "Greeba", Shady Lane, Manchester 23. Visitors are welcome on both nights. 7 Sept (Review and dicussion on club activities), 14 Sept ("The mechanism of colour photography", by W. L. Seddon, G3VIW), 21 Sept (Natter Nite), 28 Sept (Surplus equipment sale—junk prohibited!), 5 Oct ("Audio processing", by D. Taylor, G8FXO), 12 Oct ("Semiconductor manufacturing technology", by Mr P. Goldstone of Ferranti, talk and film), 19 ("Power distribution", by B. L. Scott, G8HIW, talk and film), 26 ("Life in the Antarctic—Part 2", by R. P. Smith, G3SVW). The club will also be entering VHF Field Day in September. Hon sec, G3WFT QTHR.

Manchester University (MUARS)—G3VUM is active on all bands 160–10m and also on 2m. The programme of lectures, visits, RAE and morse tuition continues as previously. Details may be obtained from the secretary, G. T. Phelan, G8EPS, University Union, Oxford Road, Manchester, M13 9PL, or G4AOS QTHR.

Manchester (UoMISTARS)—7 Oct, Freshers Week. Station GB3MAN will be in Union Small Assembly Hall. Contact G3ZSS or G8GOS for membership. G3CXX is active on all hf bands and G8FOT on 2m and perhaps 3cm. Items for club magazine/newsletter or letters from intending members gratefully received by G8GOS, 66 Howard Road, Kings Heath, Birmingham B14 7PQ.

Preston (PARS)—13, 27 Sept; 11, 25 Oct, 7.30pm, Windsor Castle (private room), St Paul's Square, Preston. Secretary, G. Earnshaw, G3ZXC. Morse practice 7.30pm, main feature 8pm.

Stockport (SRS)—Second and fourth Wednesdays each month. 8pm, Blossoms Hotel, Buxton Road, Stockport. Secretary, G. R. Phillips, G3FYE, 6 Ross Avenue, Davenport, Stockport.

Thornton Cleveleys (TCARS)—First and third Wednesdays, 8pm, St John Ambulance Brigade HQ, off Fleetwood Road North, (behind police station), Thornton, Lancs. Project group meets Fridays, 7.15–9pm, at the Project Laboratory, Rossall School, Fleetwood. Work in hand includes 160 and 2m transmitters and receivers. Please note acting secretary is J. Duddington, G4BFH, The Grove, Thornton Cleveleys, Blackpool.

Warrington (W & DARS)—4 Sept (SWR bridge), 11 Sept (Open night), 15 Sept (Visit to Anglesey Radio Coast Station), 18 Sept (Question and Answer night), 25 Sept ("Propagation", by Alan Rigby, G3FGI).

It is also hoped to be able to run a course of lectures throughout the winter for the benefit of persons wishing to take the RAE in May of next year, providing there is sufficient demand. Secretary, G3ZRN QTHR.

Wirral (WARS)—First and third Wednesdays each month, 7.45pm, Sports & Recreation Centre (Old Drill Hall), Grange Road West, Claughton, Birkenhead. Secretary, G3WSD.

Wirral (Wirral DX ASSN)—Last Thursday each month at members homes. Visitors are welcome—please inform secretary, G4AHC, T. O'Neill, 41 Willoughby Road, Wallasey, beforehand.

Merseyside members meet for lunch on the first Monday of every month. It is essential to book beforehand and obtain details of the venue from either G3VQT or G2AMV.

REGION 2 **RR J. E. Agar, G8AZA**

Barnsley (B & DARC)—At King George Hotel, Peel St, Barnsley, Details from PRO, P. Ackley, G3LRP QTHR, or hon sec P. Carbutt, G2AFV. QTHR. 14 Sept AGM at 7.30pm, 28 Sept (to be announced).

Bradford (BRS).—7.30pm, 10 Southbrook Terrace, Bradford 7, (near Chester Street bus station). 4 Sept, first meeting of new session. Future meetings details from PRO, B. Ackroyd, G8GOV QTHR.
Denby Dale (DD & DARS)—Last Wednesday each month at Denby Dale Pie Hall, Denby Dale. Details from hon. sec, J. Clegg, G3FQM, QTHR.
Doncaster (DCTARC)—Mondays 7pm (during term time) at Doncaster College of Technology (Refectory). Club callsign, G3UER. Visitors always welcome. Details from hon sec, G4AWT QTHR.
Easington (EAR & EC)—Tuesdays and Thursdays, 7.30pm, at the Easington Village Workmen's Club, Easington, Peterlee. Nightly net on 28·750MHz at 1930, anyone interested in a chat or a report please break in. G3VSS QTHR.
Fulford, York (FARS)—Tuesdays, 7.30pm, at Scout HQ, 31 George St, York. Details from hon sec, G5KC QTHR.
Halifax (NHARS)—5 Sept (Social evening), 12 Sept ("Electronic fairground organ", by G3USH), 19 Sept (Committee meeting), 26 Sept (starting in rtty), 10 Oct (Preparations for Scout Jamboree), 24 Oct (Surplus equipment sale conducted by G8CB), 7 Nov ("VHF technicalities", by Dr Tong, G8ENN. Club meets at 7.45pm at Peat Pitts Inn, Ogden, Halifax. Details from G3MDW QTHR. The WIBB lectures are available from NHARS, the custodians, contact G3MDW QTHR.
Harrogate (H & KRS)—Second and third Mondays each month at Scriven Women's Institute. Details from G8CRH/G4AZJ QTHR.
Hull (H & DARS)—7 Sept. My interest in radio by Paul Dunham SWL. 14 Sept. A different approach to fault finding. John G3PQY. 21 Sept Maths as applied to radio by Pat Cassidy. 28 Sept, Astronomy by Mr Sid Wrightson. 5 Oct, Visit to Police H.Q. Communications Room, Hull. 12 Oct, Soldering techniques by G3RDM. 19 Oct, Working dx by G3RDM. 26 Oct, 23cm aerials and equipment by "Doc" G3WWD. All meetings at 592 Hessle Rd, Hull, at 7.45pm. A warm welcome is extended to all interested in amateur radio. Details from hon sec, G8GDD, 334 Ings Rd, Kingston upon Hull, HU8 0NA. Tel Hull 76603.
Morpeth (NRC)—Thursdays, 7pm, 3 Wheatsheaf Yard, Morpeth. Details from hon sec, G4AVO QTHR.
Otley (ORS)—Tuesdays, 7.30pm, club hq in the centre of Otley. Details from hon sec, G8BZY QTHR.
Post Office (Middlesbrough) (POARC)—Thursdays, 7.30pm, 200 Marton Rd, Middlesbrough. On the air Sundays at 1900 on 145·8. Club calls G4BAY and G8GPO, Details from hon sec, G8CDP QTHR, or phone Middlesbrough 38237.
Scarborough (SARS)—Fridays, 7.30pm. Technical College, Scalby Rd, Scarborough. Details from hon sec, G3VAN QTHR, or AR G8KU QTHR.
Spen Valley (SVARS)—Grammar School, High St, Heckmondwike. Details from hon sec, G8DSB QTHR.
Sunderland (SARS)—Meets at Sunderland Polytechnic, details from hon sec, G3XID QTHR.
Tyneside (TARS)—Mondays, 7.30pm, Community Centre, Vine St, Wallsend-on-Tyne. Details from hon sec, G. Lowden, 21 Winefred Gdns, Wallsend. NE28 6EF. Tel 627878.
Wakefield (WRS)—Alternate Tuesdays, 7.30pm, Youth Centre, Ings Rd, Wakefield. Details from hon sec, G3XVU QTHR.
York (YARS)—Thursdays, 7.30pm. 61 Micklegate, York. The recent exhibition station at the garden party at the Archbishop's Palace at Bishopthorpe was a great success and brought amateur radio to the attention of many visitors. Future plans include a visit to the ITV studios in Leeds, talks on transistors by G3YVS and "DX" by G3TMN, and the Society's annual dinner. Visitors are always welcome to the YARS meetings. Details from hon sec, G3WVO QTHR.

REGION 3 — RR B. Kennedy, G3ZUL

Birmingham (MARS)—18 Sept (Lecture by R. Rew, G3HAZ) 16 Oct (AGM) 7.45pm, The Birmingham and Midland Institute, Margaret St. *G3ZMT*.
(Slade)—7 Sept (Junk sale), 21 Sept (Details to be announced later). Alternative Friday evenings, 8pm. The Committee Room, Church House, High St, Erdington. *G4BRT*.
(South)—First Wednesday of the month, 8pm, Hampstead House, Fairfax Rd, Birmingham 31. Informal meetings in the club shack every Friday at 8pm. Visitors always welcome. *G3OHM*.
Bromsgrove (BDARC)—14 Sept (Hi-Fi demonstration by G4AAL), 12 Oct (Surplus sale). Second Friday of the month, Royal Oak, Barley Mow Lane, Catshill. *J. Harvey, BRS19682*
Coventry (CARS)—7 Sept (University Challenge type quiz), 14 Sept (Discussion on future contests), 21 Sept (Visit to Birmingham Airport), 28 Sept (Night on the air), 5 Oct (AGM), 12 Oct (Night on the air), 19 Oct (Preparation for Scout Jamboree), 26 Oct (Night on the air). Friday evenings, 8pm. Baden Powell House, St Nicholas Street, Radford Rd, Coventry. *G3TFA*.
Dudley (DARC)—18 Sept, 2 and 16 Oct. 8pm, Central Library, St James's St, Dudley. *G3PWJ*.
Hereford (HARS)—The club produces a most informative and interesting newsletter each month, a copy of which can be obtained from the hon sec, Stuart Jesson, 181 Kings Acre Rd, Hereford. First and third Fridays of the month, Civil Defence HQ, Gaol St Hereford. *BRS30628*.
Lichfield (LARS)—First Monday and third Tuesday of the month, Swan Hotel, Bird St, Lichfield. *G3NLY*.
Rugby (RDAR & EC)—Informal meetings on the last Tuesday of the month, The Lawrence Sherriff Arms in the town centre. *G3YQC*.
Shrewsbury (SARS)—Thursdays, 7.30pm, Harlescott Youth Centre, Sundorne Rd, *G3VZG*.
Solihull (SARS)—Club meets at the Manor House, High St, Solihull. *G4ABV*.
Stourbridge (STARS)—4 Sept (Informal), 8 Sept (Visit to BBC, Sutton Coldfield), 17 Sept (Talk and demonstration of audio by Vic Wakeman of BSR Ltd), 2 Oct (Informal) 15 Oct (Interference—causes and cures by Messrs Holloway and Jackson of the RSGB Interference Committee), 6 Nov (Informal). Informal meetings are held in the Shrubbery Cottage, Heath Lane, Stourbridge, formal meetings at Longlands School Stourbridge. *B. Powell BRS32183*.
Stratford-upon-Avon (SADRC)—7 and 21 Sept, 5 and 19 Oct, 2 Nov. South Warwickshire College of Further Education, Alcester Road, Stratford-on-Avon. Visitors always welcome. *G8GAG*.
Sutton Coldfield (SCRS)—10 Sept (Informal), 24 Sept ("VHF, then, now and in the future", by Jack Hum, G5UM), 8 Oct (Judging of home-built equipment for trophies to be presented at the AGM), 22 Oct (Visit to Pye Telecommunications Ltd at Coventry), 12 Nov (AGM). *G8ALO*.
Wolverhampton (WARS)—3 Sept ("Listening to short wave broadcast stations" by Bob Tomkys, G3NOW), 9 Sept (Mobile picnic and df hunt, for details contact the hon sec), 10 Sept (Natternight), 17 Sept (Yaesu night, amateurs using equipment manufactured by Yaesu Musen are invited to come and compare), 1 Oct (AGM), 8 Oct (Natternight), 15 Oct (Members' slide and film show, members are invited to bring slides and films of radio interest). Morse classes continue on Friday evenings. All meetings at Neachells Cottage, Stockwell End, Tettenhall. *G3UBX*.
Worcester (W & DARC)—3 Sept (Night on the air), 15 Sept (AGM), 1 and 20 Oct (to be announced). First Monday and third Tuesday of the month, 8pm, The Old Pheasant, New St, Worcester. *G8ASO*. Worcester 29208.
Wrekin (WARS)—Wednesdays, Ketley Bank Youth Centre near Oakengates. *G3UKV*.

REGION 4 — RR T. Darn, G3FGY

Derby (DADRS)—5 Sept (Surplus sale), 12 Sept ("Visit to Fiji", by Keith, VK4VS)—this is a ladies evening, 19 Sept (DF practice run No 6 to be followed by the judging of crystal sets in the clubroom), 26 Sept ("An easy-to-maintain garden", by Tony Griffin)—this is also a ladies evening, 3 Oct (Surplus sale), 10 Oct (Final DF practice run). The club will also be participating at the Midland National Amateur Radio and Electronics Exhibition at Granby Halls, Leicester, from 25 to 27 Oct. Meetings, 7.30pm, 119 Green Lane, Derby, Visitors always welcome.
Lincoln (LSWC)—5 Sept (Treasure hunt), 12 Sept (Post-mortem on VHF NFD), 19 Sept (Films), 26 Sept (Open night), 3 Oct (AGM), 10 Oct (Junk sale), 17 Oct (Films), 24 Oct (Open night), 31 Oct (Talk). Wednesdays, 7.30pm, Lecture Room of Lincoln Astronomical Society Westcliffe St, off Burton Rd, Lincoln. Visitors always welcome. (*G4BXL*).
Nottingham (ARCON)—Thursday evenings at the Sherwood Community Centre, Mansfield Rd, Nottingham. Announcements and programme on Radio Nottingham.
Worksop—Letter received from G8ON saying that a Worksop Radio Club has been formed in place of the old North Notts Radio Society. Further details will be available soon. (*G8ON*).

REGION 5 — RR P. J. Simpson, G3GGK

Bedford (B & DARC)—Thursdays, 7.30pm, "The Dolphin", The Broadway, Bedford. Hon sec, Eric Hawkins, 8 Arrow Leys, Putnoe, Bedford.

Cambridge (C & DARC)—7 Sept (VHF transmitter design), 5 Oct (Film night), both meetings 7.30pm, Civil Service Sports Club, Brooklands Avenue, Cambridge. Other Fridays at club hq are informal. Hon sec, Sam Stimson, G3BBP, 2 Burns Way, St Ives, Huntingdon.

Dunstable Downs (DDRC)—7 Sept (Between week), 9 Sept (DF hunt on 2m), 14 Sept (DDRC Emergency Network-discussion), 21 Sept (Between week), 28 Sept ("Setting up amateur tv", by G3VZV/G6AEV/T), 5 Oct (Between week), 12 Oct (Annual club constructors contest), 19 Oct (Between week), 26 Oct ("Spectrum analysers—receivers with no-quibble S-meter", by Stuart Fox, G3VVS). Meetings 8pm, Chews House, 77 High Street South, Dunstable. Hon sec C. G. Powell, G8BPK, 1 Wenwell Close, Aston Clinton, Aylesbury, Bucks.

March (M & DARS)—The club has had to find new premises and the address is now 2 Grays Avenue, March P15 8DU, Cambs. At the AGM the following officers were elected: president G3BK, vice-president G8ADE, chairman G8BFX, treasurer, G8BDS, and hon sec R. E. Ludman, G8BJZ, 7E Wyndene Rd, March PE15 9BL, Cambs. Meetings Tuesdays 7.30pm.

Peterborough (PR & ES)—First Friday each month, 7.30pm, Peterborough Technical College, Room 32. The annual "Ham Festival" will be held on 30 Sept at Walton School, Mountsteven Avenue, Walton, commencing at 11am. Refreshments will be available and talk-in stations will operate on 1,980kHz and 145MHz. Free car parking is available and entrance fee will be 10p. Hon sec, A. H. Jackson, G8GNV, 57 Peterborough Road, Castor, Peterborough.

Shefford (S & DRS)—Thursdays, 8pm, Church Hall, Ampthill Rd, Shefford. 20 Sept ("Dxpeditions", by VK4KS). Hon sec, C. L. Davies, G8DUY, 17 Brigham Gardens, Biggleswade, Beds.

REGION 6 — RR L. W. Lewis, G8ML

Cheltenham (RSGB Group)—First Thursday each month, 8pm, Royal Crescent Hotel, Clarence Street, Cheltenham. *G2FWA.*

Banbury (BARS)—New venue, 43 North Bar, Banbury, (former Cock Horse Cafe). Three rooms available seven days a week, exclusive. Main meetings Fridays. Details from G3LTN, Tel Banbury 710623.

North Bucks (NBARS)—10 Sept (AGM), 8 Oct (Eric Mollart on df contests). Second Monday each month, 8pm, Wolverton Youth club. *G8AAT.*

REGION 7 — RR R. S. Hewes, G3TDR

Acton, Brentford & Chiswick (ABCRC)—18 Sept (Members holiday reports), 16 Oct (Film show), 7.30pm, Chiswick Trades and Social Club, 66 High Road, Chiswick. Hon sec. W. G. Dyer, G3GEH QTHR.

Addiscombe (AARC)—Tuesdays 9pm, "Prince George" High Street, Thornton Heath. Hon sec, S. V. Knowles, G3UFY QTHR.

Ashford, Middlesex (Echelford ARS)—10 Sept (To be arranged), 27 Sept ("Electronic components" by Tony Cockle, G3IEE, 8 Oct G3YCQ slide show), 25 Oct (Surplus equipment sale). 7.30 for 8pm, St Martin's Court, Kingston Crescent, Ashford. Hon sec, Vic Higgs, G3WVJ QTHR.

Barking (BR & ES)—Thursdays, 8pm; slow morse classes Tuesdays, 7.30 to 9.30pm. Meetings and classes Westbury Recreation Centre, Westbury School, Ripple Road, Barking. All visitors welcome. Hon sec, R. Clark, G8BXC QTHR.

Bexley Heath (North Kent RS)—Second and fourth Thursdays in each month. 13 Sept (Bring your own mini project). 7.30 for 8pm. Congregational Church Hall, Bexley Heath, Kent. Hon sec, Rainald Wells. G4ARQ QTHR.

Burnham Beeches (BBARC)—First and third Mondays in each month, 8pm, Hedgerley Scout Hut, Hedgerley, Nr Slough, Bucks. Hon sec, Margaret McCabe, G8HCO QTHR.

Cheshunt (CDRC)—First Friday in each month, 8pm, Methodist Church Hall, opposite Theobalds Station, Hon sec, Richard Zudwell G3ZZQ QTHR.

Chingford (Silverthorn RC)—Fridays, 7.30pm, Friday Hill House, Simmonds Lane, Chingford E4. Hon sec, M. Higgins, G8BUF QTHR.

Cray Valley (CVRS)—6 Sept ("The RSGB QSL Bureau", by A. O. Milne, G2MI), 20 Sept (Natter nite), 4 Oct ("Marine radio communications", by D. E. Nunn, G3JMJ), 18 Oct (Natter nite). 8pm. United Reformed Church Hall, Court Road, Eltham SE9. Hon sec, P. F. Vella, G3WVP QTHR.

Croydon (Surrey Radio Contact Club)—Third Tuesday in each month, 8pm, "The Ship", 47 High Street, Croydon. Hon sec, Sid Morley, G3FWR QTHR.

Crystal Palace (CP & DRC)—15 Sept ("The use of electronics in bio-chemical measurement", by John Townsend, G8CSC), 20 Oct (Being arranged), 8pm, Emmanuel Church Hall, Barry Road, SE22. Hon sec, Geoff Stone, G3FZL QTHR. Tel 699 6940.

Dartford Heath (DF Club)—7 Sept (Club night), 9 Sept (RSGB DF Qualifying Event, Dartford Heath), 23 Sept (RSGB DF National Final, Stratford), 30 Sept (Vange ARS hunt), 5 Oct (Club night), 20/21 Oct (JOTA Erith and Crayford Scouts Assc.). Hon sec, Maureen Worby, G3XVC QTHR. Club hq, The Scout House, Broomhill Road, Dartford.

Dorking (DR & DRS)—Second and fourth Tuesdays in the month, 8pm, "Surrey Yeoman", Dorking. Hon sec, P. B. Gilbey, 6 Hawkwood Rise, Gt Bookham, Surrey.

East London RSGB Group—Third Sunday in September and then every third Sunday until May 1974, 3pm, Wanstead House, Wanstead Green, E11. Hon sec, Ron Broadbent, G3AAC QTHR.

Edgware (E & DRS)—Second and fourth Thursdays in each month, 8pm, Watling Community Association, 145 Orange Hill Road, Edgware. Further details from hon sec, Alan Masson, G3PSP QTHR. Tel 950 6827.

Farnborough (Bromley RC)—Third Monday in each month, 8pm, rear of Farnborough (Kent) Village Hall (Opposite "The Woodman" Public House). Further details from PRO Derek Morgan 59 Bassetts Way, Farnborough.

Gravesend (GRS)—Mondays, 7.30pm, "Windmill Tavern", Shrubbery Road, Gravesend, Kent. Area representative, P. F. Jobson, G3HLF QTHR.

Guildford (G & DRS)—Second and fourth Fridays in each month, 8pm, Model Engineering HQ, Stoke Park, Guildford, Surrey. Further details from hon sec, Dave Coltart, G3SYM QTHR.

Esher (Thames Valley ARTS)—5 Sept (Being arranged), **Wednesday 3 Oct ("The history, development and production of "Wireless World", by Harold Barnard, retired editor-in-chief) —this is a once-only and quite unique talk and visitors are invited and will be welcomed.** First Tuesday in each month, 7.30 for 8pm, King George's Hall, Esher, Surrey. Details from PRO, Rob Muir, G3LHN QTHR, tel 01 979 6255 evenings.

Harlow (H & DRS)—Tuesdays, 8pm, Mark Hall Barn, First Avenue, Harlow, Essex. Details from hon sec, Vic Heard, 106 Vicarage Wood Harlow.

Harrow (RSH)—Fridays, 8pm, Harrow Sea Cadets HQ, Woodlands Road, Harrow, Middlesex. Refreshments available during evening. Further details from hon sec, Les Light, G3KDL QTHR.

Havering (H & DARC)—First and third Wednesdays in each month, 8pm, British Legion House, Western Road, Romford. Hon sec, Sam Hobday, G3SKV QTHR.

Holloway (Grafton RS)—Fridays, 7.30pm, Archway School Annexe, Whittington School, Highgate Hill, N19. Hon sec, H. D. Ashcroft, G8AYU QTHR.

Ilford RSGB Group—Thursdays, 8pm, Mortlake Road, (off Ilford Lane) Ilford. Hon sec, Derek Sapsworth, G3YAW QTHR.

Kingston (K & DARS)—12 Sept ("Plessey Communications ICs", by Dave White, G3JKA), 10 Oct (Film show). Due to efforts by the membership in terms of donations and loans, the society now owns a new E800 generator for portable working and contests. Second Wednesday in each month, 8pm, The Berrylands Scout Troop, Stirling Walk, off Grand Avenue (behind Surbiton Lagoon), Berrylands, Surrey. Hon sec, Dick Babbs, G3GVU QTHR.

Loughton (L & DRS)—14 Sept (Mobile operation), 12 Oct ("Aerials", by G6NR), 28 Sept/28 October (Informal). First and third Fridays in each month, 8 pm. Loughton Hall, Nr Debden Station. Hon sec, David Bowers, 12 Theydon Park Road, Theydon Bois, Epping, Essex.

New Cross (Clifton ARS)—Fridays, 8pm, 225 New Cross Road, London SE14. Details from hon sec, R. A. Hinton, 48 Camilla Road, Bermondsey, SE16.

Northolt (BEAARS)—First Thursday in each month, 8pm, BEA Trident Club, Western Avenue, Northolt, Middlesex (This club is open to non-BEA employees by invitation; Contact David Evans, G3OUF, tel Amersham 21573 for details).

Paddington (P & DRS)—First Thursday in each month, 8pm, Beauchamp Lodge, Warwick Crescent, W2. Further details from Mike Pawley, G8AWV QTHR.

Purley (P & DRS)—First and third Fridays in each month, 8pm, Lansdowne Hall, Lansdowne Road, Purley, Surrey. Hon sec, Alan Frost, G3FTQ QTHR.

Reigate (RATS)—4 Sept, 2 Oct (Natter nites), 8pm, "Marquis of Granby", Hooley Lane, Redhill. 18 Sept ("The RSGB", by Tim Hughes, G3GVV), Thursday 18 Oct (Club project by G3RIN). 8pm, St Mark's Church Hall, Alma Road, Reigate. Hon sec, F. H. Mundy, G3XSZ QTHR (Reigate 43130).

The Crawley ARC dinner and ladies evening on 4 May. Above, Geoff Bowden, G3YVR, proposing the toast "The ladies and visitors". Right, guest of honour Doug Findlay, G3BZG, presents the 1961 Committee Cup to Ray Scrivens, G3LNM, who won the 1973 Crawley Constructional Contest with an ssb transceiver

Scouts (Baden Powell House ARG)—Third Thursday in each month, 8pm, Baden Powell House, Queensgate, S Kensington SW7. Further details from hon sec, Alf Watts, G3FXC QTHR.
Shelbourne (Youth Centre RC)—Club night Thursdays. Commencing 6 Sept RAE for beginners—an informal approach to the RAE, every Monday commencing 10 Sept, 8pm. Shelbourne (Upper) School, Hornsey Road N7. Tutor and PRO R. Cummings, G3SLF QTHR.
Southgate (SRC)—Second Thursday in each month, 8pm, Southgate Swimming Baths, N11 (Nr Arnos Grove underground station) All visitors welcome. Hon sec John Bachelor, G3XMV QTHR.
St Albans (Verulam ARC)—19 Sept (Demonstration of Yaesu equipment by Ian Partridge, G3PRR), 17 Oct ("High frequency communications receivers and phase lock loops", by John Speake, G3URX). 7.30 for 8pm, Market Hall, St Albans, Herts. All visitors welcome. Hon sec, Hugh Young, G3YHY QTHR.
Sutton & Cheam (SCRS)—Third Thursday in each month, 8pm, "The Harrow", Cheam, Surrey. Hon sec, Alan Keech, G4BOX QTHR.
UK FM Group (London)—Second Tuesday in each month, 8pm, The Scout Hut, Hayes Road, Southall. Further details from PRO Roger Wilkins, G3XFA QTHR, tel Heathfield 2189.
Welwyn (Mid Herts ARS)—Second Thursday in each month, 8pm, Welwyn Civic Centre, Welwyn. Hon sec, Andrew Marshall, G8BUR QTHR.
Wembley (GECARS)—Thursdays, 7pm, Sports Club, Preston Road, North Wembley. (This club is open to non-GEC employees by invitation, tel Dain Evans, G3RPE, at 01-904 1262 during business hours for details).
Wimbledon (W & DRS)—Second and fourth Fridays in each month, 8pm, St John Ambulance HQ, 124 Kingston Road, Wimbledon SW19. Further details from hon sec, F. W. Hill, G3WDO QTHR.

REGION 8 **RR D. N. T. Williams, G3MDO**

Canterbury (EKRS)—20 Sept (VHF Field Day), 18 Oct ("Williams Trophy" constructional contest) (AGM), 15 Nov (Film show and MCC report). Further details of future meetings from hon sec, D. N. T. Williams, G3MDO, QTHR.
Medway (MARTS)—Fridays, 7pm, RAE classes and morse. Meetings 8pm, "Aurora Hotel", Gillingham. Further information of future events from sec, H. E. Willis, 111 Laburnum Road, Strood, Kent ME2 2LB.
Canterbury University (UKC)—Details of club meetings from K. Beesley, G3UXE, Eliot College, University of Kent, Canterbury.
Brighton (BTCRC)—9 Sept ("Portable picnic parties"), location three miles north of Brighton, 200yds north of junction of Dyke Road, and King George VI Ave. Talk-in stations will be there all day. Enquiries to hon sec, G2CMH, QTHR.
Worthing (W & DARC)—4 Sept (Inquest on NFD), 11 Sept (AGM), 18 Sept (Ragchew), 25 Sept (Club tx contest), 2 Oct (Ragchew and contest results). Tuesdays, 8pm, Rose Wilmot Youth Centre, Littlehampton Road, Worthing. Further details of meetings from G8ETL, 12 Bramble Crescent, Worthing.
Maidstone (MYMCAARS)—Meetings held at "Y" sports centre, first and third Fridays devoted primarily to the beginners.
Crawley (CARC)—Fourth Wednesday in the month, United Reform Church Hall, Ifield, Crawley. Further details of future events from G3MGL, QTHR.
Eastbourne (SARS)—First Monday in the month, Victoria Hotel, Latimer Road, Eastbourne. PRO, G3JFM.
Horsham (HARC)—Formal meetings Guide HQ, Denne Road, Horsham, Informal meetings "Star", Roffey. Further details of meetings from T. Wadsworth, G3NPF, 39 Church Road, Broadbridge Heath, Sussex.
Mid-Sussex (M-SARS)—Meetings held at Marle Place, Leylands Road, Burgess Hill. Further details from G3RXJ, 87 Meadow Lane, Burgess Hill.
West Kent (WKARS)—Alternate Fridays, Adult Education Centre, Monson Road, Tunbridge Wells. Further details from G4BKG, 35a London Road, Southborough, Kent.
Adur Contest Group (ACG)—Re-formed Adur Contest Group meet on first Tuesday in the month at QTH of G8FAY. Further details from A. J. Slater, G3FXB, 86 Cross Road, Southwick, Sussex.
Chichester (CRC)—Amateurs interested in this growing club please contact D. W. Hughes, G3TYD, 133 East Beech Road, Selsey, Sussex.

REGION 9 **RR H. W. Leonard, G4UZ**

Bath (B & DRG)—This group is back in action again. Mondays, 8.30pm, The Crypt, Church of the Ascension, Oldfield Park, Bath. The group 2m net is on 144·440MHz. All details from G8DRK, tel Bath 23465.
Bristol (City & County RSGB Group)—24 Sept ("Transistors", by G3YRN), 29 Oct ("73 and all that"). 7pm, Becket Hall, St Thomas Street, Bristol 1. *G3ULJ.*
Bristol (BARC)—Tuesdays, 7.45pm, 24 Bright Street, Barton Hill, Bristol 5. *G3XEI.*
Bristol (Shirehampton)—Fridays, 7.30pm, Twyford House, Shirehampton, Bristol. *G5AQZ.*
Bristol (University ARS)—Most Saturdays during term time, 2.30pm, Dept of Physics, Royal Fort, Tyndall Avenue, Bristol BS8 1TL. All enquiries to G3WDG.
Cornish (CRAC)—First Thursday in month, 6 Sept ("Stage lighting and sound effects", by G3XFL). 7.30pm, SWEB Clubroom, Pool, Camborne. *G3XTF.*
Newquay Group (CRAC)—Opens again on 19 Sept ("A simple transistor tester"), 3 Oct ("Standing wave and power meter"), 17 Oct ("An ssb transceiver for 80m"). 7.30pm, Treviglas School, Newquay. *G3THT.*
West Cornwall Radio Group (CRAC)—Second Tuesday and fourth Thursday in each month. 7.30pm, Western Hotel, Penzance. Full details of Cornish and associated groups from G3NKE, tel Camborne 2419.

Exeter (EARS)—Second and fourth Tuesdays, 7.30pm, Community Centre, St David's Hill, Exeter. Sec, Jack Bawden, 232 Exwick Road, Exeter EX4 2BA.
North Devon (NDRC)—Second and fourth Wednesdays of month. 12 Sept (Talk), 26 Sept (Ragchew). 7.30pm, "Crinnis", High Wall, Sticklepath, Barnstaple. *G4CG*.
Plymouth (PRC)—Membership is growing and 10 members are building 2m converters. Meetings first and third Tuesdays, 7.30pm, Virginia House, Bretonside, Plymouth. *G3UVS*.
Saltash (S & DARS)—First and third Fridays, 7.30pm, Burraton Toc H Hall, Saltash. *G3ZHM*.
South Dorset (SDRS)—First Friday of month. 7.30pm, Alma Road Section of Weymouth Technical College. *G3VPF*.
Taunton (T & DARS)—Every Friday, 7.30pm, Jelalabad Barracks, The Mount, Taunton. Sec, G. Swetman, "Little Copse", Monkton Heathfield, Taunton. Tel West Monkton 298.
Torbay (TARS)—Every Tuesday, with special meeting on last Saturday of month. 29 Sept (RSGB tape lecture and films), 27 Oct ("Stereo sound", by P. Jarvis). 7.30pm, rear of 94 Belgrave Road, Torquay. Visitors most welcome. *G3UIQ*.
Weston-super-Mare (WsMRS)—Second Friday of month, 7.30pm, Room Lewis M2, Worle School, New Bristol Road, Worle. *G3PQE*.
Yeovil (YARS)—Every Thursday, 7.30pm. The Youth Centre, 31, The Park, Yeovil. *G3NOF*.

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

Blackwood (ARC)—Fridays, 7pm, during school terms. Oakdale Community Centre, Oakdale, Mon. *GW3KAY*.
Barry College of Further Education (ARS)—Thursdays, 7pm, during term at the College, Colcot Rd, Barry. Out of term at the Barry Rugby Club. *GW3VKL*.
Cardiff (RSGB Group)—10 Sept, 7.30pm, BBC Club, Newport Rd, Cardiff. Talk on construction of 2m transceiver by GW8HEZ. *GW3GHC*.
Hoover (ARC)—Mondays, 7.30pm, Hoover Social Club, Hoover Works, Pentrebach, Nr Merthyr, Glam. *GW3RNC*.
Glamorgan VHF/UHF Group—Third Thursday of each month, 7.30pm, at the NCB Staff Members Club, Tondu, Nr Bridgend. Adequate car parking and refreshments available. 18 Sept ("The application of fet devices to vhf converters", by J. D. V. Ludlow, GW3ZTH). 16 Oct (Equipment demonstration and talk on 70cm transverter by P. Widger, G8AGU). *Sec, GW3ZTH*.
Pembroke & District (RSGB Group)—Last Friday of each month, 7.30pm, Defensible Barracks, Pembroke Dock. *GW4AKO*.
Pontypool (RSGB Group)—Thursdays, 7pm, during school terms, Educational Settlement, Rockhill Rd, Pontypool, Mon. *GW3JBH*.
Port Talbot (ARS)—Rail & Transport Club, Station Rd, Port Talbot, 7.30pm. 11 Sept ("Transistors", by Brian Jones, GW3WRE), 9 Oct (AGM). *GW4BIQ*.
Rhondda (ARS)—Meets at Rhondda Transport Employees Club & Institute, Porth, Rhondda, Glam. *GW3PHH*.
South-East Wales Raynet Group—Details from GW3ZFG, Cardiff 62411. Information for members interested in Raynet in the Britton Ferry area available from Alan Glassford, GW4ACF, Tel Britton Ferry 812475.
Sully & District Short-wave Club—Tuesdays, 7pm, Annexe, Sully Bowls & Social Club, 59 Port Rd, Sully, Glam.
Swansea (RS)—First and third Tuesday of each month, 7.30 pm, Commercial Hotel, Killay, Swansea, Glam. *GW3OGG*.
University College of Wales, Cardiff (ARS)—Details of society activities from the secretary, c/o Students Union, Dumfries Place, Cardiff.
University College of Wales, Aberystwyth (RES)—Details from the secretary, c/o Students Union, University College of Wales, Aberystwyth.

REGION 13 **RR V. W. Stewart, GM3OWU**

Berwick (BARS)—Last Sunday in each month, 3pm, Tweed View Hotel. Further details from C. H. Crook, G3YOG, 19 Hattes Lane, Berwick-upon-Tweed or from the AR, G. Shankie, GM3WIG, 8 Ettrick Terrace, Hawick, Roxburghshire.
Dunfermline (DRS)—Second Wednesday in each month, 7pm, CCTV Studios, Queen Anne School, Dunfermline. Further details from G. Martin, GM3NVQ, 42 Rose Street, Dunfermline.
Edinburgh (LRS)—13 Sept (Presidential address), 27 Sept (Sale), 11 and 25 Oct (Films), 7.30pm, new venue. Details from GM8BJF or GM8DIJ QTHR.
Glenrothes (GDARC)—7.30pm, Old Nursery Buildings, Leslie, Fife. Details from A. B. Givens, GM3YOR, 41 Veronica Crescent, Kircaldy, Fife.
St Andrews (UStAARS)—5pm, Dept of Physics, North Haugh, St Andrews. No further meetings until next term.

RSGB ZONE G Conference

The 1973 Zone G Conference will be held at the Pollock Halls of Residence, Edinburgh University, on 22 September, commencing at 10am. RSGB Council members T. Hughes and G. Stone will attend.

Will members with items they wish to be discussed please advise representatives.

All Regional Representatives have copies of the 1972 Zone G Conference minutes.

REGION 17 **RR L. Hawkyard, G5HD**

Newbury (NADARS)—10 Sept, 7.30pm-9.30pm, South Berks College of Further Education, Newbury. All welcome, Sec, *G8FNS*.
Harwell (AERE ARC)—Third Tuesday in each month, also informal meetings and junk sales every Friday lunch-time. 7.30pm, Social Club, AERE, Harwell, Berks. *G3NNG*.
Farnborough (FADARC)—The Society meets twice a month, details from hon sec, G8FWE, QTHR, tel Camberley 22887.
Reading (RARC)—Meetings at The White Horse, Kidmore End Road, Emmer Green, Reading. 11 and 25 Sept. *D. King*.
Maidenhead (M & DARC)—6 Sept (Informal), 4 Oct ("DF foxhunting", by Eric Mollart), 16 Oct (Demonstration of amateur tv by M. Bues, G8AAI/G6OPB/T). Note new venue: British Red Cross Hall, The Crescent, Maidenhead. 7.30pm.
Bracknell (BARC)—17 Sept, 1 and 15 Oct, at Coopers Hill Centre, Bracknell. *G8EMI*.
Basingstoke (BARC)—15 Sept (AGM) at Chineham House, Popley.
Southampton (RSGB Group)—Monthly meetings on 8 Sept and 13 Oct. 13 Oct (AGM at the Lanchester Building, Southampton University). Club meets every Wednesday evening at Kent Road, Southampton. *G5HD*.

Gerry Birch, G8FFV, chairman of the UK FM Group (Southern), measures the transmitter deviation of G8EMY/M's Pye "Cambridge" during the group's transceiver alignment evening on 6 June. Thirteen mobiles were checked out for transmitter power, frequency, vswr, deviation and receiver sensitivity during the three-hour session, and 23 members attended
Photo: G8AKA

MEMBERS' ADS

These low-cost flat-rate advertisements are accepted as a service to members of RSGB. They must be submitted on the Members' Ads order form printed on the last 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, and a remittance by postal order or cheque for 25p (stamps not accepted). They will not be acknowledged. Those not clearly worded or punctuated will be returned. No other correspondence concerning this service can be entered into.

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

Trade or business advertisements, even from members, will not be accepted for Members' Ads but should be submitted as classified or display advertisements in the usual way. The RSGB reserves the right to refuse advertisements, and accepts no responsibility for errors or omissions or for the quality of goods offered for sale.

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

See the current order form on the last page for further details.

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

FOR SALE

Cossor 1052 dble beam scope £20. GM3SBB, QTHR. Tel 05752 2563.

30MHz Panoramic rx £20; Crutype 2 £6; calibrator type 1 £2.50; 45MHz i.f. amp £2; 30MHz i.f. amp £2, carr extra. R. Hayward, "Sunnyfields", Lighthouse Road, St Margarets Bay, Dover.

RTTY gear: Northern Radio 115 vfo, 105 fs, keyer, 177 Twinplexer, ideal tx, AP105131 regen, £70 ono; 7B t/p, 85R typing reperf, 6S4 reader, 160V psu, table, h/built ST6-TU, £80 ono, no splits, buyers coll. A. Hackett, 3 Dennington Drive, Davyhulme, Manchester. Tel 061-748 2592.

Sommerkamp IC-20XT 10W 2m /m tx/rx, 7-chann, mic, aerial, £148; SRC-146A 2W 2m tx/rx, 5-chann, rechargeable batts, charger, £140. All in as new cond, ready to go. G3UCT/DA2XT, 20 Armd Bde HQ and Sig Sqn, BFPO 41.

Heath HW30 2m tx/rx, 5W i/p, mic, xtal, £17; Codar 12M/S, 12V pos or neg chassis, inverter, 280V 100mA, £8. G8FRY, 55 Hulse Ave, Barking, Essex. Tel 01-594 2263.

20 valves, used but tested, £1, pp 10p, several lots available; 7½lb resistors, caps, ex-eqpt, £1 callers only. R. J. Baker, 2 Forest Glade, Crawte Ave, Holbury, Southampton SO4 1GQ.

Trio 9R59DS, immac cond, fitted 1MHz calib and 150V stblzr. G3RSJ, QTHR. Tel Pakenham 30675.

Hamgear PMIII top-band cnvrtr, 7·0-7·2MHz i.f., only 3 mnths old, cond as new, £8. Marsh, 21 Stour Gdns, Great Cornard, Sudbury, Suffolk.

Eimac 4CX600A (two), brand new in maker's sealed packs, 750W o/p at 432MHz typical, rsnble offers pse, full data sheets available. G6FB, 11 Morningside Ave, Portchester, Hants. Tel Portsmouth 21892 office hours.

Skywood CX203 12V/mains trnsstr gen cov rx, brand new in orig packing, £20. G3VZJ. Tel 01-877 8928.

Avo model 7 mk 2 with leads and manual £18 ono. G4IH, QTHR. Tel 0705 550954.

Ranger 2007, low band, £5; 240/110V 60W transfrmr 50p; G2DAF rx mk 2 £30; DX40 tx £15; HW30 Twoer £16; 5-el 2m beam £2.50; KW77 £75. GW3ACF, QTHR. Tel Briton Ferry 812475.

Eddystone EA12 £125; KW600 lin £75; Solartron cro, CD1400, £185; Philips cro, GM3125B, £5; Woden UM3, unused, £3; Class D wvmtr £3; Heathkit af analyser IM22 £25; Marconi wvmtr/sig gen, W1649, 140-250MHz, £5. G5CS, QTHR. Tel 01-398 1582.

Cowlgill type motor, psu and brand new dessyns, will turn towers, £16; precision smd, 1:1 and 110:1, backlash free, £2.70; screened low-noise B & A valveholder £1; pr 5B254Ms £1; QQVO6-40A £2.20. G8EQA, QTHR.

HRO rx, 9 coils, National psu, £15 ono. I. R. Butson, 60 Churnwood Road, Colchester, Essex. Tel 0206 89380 office, or 0206 79724 evng.

Heath SB101 plus SB600, SBA301-2, HP23B, £165; Labgear LG300, rf section plus hbpu, £18; Murphy Rover type 960, high band rx, needs attn, £5; Solartron scope cd 1012, dc to 30MHz, £50. G3RUD, QTHR. Tel Coleshill 62222.

Marconi TF953 a.m./fm sig gen, 21-160MHz, £25; trnsfrmr, 1,000-0-1,000V 500mA, £1; Radiospares 6V vbrtrs plus trnsfrmrs, 250V out, 50p pr. G3RUD, QTHR. Tel Coleshill 62222.

Unused 2/6 Yagi, 26m 75Ω UR57, £8; New 6CH6, EF183, ECC81, ECC82, 6146, KT88, £5; 1mA 1½ by 1½ panel mtr, new, £1.50. G3WGF, QTHR. Tel Hastings 7493.

Eddystone 640 with mtchng spkr and manual, wrks rsnbly well but reqs recon, ideal set for enthusiastic amateur, bargain, £15, carr extra or coll. G5FH, QTHR. Tel 0425-2 5974.

Avo multimtr model 8, mk 3, exc, £22 ono. **Wanted** h/brew trnsstr tx/rx and antique firearms. G3SEL, QTHR. Tel West Coker 2712.

TW2 /m tx £15; 40ft Telomast £15; vlve tape rcrdr £7; Garex mdltr (drives spkr), 3-20A, £8, all in fairly gd cond, buyer coll, G3TDP, QTHR. Tel 0227-87-201.

Codar CR70A and PR30RF prslctr, mint cond, £25, can be seen wrkng any time. Simpson, 2 Longmarch View, Sutton-at-Hone, Dartford, Kent DA4 9DY. Tel Farningham 862012.

Quad multiband aerial; Ham-M rttr; BC 221AK (modulated); Avo heavy duty model; Avo R/C mtr; "Air dux" balun, air-spaced; trnsstr gdo (hb). G2MF, QTHR. Tel Sheffield 360210.

Two 4X250Bs, set of combined bases and chinneys, ptfe, £10; trnsfrmrs: mains to 1,760-1,500-0-1,500-1,760V 0·6kVA continuous, believed Admiralty, £5; mains to 0-945-1,890V 0·4kVA, RCA, £3. G3YSH, QTHR.

J-Beam 4-el 4m aerial; Pye trnsstr Ranger 2007, low band, dash mntng, with ccts; Taylor valve tester with manuals; two mains PSUs, ex-equip, £10 the lot or offers. Buyer coll or pay carr. G3XFM, QTHR.

Var volt trnsfrmr, 0-260V 2·5A, panel mntng, also 300V ac vltmtr, £6 buyer coll or pay carr. G3XFM, QTHR.

2m mosfet cnvrtr, Microwave Modules dble cnvrsn, i.f. 4-6MHz, £12.50 ono. **Wanted** cct diag for 52-set. Colin Baker, 18 Collingtree, Luton, Beds LU2 8HN. Tel Luton 35806.

BAY96, new, £2.50; fm Bantam on 145·922MHz, rx tunable, as new, with new Ni-Cads, hndsts and hndbk, offers; TY2-125 £2. G3RNV, QTHR.

Pye Cambridge dash, with xtals, 145·8, 145·0, 144·94, 6-chann switch, £30 (or £25 less xtals); ex-Gov 2002 with 12V invrtr, mains psu £12.50. **Wanted** rotator with all cables. G8CEW, "Elmstead", 83 Barnham Road, Barnham, nr Bognor Regis. Tel Easter Gate 3879.

Heathkit HW17A 2m tx/rx, /m psu, £45; Bantex 2m ½ aerial £2.50. G3ZJF, QTHR. Tel Windsor 68364.

Hammarland Super pro, int psu, modified, £25; DL6SW 2m cnvrtr, 24-26MHz, £6; 42ft triang lattice tower, 2m beam etc, £25, buyer must coll. G8CZW, QTHR.

KW2000A with ac psu, exc cond, £140 ono or exch for KW77 with cash adjstmnt. P. Rollin, 152 Ollerton Road, Athersley North, Barnsley, Yorks. Tel Barnsley 89441 ext 24 (8am-5pm).

Electroniques front end gen cov vlve model £5; pair Celestion HF1300 mk 2 tweeters £9. G3AMF, QTHR. Tel 01-989 9224.

Tech TO-3 scope £20; scope CT52 in case £17.50. G3YMS, QTHR.

TV i.f. unit, trnsstr, £4; 19 by 21 by 10in enclosed racks £1.50; TS-174U, 20-280MHz freq mtr, reqs attn; vlves: 1625s, 807s, EL34s; 813 lin, incomplete; 5-el 2m £1.50; 10W trnsstr amp, OC28s, 8Ω o/p, £3. Nock, 4 Park Cresc, West Bromwich.

Trio TS510 with cw fltr, psu, extra vfo, offers over £140, buyer coll. 0926 53524. G3HDB, QTHR.

Labgear LG300 tx, gd cond, no mdltr, £10; ac PSUs, 1,000V, 600V, 300V, 150V, with fil wndngs, £5, buyer coll. G3FQP, QTHR. Tel 0742 301481.

KW1000 lin amp, new, 2 mnths out of factory, in orig box, £125. G3LBA, tel Cobham (Surrey) 2628.

High pwr boot mntng 10-chann Westminster, 25/30W out, extra contr box, all solid state, with xtals, 144·48, 145·0, big fm voice for /m or base, £50. G8CEW, "Elmstead", 83 Barnham Road, Barnham, near Bognor Regis. Tel Eastergate 3879.

FV401 £25; Diamond KB105 80-10m aerial £25; Admiralty hndbk wireless, vol 1/2, £1; 12V dc blower 50p; 220/110V transfrmr £1; Aveley trnsstr cnvrtr, 12V dc i/p, 425V 300mA and 235V 100mA o/p, £5. G3RFG, QTHR.

Eddystone 640 rx, vgc, orig S-mtr and spkr, £16.50 carr extra. G3VYN, QTHR. Tel Hempnall 423.

Zenith trnsfrmr, 6V 8·3A, rugged cnstrctn term blocks, £1; 0-270V ac 2·5A variac £2.50; DA41 (4), U19 (4), 6U5 (2), 5R4G (10), XG5-500 (2) 50p ea; 5Z4G (25), 6SN7 (12) 25p ea, carr extra. **Wanted** KW 52Ω dummy load with SO239 cnnctr. J. H. Lepper, 128 Sheephousehill, Fauldhouse, West Lothian EH47 9EL. Tel Fauldhouse 433 evngs.

Papertape reader, 20cps, as new, £20 ono; Lafayette KT340, needs realigning, £10; tape rcrdr, Philips EL3548, four track, £15 ono; spkrs, no magnet, use field coil as choke, £5 pr. R. Selby, 145 Bedfont Lane, Feltham, Middx.

Pye base tx/rx, tx on 2m, 3/20A pa, £18; new Parmeko chokes, 10H 150mA 60p; mains ¼hp motors £2; Pye 277948 mod trnsfrmrs 60p; dash Rangers tx on 2m £10 carr extra. G8FUI, QTHR.

Omega noise bridge, fitted Belling skts, virtually unused, £10.50; CR300 rx with inbuilt psu (inc VR150), hndbk, £15; Airmec sig gen CT212, 85kHz-32MHz, £26; Panda PR120V (4 new 807s) £20, buyers coll except bridge. Hattersley, Hill Top, Holymoorside, Chesterfield. Tel 6040 after 6pm.

IO-18U Heathkit scope £30 ono, or cnsdr exch for AR88D. D. Gill, 182 Longbanks, Harlow, Essex. Tel Harlow 26383 after 5.30pm.

Collins KWT-6 ssb tx/rx, 1·6-31·6MHz in 1kHz steps synthesized, continuous tuning, 500W o/p, final three 4CX350As, 19in rack-mntng, £350. G5AHK, QTHR. Tel 0344 20358.

Hygain, 18V, £6; Emupressor, little used, £4; 1·5/3MHz Command rx, no psu, £3; Sinclair 3000 amp and stereo tuner £50 ono. G3ZYN, QTHR.

Tandberg 3000X stereo tape rcrdr, case, £60 ono, as new. G8CLH, QTHR. Tel Littlehampton 6161 ext 55 daytime.

TW 70cm cnvrtr, 12-14MHz i.f., £12; "Record" pen rcrdr, 6 and 1in per hour, 500μA mvmnt, 240V ac 50Hz, with pen, £20, buyer coll or carr extra. G3XGK, QTHR. Tel Lowestoft 64160.

JR500SE with spkr, exc cond, £50; 2m cnvrtr to suit, brand new, £14, would cnsdr exch 2m tx/rx (Microwave Modules etc) or gd trnsstrzed tx/rx. G8ESK, QTHR. Tel Bradford 45611.

Heathkit DX40, VF-U1, mint, £25; Panda PR-120-V, 10-80m tx, mint, £40 ono, or exch either of above for EC10, 9R59D, or any sim gen cov rx; WS18 set also wanted. Mr P. Jenkins, 30 Gainsborough Road, North Finchley, London N12.

Pye 70·26MHz base tx/rx, 25W o/p, xtals, £20; Storno 4m fm base tx/rx £12; Hudson 4m fm /m £9; Storno 2m fm /m £18; buyers coll or may del by arrngmnt. G8AKA, QTHR. Tel Mortimer 332582.

Hygain TH3 mk 3 beam, zinc-sprayed, used 7 mnths, £45; Polyquad cast alum spiders, boom to mast bracket and manual, £5; Sentinel X cnvrtr, 28-30MHz i.f., £13. G3TLV, QTHR. Tel Middlewich 2449.

Yaesu FT200, as new. Hardly used, with psu, £130, Hy-gain 14AVQ vertical, unused, bargain, £20; Shure 444 mic, as new, £8, pref buyer coll, job lot £150. G4AFX, QTHR. Tel 46710.

Eddystone 680X 480kHz–30MHz rx, exc cond; well-built a.m. tx with monitor. Sell or exch for colour tv eqpmnt. G3NXD, QTHR. Tel 0562 850570.

Pye 2207 boot mount tx/rx 6-40 pa, with mic and contr unit, unmodded, easily cnvrtd to 4m, £8. G3ZTV, 7 Berkley Close, Hellesdon, Norwich, Norfolk NOR 61M. Tel Norwich 44602.

Probes for Bird Thruline model 43 wattmeter: 25W 25-60MHz, 10W 100-250MHz, 50W 100-250MHz, 5W 200-500MHz, 10W 200-500 MHz; sell or exch your unwanted probes, offers. G8APV, 27 Buchan Road, Nunhead, London SE15 3HQ. Tel 01-732 6918.

R1155, needs attn, psu, o/p stage, £3 carr extra; *Radio and TV Servicing*, 7 vols, 1949-1959, £5 carr extra; *RC*, Sept 1968—July 1973, offers; tv valves and mtrs. A. Defty, 119 Westmorland Rise, Peterlee, Co Durham. Tel 2062.

KW Viceroy ssb tx, recent KW overhaul, offers about £55, buyer coll. G3MCA, QTHR. Tel Orpington (Kent) 28790.

Codar prslctr £5; Garex 2m cnvtr, i.f. 28-30MHz, £5; Heath scope, 10-12U, factory-built, new tube, £22.50; Taylor R/C bridge type 110B £5; Eagle sig gen TE188 £7.50; pr 6146s, new, £2; 500V Record insul tester. G8US, QTHR.

12-core 1A cable, suit Ham-mate, brand new, 18p/yd; heavy 75Ω coax, unused, ⅜in od, 12p/yd, carr pd. Send reply coupon for samples. GD3TIU, QTHR. Tel Marown 442.

TE22 audio gen, sine/sq, £13; Heath RF1U sig gen, up to 200MHz, £13; Heath keyer model HD10, £15; Nombrex CR bridge, model 32, £8; TMK multitester, slight fault, £2.50, 30kΩ/V. G3ZQF, QTHR.

Lafayette HA600A rx, ssm, 2m, 28-30MHz cnvrtr, £45; Microwave Modules 5W a.m. tx, 5-chann, £30; Pye Vanguard FM25B, vgc, 90W i/p rx, unmodded, large mains psu, £35, all ono. G8FBL, QTHR. Tel Lichfield 3919.

Marconi Electra rx, psu, hndbk, mech bndsprd amateur bands exc performance, much advanced version of CR100, £22.50 buyer coll. Tel 01-648 5895.

KW Vanguard tx, 160–10m. 50W a.m./cw, int psu, fair wkg cond, £18 buyer coll. P. I. Martin, 41 Ottoline Drive, Troon, Ayrshire KA10 7AN. Tel 311245.

Heath HW12A £38; h/built dc psu £12. GW3WXA, QTHR. Tel Llandovery 330.

FT2FB, as new, £75; Spitfire 2m tx, unused, £25; Twomobile rx, reqs attn, £10; Philips stereo tape rcrdr, N4407, as new, cost £120, £70 ono. J. Elliott, 92 Hinckley Road, Barwell, Leics.

Yaesu FTdx560, immac, £150, no offers; Echo 8G 10–40m vertical, vgc, £14; B44 4m tx/rx, rx tunable, £5; S440B 2m a.m. tx £5; same 4m £5; mtching S441B mains psu £2. G6AU, QTHR. Tel 039-15 27818.

Eagle sig gen, 120kHz-260MHz, perfect, £6, or exch LCR bridge or why. *Wanted* AR88D in vgc, or R1967. Mr MacGregor, 166 Ellenborough Rd, Sidcup, Kent. Tel 874 6464 ext 678.

Codar AT5, T28, 12V psu, mains psu, mic, control box, £30; Minibeam vertical, tri-band, £18; G3HSC morse course, complete, £2.50. G4BHM, QTHR. Tel Leeds 664833.

G2DAF mk 2 rx, 2·4kHz mech filtr, 898 dial etc, grey stove-enam cab, £40 ono, pref buyer coll. G4AMI, QTHR. Tel 021-705 4337.

Pye Cambridge AM10BS, 12·5kHz, high-bnd, boot mounted, with contr eqpt, leads, vgc, £35. G3VAP, QTHR. Tel Denholme 479.

Garex Twomobile a.m. tx and rx, guar exc wkg order and cond, offers over £50. G4JJ, QTHR. Tel Barnsley 3704.

EC10 mk 2 £45; Codar AT5 tx, T28 rx, 12MS /m psu, 12/RC switching contr, £30. G3ZGT, QTHR.

2000B, ac psu; HT32A tx; HT-41 lin, inc trnsfrmr; SB301; HQ170; SX101 RXs; Universal Avometer; all mint; AR88D; Erskine scope type 13. Reply coupon for long list comps, rsnble offers to estate late GD3ENK. Tel Marown 442 (std 062-485).

Heathkit IO-18U scope, mint cond, also h/brew trace-doubler for above, built to Heath cct, £30 ono the lot. G8BDM, QTHR. Tel Bristol 681285 evngs.

DC6HL 2m a.m. tx/rx kit, a.m., lsb, usb, cw, complete as supplied by *VHF Comms*, no time to put together, £70 ono. *Wanted* Collins mech fltr F455 Y21. G4BCQ, QTHR. Tel Worksop 770340 after 7pm.

Trnsfrmrs, chokes, mdltn trnsfrmrs, metal rects, caps, valves, spkrs, mics, coils, mtrs, components, w/w resistors, metal cabs. PSUs, amps, h/built test gear, partly-built eqpt, books, etc, your offers. G3DFS, QTHR.

30ft steel latt tower, 5ft sq base, 1ft sq top, dismantled, £15 ono. G3WXS, QTHR. Tel Andoversford 439 (Glos).

NCX3, ac psu, vgc, h/duty step-down trnsfrmr, handbk, Shure 201 mic, £80. S. McKaig, c/o Marine Office, British Rail, Heysham, Lancs.

AM10D tx/rx, 145·8MHz, complete, £30 ono; freq mtr, TS174-U, ac psu, charts, 20-250MHz, £30 ono, buyer coll. G8ESY/G4BXD, QTHR.

Trio TR2200 2m fm hand /p tx/rx, as new, standard channs, £45; Trio JR500S, with SP5D, exc cond, £45, both ono. *Wanted* IC700R details pse. Price, Sherwood House, Brimpsfield, Glos.

KW1000 lin £85. *Wanted* Collins KWM-2; Heath SB220, must be in first class cond. G3XVF/QTHR. Tel Norwich 56782.

AR88D rx, fair cond, few mods, £20 pref buyer coll. G8HGQ, 60 St Mary's Cresc, Ruddington, Notts.

Complete clearance: KW2000 with both PSUs; Heathkit Pawnee HW-20 2m tx/rx; 3FIF and Hustler /m aerials; Class D wvmtr; McElroy bug; Z-match; Bendix reflectometer; keys; mics; sundries; complete stn £220 ono, buyer coll. C. L. Fenton, Rustington Post Office. Tel Rustington 3369.

Yaesu FT2F 2m 12-chann fm tx/rx, 8 sets xtals, repeater toneburst, am/fm switching, optional handset, works GB3PI fb from Wares, £90 ono. G2AFD, QTHR. Tel 05845 3242.

VHF TX/RXs: Pye 25W 70·26MHz base, xtalled, £22; Storno 15W 70·48MHz fm base, xtalled, £20; Hudson FM208, unmodded, low band, £9; Viscount 2m fm /m £20; BC221 with ac psu, charts, £15 buyer coll. G8AKA, QTHR. Tel Mortimer 332582.

AR88D, S-mtr, handbk, spkr, valves, going vhf /p, buyer coll. Tel Cambridge 51386 (office) or 59540 (home).

Hy-Gain 12AVQ vertical, 10-15-20, with radials, £10 inc p & p. G3PLL, QTHR. Tel Cottesmore 513.

Pye AM10D Cambridge, clean cond, on 2m, with xtal for 145MHz but not tunable, £25. G3WHL, QTHR.

CR100 with mtr, x-cal, int spkr, stblzer, with manuals, £18; 62H (1392) rx, tunable over 2m, built-in psu, £8; Taylor 45A valve tester with handbk £2. Gordon, 5 French Weir Ave, Taunton, Somerset. Tel Taunton 87406.

7B teleprinter, prof adjusted, proper cover, DL6EQ tu with tuning indicator, Ranger tx sections, "hi & lo" xtal calib number 10, xtals for 2m, 8, 24, 48, 5MHz, 100kHz, sae pse, all offers or exch. G4ADE, 5 Oxford Close, Gomersal, Cleckheaton. Tel 0274 24258 day.

FL50B £4; B & W 2Q4 £2; National MB-405L tuner £5; G4/105, xtals, dial, £5; following £1 ea; 100TH plus base, Collins *Amateur SSB*, ARRL 43rd, Radio 16th, PTC2007, pr 803 skts, Ch48 plus Ch49 (3 ea), carr extra. G3HCV, QTHR.

Trio TS510D tx/rx with psu, new cond, orig packing inc cw fltr, £145; FL1000 1in £60. G3UCE, QTHR. Tel 0542 51760 evngs.

Clearance: SX111 £45; cowlgill and prop pitch motors, many other items, list available, 50-mile rad. G3AAM, QTHR. Tel 021-422 4113.

KW2000A, 6146Bs in final, KW ancillary eqpt; BC221, sig gen, aerials, fair prices, sae for full details. G3WXT, QTHR.

DX100U, 160-10m tx, £35; SB10U ssb adaptor £20, both exc cond. G3YJV, QTHR. Tel Bourne End (Bucks) 21606.

Trio JR310 £55; Pye a.m. base stn in 3 units; PTC3004V rx, PTC-354V tx, 60W and psu, offers, many small components, sae list. D. Branston, Colevalley Road, Birmingham B28 0DD.

Magazines: *SWM* March '69 to Dec '72 £1 per vol; *RC* March '69 to June '73 £1 pr vol; *Ham Radio* March '70 to Dec '72 75p per vol; *WW* Oct '71 to April '73 £1. S. Whitehead, Roundhill Street, Brighton Sussex.

QTH, Derbyshire village 700ft asl, overlooking valley, mod det 2-bed bung, full gas ch, prepared gdns front and rear, ample grge space, many extras, midway between Derby and Ashbourne, £9,500. G8EBM, 31 Ellesmere Road, West Bridgford, Notts. Tel Nottm 23-1933.

Ten-Tec PM2B plus tuner £32; Yaesu FL50B £60; Yaesu FR50B £60; Heath SB610 £40; Heath HM102 £12, all ono. G3ENB, QTHR. Tel 0723 65093.

Avo Minor mk 4 £9; Heathkit IM-58 (kit) distortion mtr £20; switch S-3U £12. C. Ellis, 9 The Sheraton, St Marks Hill, Surbiton. Tel 01-399 9807.

Pye Cambridge modified 2m, var tuning on rx, £30. Tel 01-644 2687 after 6.30pm. G8CKH, QTHR. Tel 01-644 2687.

KW Vanguard, 10-160m, hndbk, concours cond, will del 100 miles, first offer over £20 secures. G. R. Wooster, 123 Knights Road, Hoo, Rochester, Kent. Tel Medway 251219.

Murphy r/t, ex G3BA, tunable rx, £18; Pye Cambridge cnvrtd 2m, 4 tx xtals, 1 rx xtal, £25, carr extra or buyer coll. G8BBA, QTHR.

HW100 plus HP23A psu, both in mint cond, £120, pref buyer coll or will del up to 50 miles. G3VQL, QTHR. Tel Shrewsbury 51733.

Panda Cub tx, 160-10m, gd cond, best £15 +; TC56 rx, 1·5-12MHz, manual, best £10+; Cossor dbl beam scope 1049, manual, old tub works well, best £10+; buyers arr coll. A. B. Dixon, 37 Belle Vue Cresc, Llandaffnorth, Cardiff.

FT241 xtals, suit h/brew fltrs, 451·85kHz and many others, 20p ea, sae list. G3XZK, QTHR.

AT5, ac psu, /m contr unit, £23; T28 rx £7. G3III, QTHR. Tel 0608 61882.

Property late G3WCI: FTdx150, exc cond, £120; 10-el J Beam £5 with cable; Marconi TF1445 sig gen £12; Pye boot mount Vanguard, modified 2m, complete, £20, buyers coll or phone G3PHO (Sheffield 306956) re carr.

DX40U, VF1U, £20; BC348 with mains psu and trnsstrzd af, £15; both for £30 ono, can del Manchester or B'ham areas. Cnsdr exch for 2m /m tx/rx, h/brew acceptable. G3XVN, QTHR. Tel Crewe 68483 evngs.

Hy-Gain 20-40 beam, perf; G3BXI 3-sect 50ft tower; two Strumech 2-sect 40ft towers; Yaesu FL2000B lin, as new; Yaesu FT2FB tx/rx; FP2 psu. Rsnble offers pse. G3RDW, QTHR. Tel 021-353 7427.

Emigration sale: must sell new freq counter parts, 14 × 7490s, 9 × 7475s, 8 × 7441s, 8 × dig tubes with bases, £25.50; used/tested ICs—7400 10p, 7490 45p, 7473 25p, 7440 10p, 7428 45p, p & p 10p, sae list, ring for details. Alan Hackett, 3 Dennington Drive, Davyhulme, Manchester M31 2EA. Tel 061-748 2592.

Sphinx tx and Delta control, ssb/a.m., 20, 80, 160m, £40. Tel 021-353 2620.

Eddystone EC10 mk 2, with Microwave Modules 2m cnvrtr and h/brew psu, £68 inc Securicor del; rx, 1 year old with orig box and instrctns, G3BNI, QTHR. Tel 07937 62703.

Creed 54R pageprinter, 7PN4 perforator, gd cond, also 3x wkg stacks of paper, A61-120W tube, timebases and trnsfrmr psu, ideal cctv, 1 year old, offers. *Wanted* hb fm Westminster or parts. G8BGC, 2 Cottington Close, Kingsclere, Newbury, Berks. Tel Kingsclere 298871.

TC7 mk 2, 28-30MHz, as new, £35; Telford 144MHz cnvtr £9; J Beam square halo £1.50; G3PRX 144MHz cnvrtr £5, all vgc. G4LA, QTHR. Tel Hexham 2734.

Fantavox HE-50 rx, 0·5-30MHz, much modified, £8; Codar RQ10X Q-mult, int psu, £5; xtal-contr 20m covrtr, i.f. 2-2·45MHz, £3; 19 set, mk 3, rx wkg, £3 buyer coll. G8EQX, QTHR. Tel 01-904 8191.

Used valves: QQV03-10 25p, 5B255M 20p, 5B257M, ECC88, 6AM4, 807, 12E1, 6V6, 6X4, 4074A, EL84, EC91, all 15p ea plus p & p. Many more inc older types, sae lists. G8DJE, QTHR.

Band edge and clbrtr xtals, 1, 1·75, 2, 5, 10MHz; 9MHz McCoy with carrier xtals; TS56-AP slotted line; 600/600 400mA oil-filled trnsfrmr; valve v/mtr; uhf valves, sae req'mnts. G2CPM, 10 Wyndham Road, Newbury, Berks. Tel Newbury 464.

Codar Q-mult £5; Eagle rx £2.50. *Wanted* AR88 case, Heath Mohican or Grundig 600, faulty cnsdrd. M. B. Worvill, 40 The Leys, Chipping Norton, Oxon. Tel 2724.

DX100U, immac, recent £30 service, new 6146s, £40 ono; Murphy base stn, 821, tx on 2m, rx wkg, unmodified, cct, mic, £11; BCC low band base stn £5; 832s 75p ea; BC221, charts, int mains psu, £18, sae list other gear & comps. S. Marsh, 8 Cerise Road, Peckham SE15 5HQ. Tel 01-732 0668.

STC 28-LRU-457D 70cm pa with 4X150A, £20; Newnes *Practical Electrical Engineering*, 5 vols plus charts and supplement, £10; *Gas and Arc Welding*, 3 vols plus charts, £5 buyers coll. G8AFA, QTHR.

VHF sig gen, as new, continuous 95-161MHz, scale length 24ft, attenuator, sine/sq mdltn, cct diag, cables, coaxial plugs, no psu, sim size/weight/quality AR88 rx, £25. G3XER, QTHR. Tel Leeds 658568.

AR77E rx, 500kHz-30MHz, recently aligned, hndbk, 12V dc psu, £20. G3LXN, QTHR. Tel Plumtree 3935.

B40A rx, complete, manual number BR1617, vgc, £17; Joymatch SM atu, receive only, £4; 32 *PW* and *PE* mags in mint cond, recent issues, £3.50. Tel 051-220 5470 after 6pm.

KW202, vgc, little used, £100, or exch for Eddystone 940 or sim. G3OQT, QTHR. Tel Medway 361567.

Trio JR310 with top band and ssb cw filters £65. G4ASE, QTHR. Tel Nether Broughton 508.

KW Viceroy mk 1, ssb tx, 180W p.e.p., 10-80m, hndbk, £35 ono. G3QUB, QTHR. Tel Macclesfield 25910.

Mullard TY4-400 (1), 5867 (2), English Electric equiv, new, £5 ea, listed £29, suit grounded grid lin, 1·3kW at 100MHz; new valve holder £1, used 25p, lot £15; mtchng heater trnsfrmr available. J. H. Lepper, 128 Sheephousehill, Fauldhouse, West Lothian EH47 9EL. Tel Fauldhouse 433.

JR500SE, xtal fltr, stable vfo, £45; BC221, mains psu, £15. GM8BOV, QTHR. Tel Bathgate 54025.

30ft Heathkit tower, needs new bolts, buyer coll, offers. G3FKM, QTHR. Tel 021-429 3200.

Coastal Radio "Curlew-350", 1·6-4·0MHz 24V dc supply, solid state rx tunes mw/lw/rt bands, with df on lw; 6-chann tx, 60W, pa/mod 6146s, ptt mic, handbk etc, offers over £60. G3JMJ, QTHR. Tel 073-271 3467.

2m 40W a.m. tx £25. Colin Baker, 18 Collingtree, Luton, Beds LU2 8HN. Tel Luton 35306.

IC700R rx £45; Trio 9R59DE rx, gd cond, £30; pair 813s with bases, new, £3 ono for all items. G3ZBY, QTHR.

National NCX5 mk 2 £160; KW77 £70; LA600 lin amp £35; 160m a.m. tx £10; Garrard tape rcrdr £5; much more gd stuff. G3UBI, QTHR. Tel Calder Valley 3166.

500μA mtrs £1.50, others sae list; S20R, 0·55-44MHz, spkr, bandsprd, realigned, £15 plus carr; audio osc, 12 tones, attenuator, separate superb level mtr, —50 to +20dBm, £12 pr; 7B/N3 teleprinter less type unit £3 buyer coll. G8HEV, Dolphin Cottage, Mounts Lane, Newnham, Daventry NN11 6ES. Tel Daventry 3954.

BC221, mains powered, as new, unwanted gift, £15; RCA vfo/xtal driver, 5W o/p, mains powered, 12ft scale length for 500kHz up to 7MHz, hndbk, £12, callers only; X/Wmtr 50p; BC103 6p. G3JGF, QTHR. Tel Bookham 56544.

Closing down sale: Heath SB101, SB600, spkr, psu, ptt mix, cw fltr, £145; Moseley RV4 trap vertical, feeder, £7; the G3SWH/MM rig, buyer coll or carr extra. G3SWH, QTHR. Tel Yatton 832733.

Dishes: 2ft dia, foil lined, fibreglass, ideal 3cm, f/d ratio 0·48, suit horn feed, offers pse, coll or carr extra. A. Cox, Lower Park, The Walls, Mistley, Essex. Tel Manningtree 2621.

Heath HW7, little used, with calibrator and addit af amp, complete /p stn, £30. *Wanted* KW160 or sim, wld cnsdr pt exch, also Muirhead slow-motion drive. G3PJT, QTHR. Tel Comberton 3137.

RF amp £1; osc amp £1; a.m./fm demodltr £1; af amp £1; 20MHz i.f. amp £2; 45MHz i.f. amp £2; all plus postage, all miniature units. R. Hayward, "Sunnyfields", Lighthouse Road, St Margarets Bay, Dover.

B29, lf version CR100, wkg, £4; 4X150 base £3; 70·26MHz rack-mntng rx £3; several HC-6U and HC-18U xtals from 10p. *Wanted* AR88 or sim rx. Tel 01-452 6724, or call at 138 Dollis Hill Lane, NW2.

Nixie tubes: miniature type 1in high, 1in end viewing, 2 sets of 4, both types, 60p ea. G3WXZ, QTHR. Tel Needham Market (Suffolk) 720422.

Heathkit DX100U tx and manual, vgc, fitted QST time-sequence keyer £24; immac GKD "Chiltern" hi-fi equipment cab for amp, tuner, tape-deck, gram-deck, record storage, teak finish, £24 will, haggle. G3BRQ, QTHR. Tel Fleet (Hants) 6588.

WANTED

Missed June issue, so HRO wanted with bs coils and psu. Brian Armistead, 45 Swanston Gardens, Fairmilehead, Edinburgh 10. Tel 031-445 1343.
R107 rx in wkg cond, with psu if poss, state price and cond. C. Jones, 45 Currock Park Ave, Carlisle CA2 4DJ.
Loaded whip /m aerial for 160/80, with base mount, also dc psu for KW2000A. G3ZVU, QTHR. Tel Oxted (Surrey) 4277.
CCT diag for 1154 tx and any info to put this set on the air. G3KER, The Ship, 47 High Street, Croydon CR0 1QD. Tel 01-688 2878.
TX/RX with psu, covering 80-10m, price and partics to G3VFG, QTHR. Tel Leeds 57692.
National dolls for collection, 6in or 12cm tall, no European, exch British or RSGB books (new), all replies answered. G3OKA, QTHR.
HW12A and psu, must be mint, pref factory-built model, will cnsdr h/built, details to GW3TMP, QTHR.
Dial drive for R1155, complete assy reqd, inc glass, escutcheon, knob etc, also cct of associated indicator unit. John Howe, 5 Central Drive, Westhoughton, Lancs. Tel Westhoughton 3652.
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Manual for CR100/2 to buy or borrow. G3SWP, QTHR.
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TA33 jnr Mosley beam; AR22R rotator; all offers acknowledged. Mr A. K. Whatmore, Hollybank, Sellicks Green, Blagdon Hill, Taunton, Somerset. Tel Blagdon Hill 253.
DL-QTC No 4 1971, or copy of article by DJ7IC in this issue, on Plessey ic rx. J. E. Hughes, 37 Priory Gardens, Usk, Mon NP5 1BB. Tel Usk 2129.
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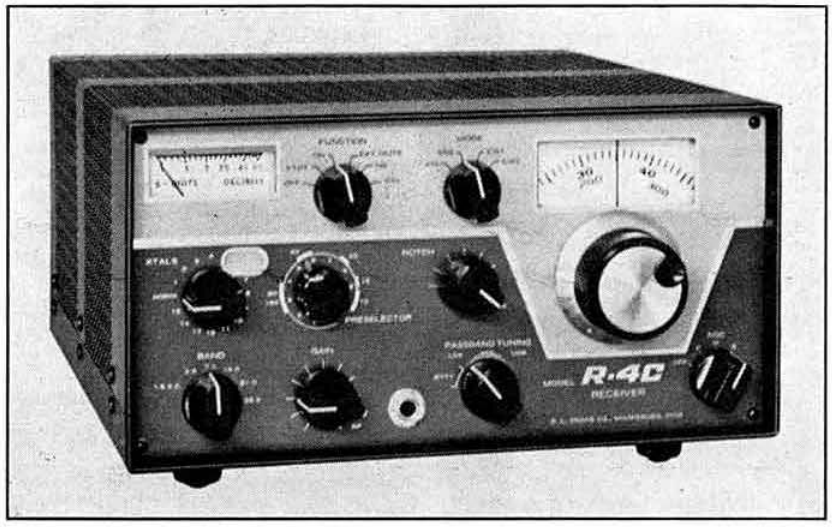

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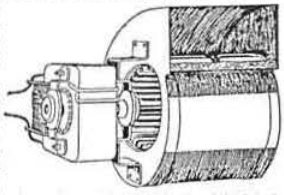

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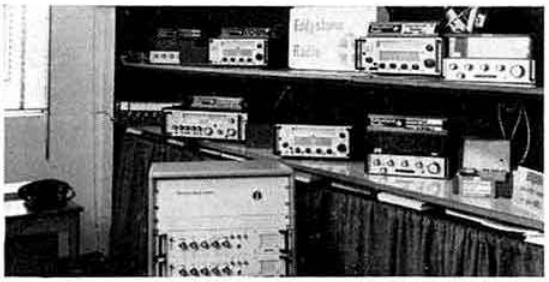

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