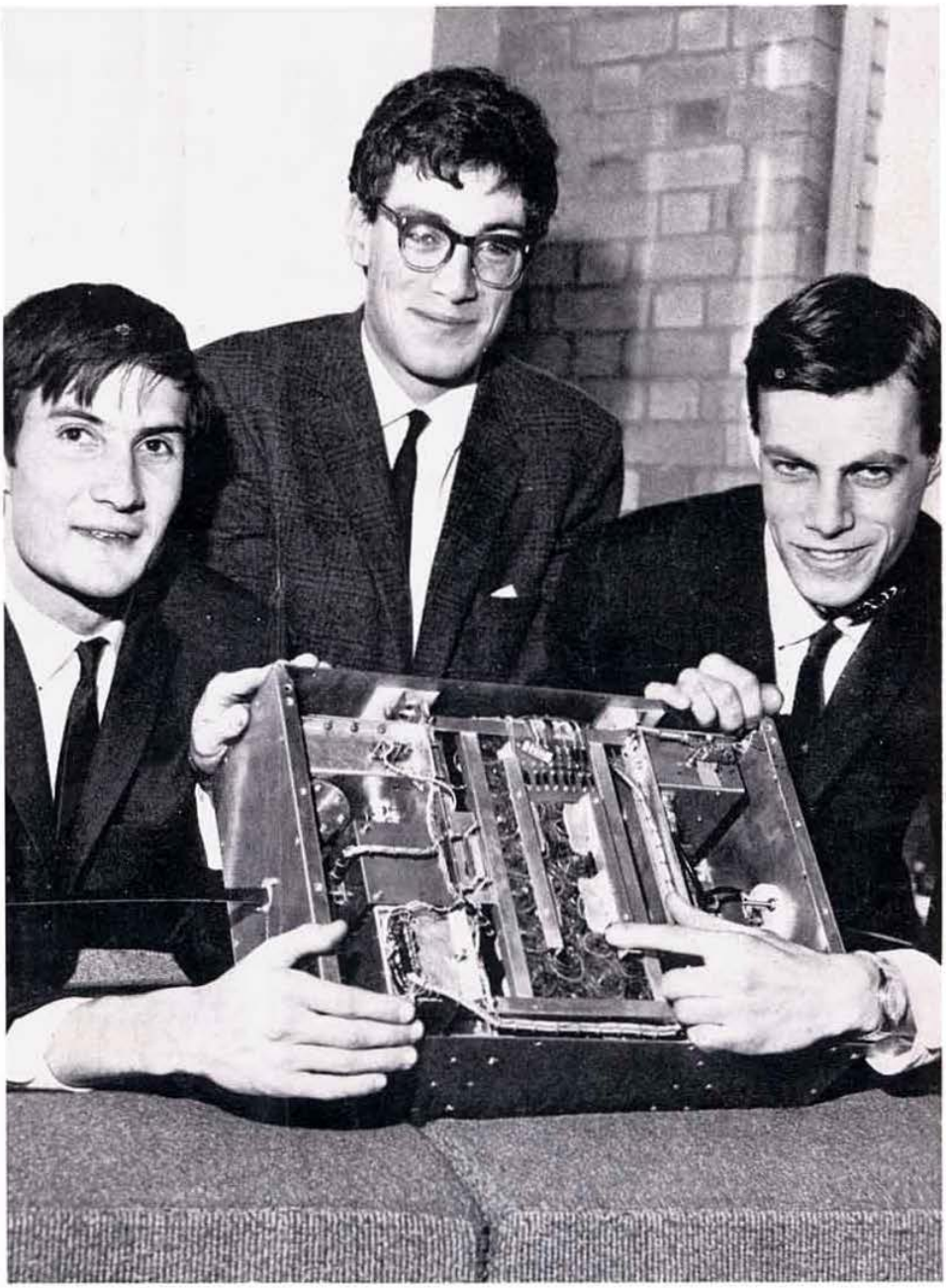
DECEMBER 1969

RADIO COMMUNICATION



THE AUSTRALIS-OSCAR FLIGHT PACKAGE

Journal of the Radio Society of Great Britain

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plus the usual KW Quality and Reliability

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KW ELECTRONICS LIMITED

Write for illustrated detailed specifications on other KW Equipment including the KW 2000B; KW Vespa Mark II; KW 201; KW 1000 and our list of KW Tested Trade-ins.

K. W. ELECTRONICS LIMITED
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RADIO COMMUNICATION

Incorporating RSGB Bulletin

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Closing date for contributions, unless otherwise notified: 7th of month preceding month of publication

Advertising, other than Members' Ads, should be addressed to:
Mrs P. D. Harvey,
Sawell & Sons Ltd,
4 Ludgate Circus,
London EC4.
FLE 4353

RADIO COMMUNICATION (INCORPORATING THE RSGB BULLETIN) IS PUBLISHED BY THE RADIO SOCIETY OF GREAT BRITAIN AS ITS OFFICIAL JOURNAL AND POSTED TO ALL MEMBERS ON THE FIRST TUESDAY IN EACH MONTH

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PRICE 4s.

FRONT COVER: The Australis-Oscar flight package in the hands of Owen Mace, Richard Tonkin and Paul Dunn. This photograph was taken the day before the package was taken to Project Oscar in San Francisco. *Photo:* The Age, *Melbourne.*

Due to pressure on space in this issue, the index to Volume 45 will appear in the next issue.

DECEMBER 1969
VOLUME 45 No. 12

Our Best Wishes To All For The Coming Season

LOWE ELECTRONICS

Wellington Street	**4 Southwark St.**	**38 Huckford Rd.**	**19 Ellismuir Rd.**
Matlock	**Southwick**	**Winterbourne**	**Baillieston**
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Matlock 2817 2430 after 6	**Southwick 4887**	**Winterbourne 3086**	**no phone yet**
Bill G3UBO	**Alan G3MME**	**Vic G3CHW**	**Sim GM3SAN**

Once again, Lowe Electronics spreads a bit more—my voracious appetite for the seven-sided stuff knows no bounds. All is, as they say, grist to the mill or something. Anyway, in order to stuff even more loot into the bulging till, we now have a Scottish rep., Sim Weir, GM3SAN, 19 Ellismuir Road, Baillieston Near Glesca (Sassenachs pay no regard—carry on eating your jeely piece.) is the boy to go and see. He will show you Sommerkamp and Inoue gear and persuade you to part with your money with his blether. But just let me issue one solemn word of warning to you—we will remain to be known as Lowe Electronics and any attempts to alter the name of this sober and upright business emporium to "Oor Wullie" will be frowned upon nae bother.

Enow o' this blether—to flog or not to flog, that is the question. Here's a few nice bits and bats for Christmas presents:

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MORSE KEYS: The ordinary plain brass type I've been flogging for years **18/6.**

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MEDCO LP FILTERS 50 ohm **£5,** 75 ohm **£4.10.** New HP filters **27/6.**

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LUSTRAPHONE PTT MIKES: A limited number of these top quality dynamic mikes. Normally around the £8 mark and perfect for the Tx's I flog. **£4.** In the second-hand line, we have a pretty good selection and to give you just a taste of blood:

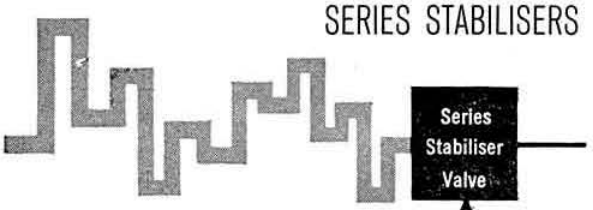
EA12 £130; HQ170 £70; 770R £80; HA350 £55; 75SI £170; 680X £45; FR100B £90; HRO, psu, BS coils £25; RA1 £30. Apache, £50; Panda Cub £25; HT41 linear £60; Green and Davis PGLA1 linear £60. DX100U £45; TRIO 388s nice exciter, gift £60; FT100 mint £140; KW2000 £135; KW2000A £175; 2000A dc psu new £40; complete Inoue demo. £160; Anglia 1200W pep Big Daddy with a PAIR of 4CX250B's £230; National 200 new £145; Paros 3 bander £100. HW12A £40.

The above are a selection of our stock and are all in the sort of condition that makes me happy to sell them. If you want the best in new stuff or a piece of gear second-hand which has been thoroughly checked, drop me a line.

73 de Bill, VE8DP/G3UBO

M-O V

MANUFACTURE A WIDE RANGE OF TRIODE & TETRODE SERIES STABILISERS



TRIODES	TETRODES
A1834	A2134
A2293	KT66
6AS7G	KT88
6080	12E1

G.E.C.

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KW 201 Rx £111
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TRIO 9R59DE ...142 10s.
TRIO JR500SE Rx ...£69 10s.
TRIO JR310 ... ...£77 10s.

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We take the opportunity of wishing you all
A Very Happy Christmas and a Prosperous New Year.
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DRAKE T-4XB Transmitter—SSB	250	0	0
DRAKE TR-4 Transceiver—SSB	315	0	0
DRAKE L-4B Linear Amplifier	415	0	0
DRAKE MN-2000 2000 watts Antenna Match Network	105	0	0
DRAKE MN-4 Antenna Match Network for 2-NT, T-4XB, TR-4	55	0	0
DRAKE 2-NT Transmitter—CW	75	0	0
SWAN 350C Transceiver & PS/Speaker	295	0	0
SWAN 500C Transceiver & PS/Speaker	369	0	0
SWAN 260 Cygnet Transceiver	225	0	0
TRIO JR500SE Receiver—Amateur Bands	69	10	0
TRIO 9R59DE Receiver—General Coverage	42	10	0
TRIO TS-510 SSB Transceiver & Power Supply	212	0	0
TRIO VFO-5D Remote VFO	32	0	0
TRIO JR 310 Amateur Bands Receiver	77	10	0
KW ATLANTA Transceiver with AC PSU	250	0	0
KW2000B Transceiver with AC PSU	240	0	0
KW 2000B DC Power Supply Unit	42	0	0
KW 1000 Linear	135	0	0
KW VESPA Mk II Transmitter with AC PSU	135	0	0
KW 201 Receiver	105	0	0
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KW E-Z Match 10-80m Aerial Tuning Unit	12	10	0
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KW Balun 1 : 1 Ratio. Dual Impedance 52/75ohms	1	16	6
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12 AVQ 3 Band Vertical	16	10	0
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TH3MK3 Tri-Band Beam	67	10	0
TH3JR Jinior Tri-Band Beam	41	0	0
SHURE microphones. 444	12	15	0
201	5	12	6
202	6	0	0
Used Equipment			
HAMMARLUND HQ 110 Amateur Bands Rx (10, 15, 20, 40, 80, 160m)	65	0	0
HAMMARLUND SP600JX—General Coverage Receiver	100	0	0
HEATHKIT RA-1 Amateur Bands Receiver	30	0	0
HEATHKIT 10-10 DC Coupled Oscilloscope	45	0	0
HEATHKIT 0-12U 5in Laboratory Oscilloscope	25	0	0
TRIO 9R59DE General Coverage Receiver. As new	35	0	0
MURPHY Type 55 TV Pattern Generator. 405/625	45	0	0
HARTLEY CT 436 Dual Trace Oscilloscope	85	0	0
SOLARTRONM VM 1484 RMS Voltmeter. Current Model. As new	95	0	0
CROMPTON PARKINSON Wattmeters	10	10	0
EDDYSTONE EA-12 Receiver	125	0	0
KW 2000B Transceiver with AC PSU. As new	200	0	0
SWAN 500 Transceiver & PS/Speaker. As new	265	0	0
RACAL RA-17 General Coverage Receiver	250	0	0
RACAL Universal Counter/Timer 0-100 MHz	375	0	0
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ECHO R216 VHF Receiver	95	0	0

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SPECIFICATIONS OF JR-310

* FREQUENCY RANGE: 3.5-29.7MHz (7 Bands)
* SENSITIVITY: 1μV (at 10dB S/N)
* IMAGE RATIO: More than 50dB
* FREQUENCY STABILITY: ± 2KHz in 1–60min. after switching on, subsequently within 100Hz per 30min.
* Dimensions: 13"(W), 7-3/32"(H), 12-3/16"(D).

Model SP-5D
COMMUNICATION SPEAKER

* Communications Speaker which has been designed for use with the 9R-59DE. * Dimensions: 3-9/16"(W), 7-1/8"(H), 5-3/16"(D).

Model 9R-59DE
BUILT IN MECHANICAL FILTER 8 TUBES COMMUNICATION RECEIVER

* A mechanical filter enabling superb selectivity with ordinary IF transformers. * Frequency Range: 550KHz to 30MHz (4 Bands) * Sensitivity: 2μV for 10dB S/N Ratio (at 10MHz) * Selectivity: ±5KHz at −60dB (±1.3KHz at −6dB) When using the Mechanical Filter * Dimensions: Width 15", Height 7", Depth 10".

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TRIO

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ADDRESS:

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Send for HANDBOOK/CATALOGUE containing full details and prices Antenna and technical information, 2/6 refundable on purchase of an Antenna.

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V-3 Jr.

Telephone: Costessy 2861. **order only**

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AMATEUR ELECTRONICS G3FIK

TRIO COMMUNICATIONS EQUIPMENT. We are now able to offer from stock the new TRIO JR-310 Amateur Band Receiver which has been introduced to supplement the existing range. The well-known 9R-59DE general coverage and JR-500SE Amateur Band receivers are, of course, in use in large numbers in this country and it would be perfectly true to say that at the present time there are no other receivers of British manufacture or otherwise which can compare from a point of view of value for money. Needless to say both of these will remain in the range but the object in the introduction of the JR-310 is to offer a receiver with extra facilities, some of which are incorporated and some of which are available as optional extras. The coverage of the JR-310 embraces 10 through 80 metres, 10 being covered in three segments, and in addition to WWV there is provision on the bandswitch for an extra band, details of coils and xtals for this being given in the handbook. Contrary to the impression formed by some customers the 6 metre band is not included this appearing only on the original version. Optional selectivity is also incorporated but for fuller details we shall be pleased to forward literature by return. As with all other TRIO equipment a twelve months guarantee is offered backed by a first class after-sales service.

TRIO JR-310 AMATEUR BAND RECEIVER	**£77.10.0**
TRIO JR-500 AMATEUR BAND RECEIVER	**£69.10.0**
TRIO 9R-59DE GENERAL COVERAGE RECEIVER	**£42.10.0**
TRIO HS-4 LIGHTWEIGHT HEADSET	**£5.19.6**
TRIO SP-5D MATCHING SPEAKER UNIT	**£4.7.6**
TRIO TS-510 TRANSCEIVER	**£212.0.0**
TRIO VFO-5D VFO UNIT	**£32.0.0**

Please note: all the above prices are nett and do not include carriage.

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MEDCO LOW PASS FILTERS. We very much regret the inconvenience caused through our inability to meet orders for these but as our advertisement appeared last month advertising these from stock Messrs MEDCO ran into serious difficulty maintaining supplies of components with the result that they in turn were unable to complete our orders. However, by the time this appears we hope that there will be an all round improvement in the position. Please note, however, that we are able to offer from stock the new **MEDCO HIGH PASS FILTERS** which are priced at 30/- carriage paid and which have a specification which should make them very effective in cases of TVI.

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LESON TABLE STANDING MICROPHONES. A high quality instrument incorporating transistorized pre-amplifier with gain control. Bar type PTT switch. **£8.5.0**

USED TRIO JR-500SE and **9R-59DE RECEIVERS.** At the time of going to press we have several of these coming in but at the moment are unable to provide prices. However these are expected to fall between two-thirds and three-quarters of the new price and all receivers offered will be in absolutely first class and near new condition. Further details upon request with pleasure.

AR88 RECEIVERS. We have a requirement for AR88D and AR88LF receivers in used or new condition and should be pleased to learn if you have a set for disposal. When writing be sure to indicate condition and the price required.

Unfortunately, space does not permit the listing of our current stock of used equipment this month but details of this gladly upon request.

Adequate S.A.E.'s gentlemen please. Full Hire Purchase facilities. Excellent parking for the caller.

Dept. B,

AMATEUR ELECTRONICS, 518-520 ALUM ROCK ROAD, ALUM ROCK, BIRMINGHAM 8. **Telephone: 021-327 1497**

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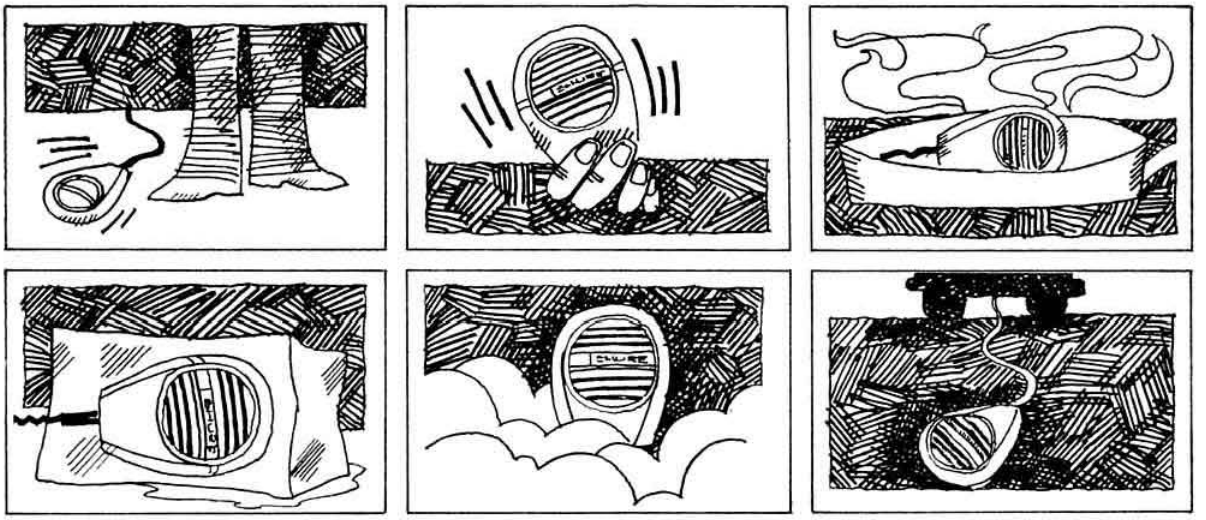

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Region 2.—North Eastern	K. Sketheway, BRS20185, 51 Baret Road,Walkergate, Newcastle upon Tyne.
Region 3.—West Midlands	R. W. Fisher, G3PWJ, 47 Elmshurst Drive, Kingswinford, Brierley Hill, Staffs.
Region 4.—East Midlands.	T. Darn, G3FGY, " Sandham Lodge " Sandham Lane, Ripley, Derbyshire.
Region 5.—Eastern.	S. J. Granfield, G5BQ, St Lukes, 47 Warren Road, Cambridge.
Region 6.—South Central	L. W. Lewis, G8ML, 34 Cleevelands Avenue, Cheltenham, Glos.
Region 7.—London	P. A. Thorogood, G4KD, 35 Gibbs Green, Edgware, Middlesex.
Region 8.—South Eastern	D. N. T. Williams, G3MDO, Seletar, New House Lane, Thanington, Canterbury, Kent.
Region 9.—South Western.	J. Thorn, G3PQE, Jessamine House, Chapel Allerton, Axbridge, Somerset.
Region 10.—South Wales.	C. H. Parsons, GW8NP, 90 Maesycoed Road, Heath, Cardiff, Glam.
Region 11.—North Wales.	M. Williams, GW3LCQ, "Dwyros," 12 Penrhos Avenue West, Llandudno Junction, Caerns.
Region 12.—North-East Scotland.	A. W. Smith, GM3AEL, 1 Sclattie Place, Bankhead, Bucksburn, Aberdeenshire.
Region 13.—South-East Scotland.	V. W. Stewart, GM3OWU, 9 Juniper Avenue, Juniper Green, Midlothian, EH14 5EG.
Region 14.—West Scotland.	N. G. Cox, GM3MUY, 191 Maxwell Avenue, Westerton, Bearsden, Glasgow.
Region 15.—Northern Ireland.	J. Thompson, GI3ILV, "Albany," Newry Road, Armagh, N. Ireland.
Region 16.—East Anglia.	W. J. Green, G3FBA, Meadway, Links Avenue, Brundall, Norwich, Norfolk, NOR 86Z.
Region 17.—Southern.	C. Sharpe, G2HIF, 20 Harcourt Road, Wantage, Berks.

CERTIFICATES MANAGER (HF)	C. R. Emary, G5GH, c/o RSGB HQ.
CERTIFICATES MANAGER (VHF)	F. E. A. Green, G3GMY, 48 Borough Way, Potters Bar, Herts.
INTRUDER WATCH ORGANIZER	C. J. Thomas, GW3PSM, 59 Maendy Way, Cwmbran, Monmouthshire. NP4 1HW.
PUBLIC RELATIONS OFFICER	Mrs Sylvia Margolis, 95 Collinwood Gardens, Clayhall, Ilford, Essex.
QSL BUREAU MANAGER	A. O. Milne, G2MI, 29 Kechill Gardens, Bromley, Kent.
RECORDED LECTURE LIBRARY CURATOR	A. O. Milne, G2MI, 29 Kechill Gardens, Bromley, Kent.
SLOW MORSE PRACTICE TRANSMISSIONS ORGANIZER	M. A. C. MacBrayne, G3KGU, 25 Purlieu Way, Theydon Bois, Essex.
TVI CLINIC	Barry and Kay Priestley, G3JGO-XIW, 43 Raymond Road, Langley, Slough, Bucks.
VHF MANAGER	G. M. C. Stone, G3FZL, 11 Liphook Crescent, Forest Hill, London, SE23

A Seasonal Message From The President

IT seems only yesterday that I was invited to compose my first message to you as President of the Society, and now the time has come to take my leave.

This has been a momentous year for the Society, when we have had to embark on a big reorganization of our Headquarters organization and a redeployment of our resources. This would not have been possible without the enormous amount of voluntary help which we have received at all levels, and I would like to thank our helpers for their efforts and loyalty to the Society. We must be especially grateful to those concerned with the production of our publications, the profit from which has helped to offset the burden of increased costs and enabled us to "peg" our subscription at its present level.

For 1970 our aim must be to increase our membership until *all* active licensed amateurs are members—this is *your* guarantee that we speak with one voice and receive due recognition as the negotiating body for the movement *as a whole*. This is to every member's advantage —I hope you will do your bit for the Society in the coming year.

I am proud to have been your President during this exacting year, and I would like to thank all those who have supported me and made me welcome at local functions. I hope that you will give my successor in office support and encouragement to carry out his work; I invite you to join me in wishing him well.

Finally may I wish you seasonal greetings and express the hope that 1970 will bring you enjoyment and satisfaction in your chosen sphere of amateur radio.

John Swinnerton, G2YS

QTC

AMATEUR RADIO NEWS

Headquarters' staff

To many members "The RSGB" is a collection of faceless persons at 35 Doughty Street (*wherever that is!*), London WC1. This is, of course, not the truth, since the RSGB is a band of over 15,000 people all interested in varying degrees in one or more of the many facets of amateur radio. But 35 Doughty Street does exist, with a permanent staff of some 16 bodies. The voluntary side of the RSGB elects a Council as a governing body whose ultimate responsibility is the smooth and efficient running of Headquarters.

However, both Council Members and Headquarters staff are human beings, and being so are not infallible. Things go wrong and have to be put right. During 1969 there has been a build up of problems at Headquarters such that drastic action was deemed necessary by Council. Certain members of staff have been dismissed. Those who now constitute Headquarters staff ask for your indulgence and patience until they master the situation.

Society streamlines representation

At the Regional Representatives' Conference held in London on 13 October 1969, the question of improving the liaison between the members and the Society was discussed in considerable detail.

As a result it was unanimously agreed that the Society's Council members elected on a zonal basis should forthwith become also managers of their respective zones, and that the present regional representatives would operate as their assistants in the respective regions, while retaining their original title, status and responsibilities.

The organizational arrangements in each of the seven zones will, therefore, be the direct responsibility of the zonal Council member and his assistants who will, with the members' approval, make local appointments so that there will exist an improved form of representative coverage throughout the zones.

While it is appreciated that different arrangements may be necessary in individual zones, it is still anticipated that with the fullest co-operation of RSGB groups and affiliated societies, this type of administration should give a more streamlined, efficient and simplified means of direct communication between the ordinary member and Council.

The following is the text of a letter sent by the President of the RSGB to the editor of Short Wave Magazine:

The Editor,
Short Wave Magazine,
55, Victoria Street,
LONDON, S.W.1. 11 November 1969

Dear Sir,

It has come to the notice of the Council of this Society that you have expressed support of one candidate for election to Council by a recommendation printed in a recent issue of *Short Wave Magazine*.

I must point out that we regard with grave concern this unwarranted interference in what is a purely Society matter, especially as it has been your policy for many years to ignore mention of the work of the Society in the pages of your publication. We infer, therefore, that the above-mentioned comment is a wilful attempt to embarrass the other candidates in the election and to discredit the democratic process of Society representation. Should the candidate you name be elected, we are bound to assume that his attitude to Society affairs is likely to be biased by a direct relationship with your organisation, and his vote as such will not be impartial.

While I cannot forecast what the attitude of the 1970 Council will be on this matter, I venture to suggest that it is unlikely that the members will welcome in their midst a person who relies for his support on a commercial publication actively unsympathetic to the Society.

Yours faithfully,
J. W. SWINNERTON
President

Installation of President 1970

Dr J. A. Saxton, PhD, ARCS, FIEE, will be installed as the thirty-sixth President of the Society during the course of a social evening on

Friday 16 January 1970

at the

Bonnington Hotel, Southampton Row, London WC1

commencing at 7.30 pm

Admission will be by ticket, available on request (with sae) from Society Headquarters. Tickets are restricted to two per member.

How much more?

As this issue closed for press we received the unwelcome news from our printers that with immediate effect the cost of printing *Radio Communication* will rise by six per cent. Further, when negotiations with another printing trade union are concluded this will have the effect of adding yet a further one and a half per cent to the already augmented monthly bill. In terms of cash, more than £1,000 per year.

The RSGB is not in the position of a commercial publication which can pass on these increased costs to its readers by adding a few pence to the cover price. The Society is forced to absorb these increases (of which there have been many during the past two years), but the point has now been reached when action must be taken to reduce the burden on the Society's finances. For some time past enquiries have been pursued to ascertain if the journal can be produced on a more economical basis without sacrificing size or quality. It seems that some saving can be effected, but certainly not more than around eight per cent of the total cost.

There are many extremely good articles held for publication in *Radio Communication*, and to reduce the size of the journal to 64 pages would add materially to the already existing delays before publication can be effected. Certainly both Council and the editorial staff are extremely loth to contemplate such a retrograde step. What is the alternative? Income must be increased both by sales of other publications, which already contribute very considerably to the Society's finances, and also by an increase in the amount of the subscription. This is an unwelcome prospect, but how else can the present position be maintained in the face of spiralling costs forced on the Society by the printing trade?

Recently the Wireless Institute of Australia (the world's oldest national amateur radio organization) considered whether they could continue to produce *Amateur Radio* in its present form in view of the rising cost. Several other national societies have drastically reduced the size of their journals, and the quality of the material has also suffered. Let it be clearly stated that the RSGB has no intention of adopting any course of action which will reflect adversely on *Radio Communication*. On the contrary, the objective is enlargement and improvement. However, in the long term, this can only be achieved with your co-operation and willingness (in due course) to pay a subscription that is reasonable in the light of present-day costs and conditions.

Illness of Mr N. Caws

Members will be sorry to hear that the Society's hon. treasurer, Mr N. Caws, G3BVG, was taken ill early in November and is unable, for the present, to give his usual guidance to the financial side of the Society's work. However, they will be pleased to know that Mr Caws is making satisfactory progress towards recovery.

Any member, professionally qualified in accountancy, who would be willing to lend a hand in the supervision of this aspect of the Society's affairs is invited to contact the general manager without delay.

Letters to HQ

Members are reminded that when writing to Headquarters a separate sheet of paper should be used for each item requiring action. "Omnibus" letters containing several enquiries, orders, etc, on one sheet are frequently received, and these can cause considerable administrative difficulty.

Pirates caught

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

Mr T. Cozens, 3 Clifton Avenue, Stanmore, Middlesex, at Harrow Magistrates' Court on 24 June 1969. He was given a conditional discharge for two years and ordered to pay £5 5s costs with forfeiture of equipment.

Mr G. I. Davies, 131 Winchester Road, Fordhouses, Wolverhampton, at Wolverhampton Magistrates' Court on 16 August 1969. He was fined £50 on each of two charges, plus costs of £14 5s and forfeiture of equipment.

Mr M. Bethall, 8 Oxley Avenue, Wolverhampton, at Wolverhampton Magistrates' Court on 16 August 1969. He was fined £30, plus costs of £14 5s and forfeiture of equipment.

Mr F. Stewart, 20 Harley Avenue, Radcliffe, Manchester, at Radcliffe Magistrates' Court on 15 July 1969 and at Bury Magistrates' Court on 14 August 1969. He was fined £20 for each of three offences in Radcliffe and £10 for each of three offences in Liverpool, plus 20 guineas costs and forfeiture of equipment.

Radio Amateur Old Timers' Association

The eleventh reunion of RAOTA took place at the Horse Shoe Hotel, London W1, on Friday 24 October 1969. The dinner was preceded by a business meeting at which a formal constitution was adopted for RAOTA. The affairs of the Association, which had been guided by the late John Clarricoats, G6CL, will now be in the hands of an elected committee, the first chairman of which is Kenneth Alford, G2DX. Other members are G5WP (vice-chairman), G2NH, G5DJ and G6LL. The secretary/treasurer is Miss A. M. Gadsden. It was agreed that the next reunion dinner will take place on Friday 1 May 1970.

Sixty-one members of RAOTA sat down to the dinner at which Victor Desmond, G5VM, presided. Tributes to G6CL, a founder of the Association, were paid by Arthur Milne, G2MI, and Roy Stevens, G2BVN.

432MHz SSB transmitter

Mr N. G. Hyde, author of the article "A 432MHz Single Sideband Transmitter", which was concluded in the last issue of *Radio Communication*, has pointed out an error which unfortunately occurred on page 777 of the November issue.

Under the section "Filter and Amplifier (V4)", the second sentence of subsection (3) should read: "Adjust the primaries of T1, T2 and T3 to give minimum dip at the centre of the passband."

A word of caution

Mr J. M. Sonley, LRIC, AMInstF, G3XZV, has been prompted by the mention of the use of trichloroethylene in the formation of acrylics cement in the "Workshop Practice" article in the October issue of *Radio Communication*, to caution members about the danger of using a "near relative", trichloroethane.

While the former is fairly safe to use, the latter reacts violently with aluminium filings, forming a substance which reacts vigorously with water. In addition to not smoking while using either of these materials it should be borne in mind that if their vapours come into contact with hot copper the deadly gas phosgene is produced.

Silent keys

It is with sorrow that we record the passing of the following radio amateurs:

J. Hargreaves, BRS30712, of 11 Moorfield, Whalley, Nr Blackburn, Lancs.

L. W. Tonking, BRS27998, of Melody House, Basset Road, Camborne, Cornwall.

G. A. Wilkes, BRS26042, of 14 Overlea Avenue, Acocks Green, Birmingham 27.

W. H. Morris Airey, ex-G2AY, of Wallington, Surrey.

Paul Hayward, G3KNH, of Newton Abbott, Devon. He was an honorary life member of the Cannock Chase ARS, and a past member of the Tops CW Club.

Mr G. H. Marshall, G3JT, of Thornton Cleveleys, Lancs.

Mr R. Lewis, G3WWZ, of Flixton, Manchester.

Licence figures

The GPO advises that the following numbers of amateur licences were in force at the end of October 1969:

Class A	13,373
Class B	1,841
Class A/M	2,584
Class B/M	232
Television	180
Model control	16,954

QSL cards for Belgian stations

The attention of members is drawn to the correct address of the official Belgian QSL Bureau, which is: Union Belge des Amateurs Emetteurs (UBA)—Post Box 634, Brussels 1.

The UBA is the Belgian member society of the IARU and includes in its membership almost all the active Belgian operators.

RSGB Dinner Club

The next meeting of the RSGB Dinner Club will be on Friday 30 January 1970 at the Kingsley Hotel at 7.30 for 8.00pm. The Kingsley Hotel is in Bloomsbury Way a few minutes' walk from Holborn tube station. Ample car parking facilities are available adjacent to the hotel. The cost of the dinner is 26s and bookings accompanied by a remittance may be sent to Mrs M. Jardine at RSGB Headquarters. Arrangements have been made for the Apollo 11 moonwalk colour film to be shown at this meeting.

The RSGB Dinner Club is not a separate entity and all members of the Society are welcome at its meetings.

The Integrated Circuit Approach to A.G.C.

By P. G. MARTIN, BSc, G3PDM*

SEVERAL circuits have been published [1] for audio-derived "hang" type automatic gain control, but none have been as well matched to actual operating conditions as the latest Plessey agc generator in integrated circuit form.

When designing an ic to perform a certain function, it costs no more to use 20 transistors than three: the very best circuits cost no more than the simpler ones. For this reason the SL621 ic contains the equivalent of 20 transistors and most of their associated components. The characteristics of this device were sufficiently interesting for the author to develop a simplified form of the circuit using discrete components. This was further encouraged by the cost of the SL621—£7 3s at the time of writing.

Principles of the SL621 ic

The equivalent circuit of the Plessey agc generator is shown in Fig 1. Audio signals from the detector are applied to pin 1, amplified in Tr1-4, and fed to two detectors, Tr14 and Tr15, which have short and long rise and fall times, respectively. Tr16–20 form a dc amplifier which responds to the detector with the higher output level. A signal at the input establishes an agc level via Tr14 in about 20ms. After about 200ms the output of Tr15 is larger and takes control (see Fig 2). If a noise burst occurs the short time constant detector rapidly reduces the receiver gain, but the output of Tr15 is virtually unchanged, and C2 "remembers" the pre-noise agc level.

The amplified audio signal is also applied to a Schmitt trigger circuit (Tr6–8) which has two functions associated with discharging the long time constant detector capacitor C2 through Tr12 or Tr13.

If the incoming signal fades slowly (less than about 20dB/sec), the pulses at the collector of Tr8 will partly discharge C2 on every positive half-cycle of the input signal, so that the receiver gain will rise to hold the signal level constant. If, however, the signal fades abruptly, as in a pause of speech, then Tr6–8 are not triggered, and C2 holds its charge, effectively remembering the signal strength. The output of Tr14 will drop to zero in about 200ms.

If the break in the signal lasts for longer than about one second, the "hang" circuit (Tr9, Tr11, Tr12) operates and discharges C2 in about 200ms. The "hang" capacitor C3 is charged by the output pulses of Tr8 when a signal is present. When a break in transmission occurs C3 discharges through

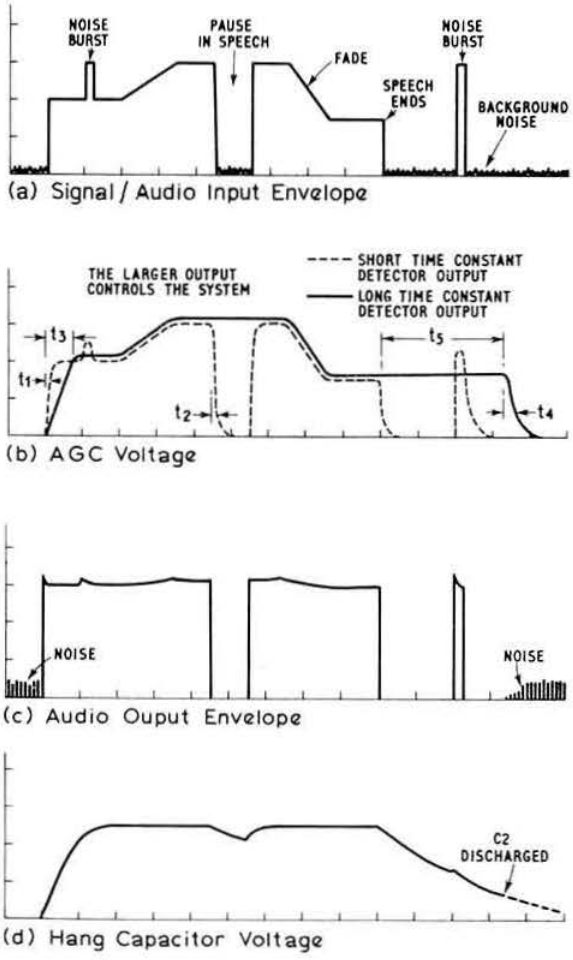


Fig 2. Graphs showing the action of the agc circuits under various operating conditions. The time constants referred to depend on the values of C1, C2 and C3 (see Table 1)

* Oak Cottage, Witton Gilbert, Durham.

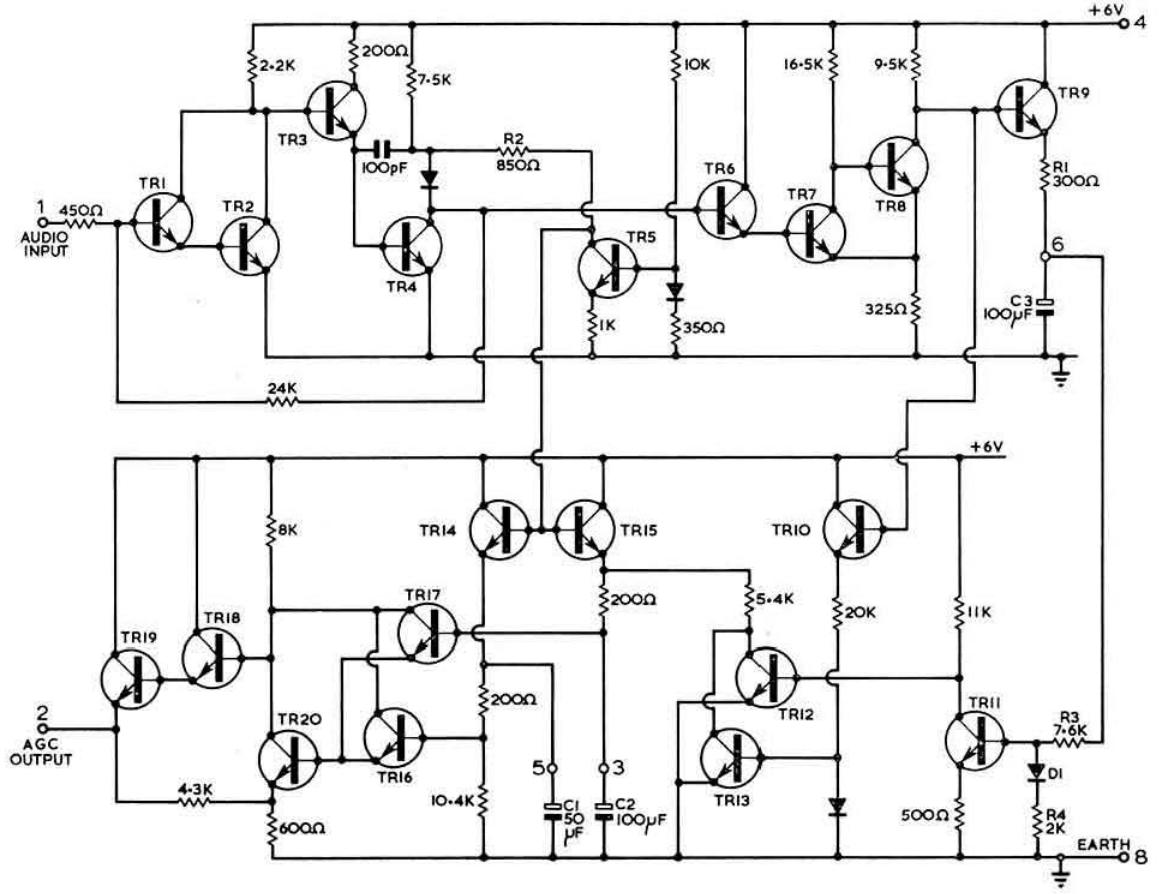


Fig 1. Equivalent circuit of the Plessey SL621 integrated circuit agc generator. The action of the various stages is explained in the text. C1, C2 and C3 are external components, connected to the ic via the appropriate leads on the device, which are numbered 1 to 8

R3, R4 and D1 until Tr11 is turned off and Tr12 on. R1 is added to increase the charging time of C3 so that the "hang" circuit is not actuated by short noise bursts (see Fig 2).

Tr5 is a constant-current generator, causing a voltage drop of about 170mV across R2 regardless of the input signal level. This ensures that the Schmitt trigger circuit operates at the same minimum signal level as the two detectors.

Simplifying the Circuit

The integrated circuit is intended for use with ic rf and if amplifiers requiring agc voltages between about +2 and +4·5V. The discrete component unit is designed for valve if amplifiers, and gives output voltages in the range zero to −20V.

The input sensitivity of the SL621 is 5–10mV. The author's circuit is intended for use with higher level detectors such as the 7360 product detector [2] and was therefore designed to handle signal levels up to about 2·5V peak. The agc generator therefore no longer needs a signal amplifier.

The agc line of a valve receiver invariably has a high resistance to earth, so the circuitry around Tr17–20 can be simplified.

By introducing these modifications the number of transistors is reduced to eight.

Practical Unit with Discrete Components

The incoming audio signal is applied without amplification to the two detectors Tr6 and Tr7 (Fig 3) and to the Schmitt trigger circuit Tr1–2. The hang capacitor C3 is charged through Tr3. Tr5 discharges the long time constant detector capacitor C2 when turned on by Tr2 or Tr4. Tr8 forms a simple dc amplifier to improve the flatness of the agc characteristic.

The common types of silicon planar transistors are unsuitable for three positions in the circuit because of their very low reverse V_{be} rating (−5 to −8V for an *n-p-n* type). For this reason Tr1 6 and 7 are *n-p-n* germanium alloy types (2N1304) with a typical base-emitter breakdown voltage of

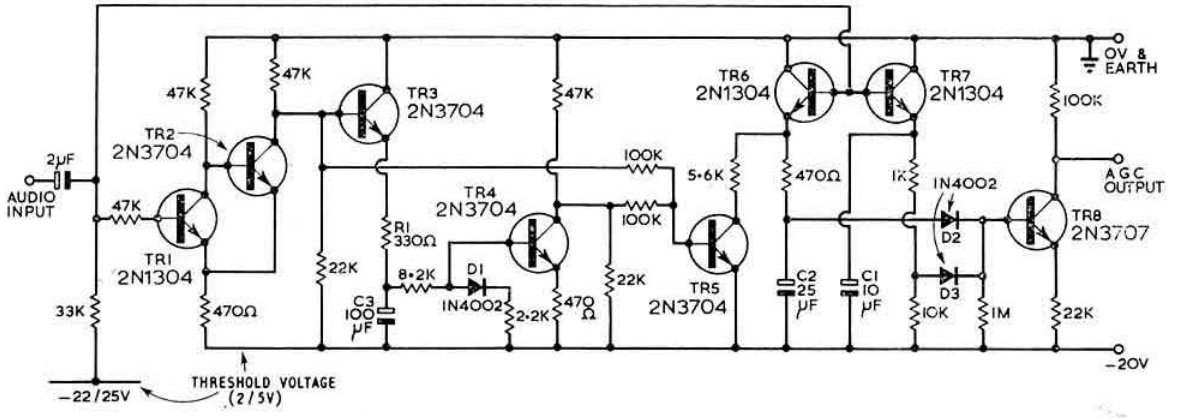


Fig 3. Circuit diagram of the simplified agc generator using discrete components, and intended for controlling valve rf and if amplifiers. D1, D2 and D3 can be almost any small silicon junction diode

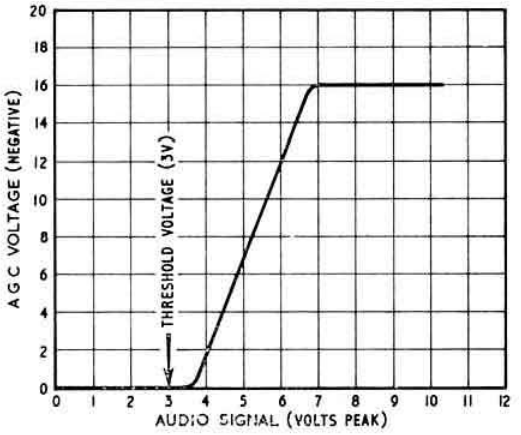


Fig 4. The transfer characteristic of the simplified agc circuit. Note the threshold level and the maximum signal level. The receiver output increases by about 6dB over the dynamic range of the agc loop. When used with three controlled EF183 if amplifiers, this corresponds to variations in signal strength of about 150dB. The gain of the receiver should be such that the threshold level corresponds to a signal level of about one microvolt

−40V. Silicon types with suitable ratings are available but are not usually found on the surplus market. Tr2, 3, 4 and 5 can be almost any *n-p-n* silicon transistor with a β of 50 or more, and a V_{ce} rating greater than 20V. 2N3704s are recommended. Tr8 operates at a very low collector current, so a 2N3707 is used here.

Conclusions

The practical circuit has as yet only been tested under laboratory conditions with an audio signal generator connected to the input. The transfer characteristic is shown in Fig 4, and the various time constants are listed in Table 1.

Table 1

Characteristic	SL621	Test conditions μF	Practical Circuit	Test conditions μF
Input resistance	500 ohms		25 kilohms	
Output resistance	70 ohms		100 kilohms	
Fast rise time (t_1)	20 ms	C1—50	20 ms	C1—10
Fast fall time (t_2)	200 ms		300 ms	
Slow rise time (t_3)	200 ms	C2—100	200 ms	C2—25
Hang time (t_4)	1 sec	C3—100	1 sec	C3—100
Slow fall time (t_5)	200 ms	C2—100	600 ms	C2—25
Quiescent current consumption	3·1 mA		0·5 mA	

The basic characteristics of the SL621 integrated circuit and the practical circuit. The various time constants can be altered at will by changing the values of C1, C2 and C3. See Fig 2 for definitions of times t_1 to t_5

The unit is shortly to be built into the G3PDM Receiver Mark II (the Mark I version is described in the *Radio Communication Handbook*). Comments on the performance and usefulness of the agc circuit under amateur band conditions will be presented when the Mark II receiver is described in a later issue of *Radio Communication*.

Although the practical circuit shown above is intended for valve receivers, it is readily adaptable to transistor if amplifiers. Normally it would be necessary to change the dc amplifier circuit and possibly the polarity of the supply rails. For forward agc on silicon *n-p-n* if amplifiers the dc amplifier in the original integrated circuit would be suitable.

References

[1] *Radio Communication Handbook*, 1968, p. 4.23.

[2] *Radio Communication Handbook*, 1968, pp. 10.104-10.108.

The G8ARV two-watt two-metre transistor transmitter

By D. J. TAYLOR, G8ARV, G6SDB/T.*

THE transmitter to be described is an adaptation of a Mullard design to provide a 2W 144MHz am transmitter capable of operating under mobile conditions directly from a 12V vehicle supply line.

Silicon planar transistors are utilized throughout the rf section, and this, coupled with the use of a printed circuit board for the exciter, results in a repeatable and robust transmitter design. The transmitter has been built by more than twenty amateurs in the Midlands and consistently good results have been reported.

1 System configuration

In its present form the transmitter consists of three separate units: an exciter, modulator and pa. The exciter and pa are based on a Mullard design [1] with appropriate circuit modifications. The modulator can be any audio amplifier capable of 1½W output.

2 Circuit description

2.1 Exciter

The circuit diagram of the exciter is shown in Fig 1, with coil and choke details in Table 1. A 48MHz crystal oscillator is followed by a trebler and two amplifiers at 144MHz producing about 400mW rf output.

A BF115 (TR_1) acts as a 48MHz oscillator with the crystal operated in its series resonant third overtone mode. The value of C_2 enables the frequency to be varied by about 10kHz on 2m, and may be any capacity from 10pF upwards. A panel mounted trimmer (60 or 100pF) would permit vxo operation. The oscillator is loaded with a 2·2KΩ resistor (R_4) and lightly coupled to the trebler (BSX19, TR_2) by means of C_3 and C_5. Tapped capacitive matching is used for all interstage couplings.

144MHz output from the trebler (5–10mW) is coupled to the first amplifier (BSX19, TR_3) by means of C_8 and C_9. A certain amount of forward bias for this stage is provided by R_6 and D_2. The latter ensures thermal stabilization of the bias, since, as the temperature varies, the forward voltage of the diode "tracks" the base emitter voltage of the transistor, as they are both silicon pn junctions.

The output from TR_3 is coupled to the second amplifier TR_4 by means of C_{11} and C_{13}. This stage operates at a collector current of approximately 55mA and a power output of 400mW should be available. Matching to 50 or 75Ω is by means of L_4, C_{14} and C_{15}.

The use of slight modulation of TR_4 gives better overall modulation linearity. This is achieved by taking its dc feed both from modulated and unmodulated ht.

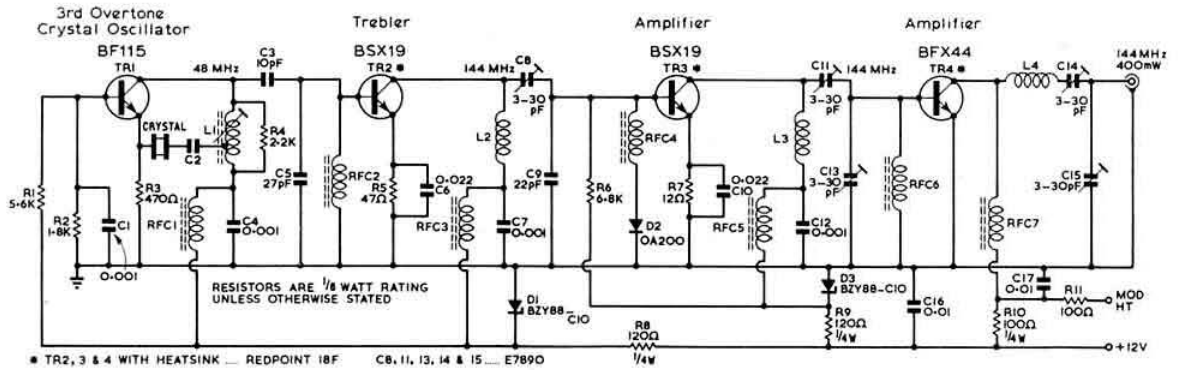


Fig 1. Circuit diagram of 144MHz 400mW exciter

*'Crestwood' 8A New Rowley Road, Dudley, Worcs.

Zener stabilization of the supplies to the earlier stages ensures the voltage ratings of the transistors are not exceeded over the full operating voltage range (11–16·5V on mobile operation) and provides some stabilization of frequency and rf output. Heat-sinks are fitted to $TR_{2,3}$ and $_4$ so that dissipation ratings are not exceeded even at high ambient temperatures.

2.2 Power stage

The pa circuit shown in Fig 2 consists of a single BLY33 in grounded emitter, requiring a drive of at most 0·4W for 2W am output. The output from the pa is sufficient to drive a higher power transistor such as the BLY35 for 7W am output or to drive a QQV06-40A in either linear or screen-modulated mode. Circuits for transistor power amplifiers are given in Ref 1.

The matching networks (C_1, C_2, L_1; C_5, C_6, L_3) enable input and output to be coupled to 75 or 50Ω lines. The use of a non-resonant choke in base and collector circuits and of lossy low frequency decoupling (R_1C_4) helps prevent parametric instability (see Ref 2).

Collector modulation is used, and any audio amplifier capable of producing 1½W into the 65Ω impedance of the pa would be suitable. The 30V zener (BZY93-C30R), while not essential to the correct functioning of the pa, prevents over-enthusiastic modulation from damaging the transistor and provides some protection against reversed supply voltage (as do the zeners on the low power board).

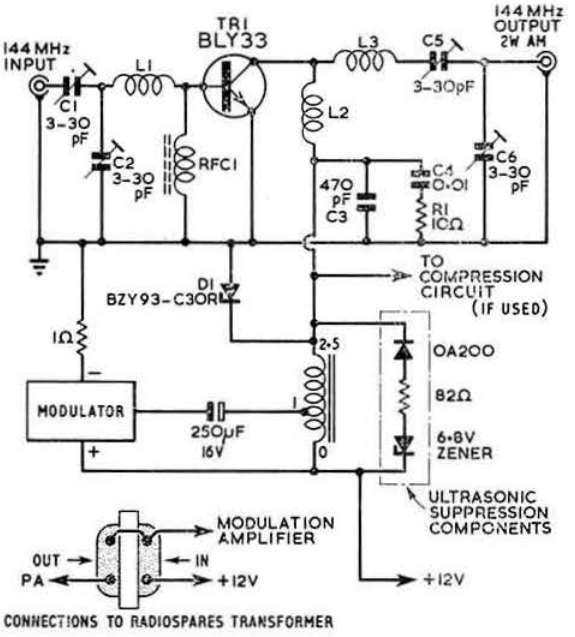


Fig 2. Power amplifier stage

2.3 Modulator

Any audio amplifier can be used (see above) but one which is convenient electrically is the Newmarket PC5 whose output can be up to 3W. The voltage output is 10V (p-p) and since about 24V (p-p) is required for 100 per cent modulation, a transformer ratio of about 2.4 : 1 is needed. The ratio of a Radiospares "Midget speaker isolating transformer" when connected as shown in Fig 2 is about 2·2 : 1, which is sufficiently near. A larger transformer would be needed for the high power circuits to avoid saturation effects.

A slightly higher ratio, eg 3 : 1, would result in the modulator being driven less hard, voltage-wise, and may give slightly better results with the compression circuit suggested.

With the PC5 and typical dynamic (50kΩ) microphones a certain amount of preamplification is needed. A circuit which provides this, and compression of the audio, is shown in Fig 3. The compressor utilizes the variable resistance property of an FET [3] (when operated at zero drain-source volts) to attenuate the microphone output when the modulation level exceeds 80–90 per cent. Some adjustment could be provided by making the 680kΩ a 1MΩ linear pot. The components within the dotted lines and the FET are removed if compression is not required. Either the circuit shown (Fig 2) or a 0·1μF capacitor in series with 10Ω may be tried across the autotransformer as shown if ultrasonic instability is encountered (Check with scope).

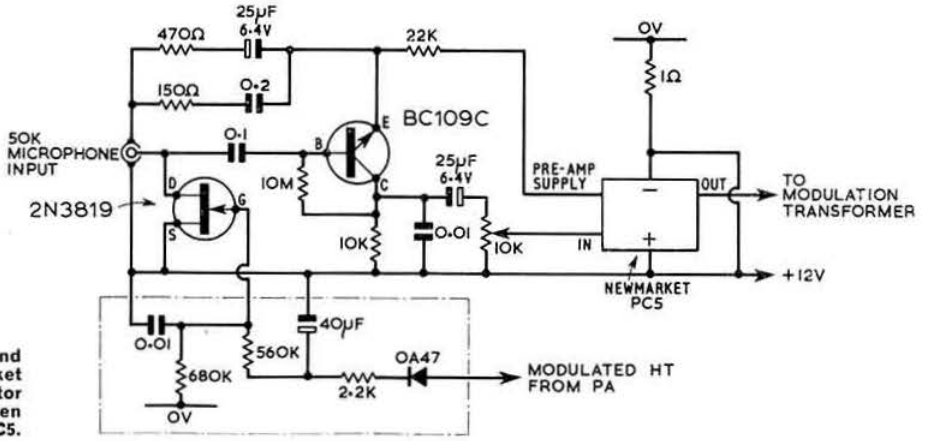


Fig 3. Speech compressor and pre-amplifier for Newmarket PC5. A 1000 MFd capacitor should be connected between + and − terminals on the PC5.

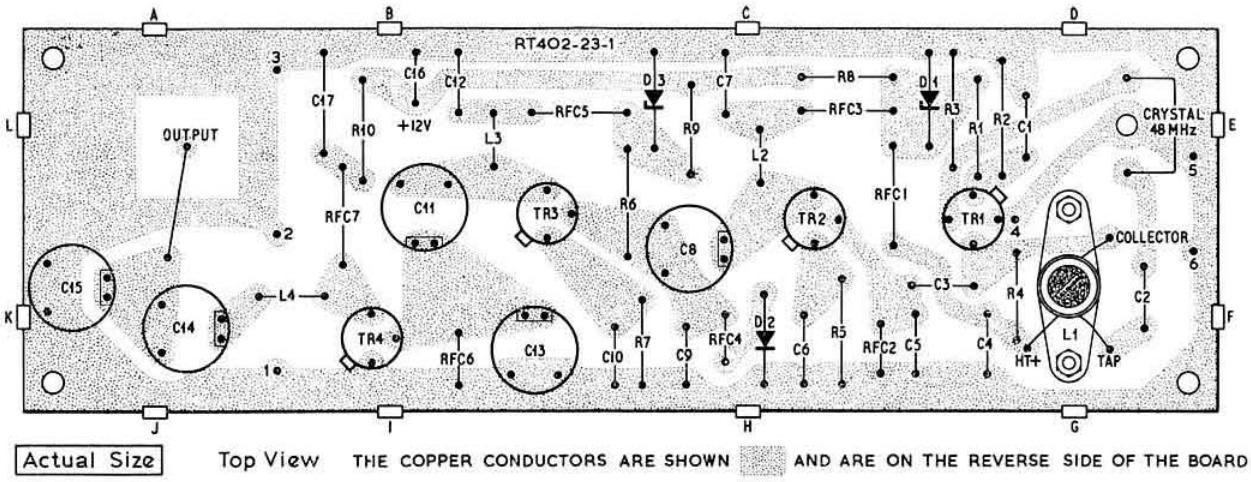


Fig 8. Printed board layout. This is a modified version of the original Mullard board. Boards supplied by J. R. Hartley, Ref [4], will have the original layout

3 Construction

3.1 Exciter

The exciter is built on a double sided printed circuit board. The top side of the board is shown in Fig 8 and its underside layout may be judged from the photograph. This board is an exact copy of the Mullard original, as a copy of the master was very kindly made available by Mr Cash of Mullard Ltd.

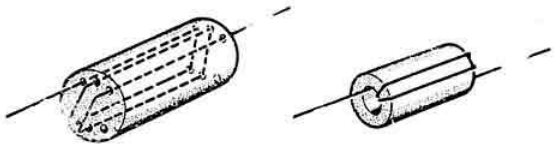
Brief notes about the board appear in the September 1968 *Radio Communication* (p. 598) and constructors proposing to make their own boards are referred to these. Boards are available to amateurs through John Hartley [4], who will supply constructional notes and a price list for the remainder of the components on receipt of an sae.

A metal chassis version is perfectly feasible but bear in mind the notes referred to above.

Table 1

Coil details for exciter

	Turns	swg	
L_1	10	26	Wound on 7mm former tapped 1¼ turns from "earthy" end; slug tuned.
L	3	18	Internal diameter 7mm, spaced ½ turn self supporting.
L_2	2	18	I.D. 8mm length 5mm self supporting.
L_4	4 *	18	I.D. 10mm length 8mm self supporting.
$RFC_{1,3,5,7}$			2½ turns, 30swg, on ferrite bead FX1898 (Mullard) [or as per $RFC_{2,4,6,8}$ in emergency]
$RFC_{2,4,6,8}$			2½ turns, 26swg, on ferrite bead FX1115 (Mullard).



$RFC_{1,3,5,7}$ six holes

$RFC_{2,4,6,8}$ one hole

* It may be worth experimenting with 5 turns for 75Ω.

3.2 Power stage

It has been reported that a printed circuit construction is not really suited to a transistor like the BLY33 in the TO-39 encapsulation. Consequently a brass or tinplate subchassis is used.

Construction details are shown in Fig 4, but the layout is not critical. The BLY33 is mounted in a Redpoint 5C heat-sink, but insulated from it by a 5thou layer of mica or polythene cut to be the same shape as the base of the transistor.

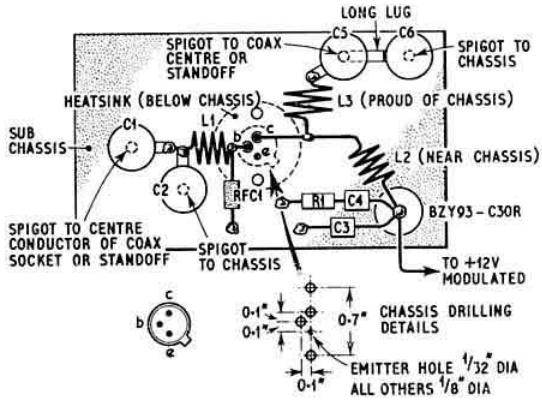
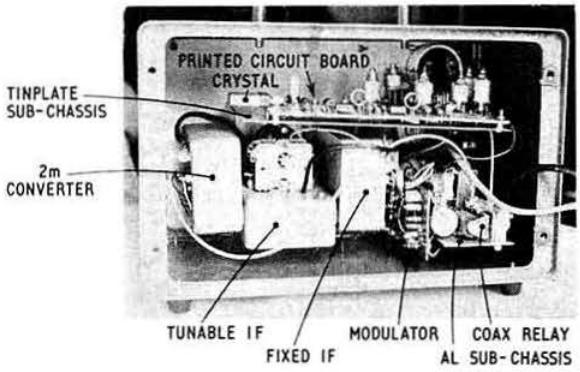


Fig 4. PA layout



Looking inside the transceiver

The heat-sink is mounted underneath the subchassis and the emitter lead soldered directly to earth. Components are mounted on top of the subchassis, trimmers being soldered to coaxial socket centres (if the pa is made as a separate unit), the subchassis or standoff insulators as appropriate.

The use of self-locking trimmers, which have a much finer adjustment than the usual "Philips" trimmer, is recommended for the pa. Note that the BLY33 emitter lead *must not* be longer than 1·6mm if full performance is to be obtained.

The author has built power amplifiers both as a separate unit, interconnected by plugs and sockets, and as an integral part of a transceiver (ie fully wired in) and obtained satisfactory performance from both.

4 Alignment

4.1 Dummy load

A suitable circuit is shown in Fig 5. This may be made up in an Eddystone diecast box and connected by cable (of the correct impedance) to the exciter or pa as required, or the circuit may be soldered into place on the exciter or pa while alignment is carried out. It is important to keep leads very short in the dummy load, otherwise voltage measurements will be meaningless due to resonance effects.

The exciter and pa are lined up independently, first exciter, then pa.

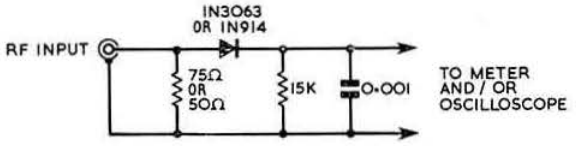
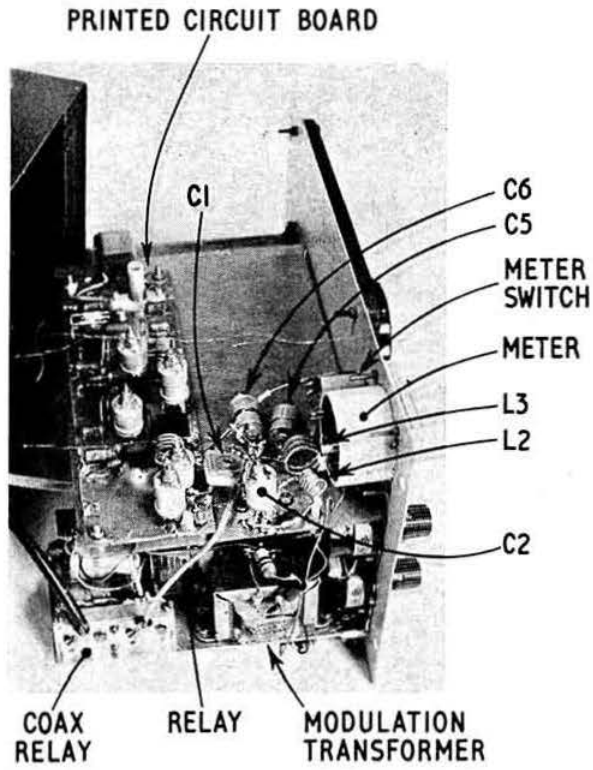


Fig 5. Dummy load. The 75/50Ω resistor must be non-inductive (of carbon composition) of suitable rating



RF and modulator stages in the transceiver

4.2 Exciter alignment

Step	Measure voltage	Should be	Action
1	ht	12V	Set C_{13} = C_{15} at minimum, C_8 = C_{11} at half and C_{14} at maximum capacitance. Apply dummy load, crystal and ht. Measure ht current. Should be <150mA (possibly much less). If not check for shorts, etc.
2	Across R_5 (47)	0·5–0·6V	Tune L_1 for maximum. If 0·5V cannot be obtained increase R4 (2·2kΩ) until it can, within the limits of oscillator stability.
3	Across R_7 (12)	0·2–0·22V	Tune C_8. Adjust L_2 slightly if necessary to optimise drive, ie alter L_2, retune C_8 and measure new drive. A tuning wand enables this to be done quickly.
4	Across R_{10} (56)	3·1–3·5V (may not be obtained until output is tuned)	Tune C_{11} and C_{13}. It will be found that C_{13} is near minimum capacitance and in some instances removal of C_{13} will increase drive.
5	From dummy load	>5·3V 50Ω >6·6V 75Ω	Tune C_{14} and C_{15} for maximum. Although C_{15} will be near minimum, it should be possible to obtain a peak, at least with 50Ω.
6	From dummy load		Carefully repeat operations (3) to (5) for maximum output. The voltages given will then serve as a check on the future working of the board.
7			Do not disturb alignment of exciter from now on.

4.3 PA alignment

For pa alignment the circuit shown in Fig 6 should be set up. An oscilloscope with both x and y amplifiers is required and if a dc coupled scope can be obtained, so much the better, but one is not necessary.

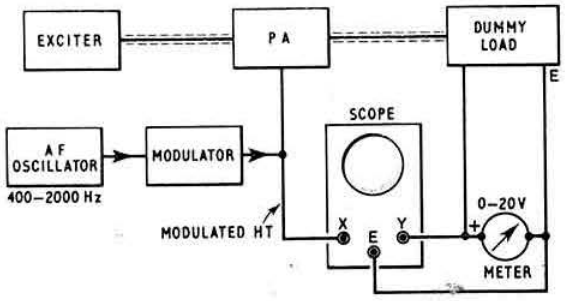


Fig 6. PA alignment arrangement

Initially (and without modulation) tune all the trimmers for maximum output as indicated on the meter. Apply 100 per cent modulation (9V (rms) on secondary of modulation transformer will be more than adequate) and tune all trimmers for the straightest line as seen on the scope.

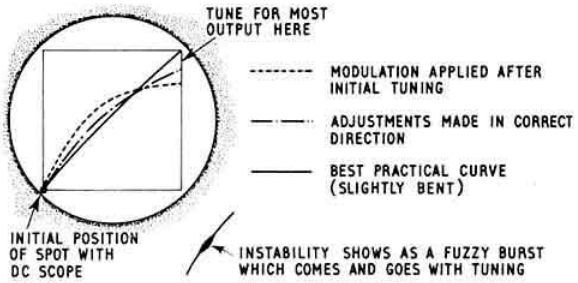


Fig 7. Oscilloscope tuning of pa

This will involve carefully adjusting C_1 and C_2 and then C_5 and C_6 for the most output on peaks of modulation. The adjustment of these capacitors is then repeated until the best result is obtained. It is worth spending plenty of time on this procedure as the quality of the (finally) radiated signal seems to depend directly on the time spent! It is possible to obtain a signal from this transmitter as good as the best that valves can produce—but it does not come after the first tuning up. Scope patterns for the tuning up are shown in Fig 7.

If any instability is present then the remedies suggested in 2.3 can be tried. Both have been successful in suppressing ultrasonic oscillation with the PC5. It is advisable to screen the PC5 from the pa, also the pre-amplifier should definitely not be able to "see" modulated rf from anywhere. When tuned up, the meter should read 12V (50Ω) or about 14V (75Ω) on an unmodulated carrier.

5 Component subsitution

Certain of the components (for the exciter in particular) seem to be in very poor supply from Mullard. The practice of manufacturers publishing designs for which they are not able to supply the components is, in the author's opinion, eventually detrimental to the manufacturers concerned or, unfortunately, to the retailers who have to deal with them. Certain substitutions have been suggested or tried and they are listed below:

Key
T = *Tried and tested, satisfactory.*
SN = *Should be satisfactory but not tried by the author.*
EN = *Emergency replacement only: not tried by the author.*

Transistors

Type	Alternative	Status	Comment
Exciter			
TR_1 BF115	2N918	SN	Different base connection.
$TR_{2,3}$ BSX19	BSX20, 2N2368 2N2369	T	Only Mullard or Texas transistors recommended (others found not to perform as well).
TR_4 BFX44	BSX19, BSX20 2N2368, 2N2369	T	Transistor must have Vcer > 23V. On samples tested Vcer of BSX19/20 has been found higher than that of BFX44! Only Mullard or Texas transistors recommended.
PA			
TR_5 BLY33	MM1557	SN	Motorola "equivalent".
	40290	T	RCA "equivalent." Both may give less output.
Modulator Preamp			
BC109c	BC107, BC108 or plastic equivalents	SN	10MΩ may need reducing to 5·6MΩ for lower gain devices.
Other sections			
Exciter Beads FX1898	FX1115	SN	May need 3½ turns on FX1115
Zeners BZY88–C10	Any 10V 400mW zener	T EN	Zeners could be omitted for initial tests if not available.
Diodes OA200	OA202 (1S130)	T	Same family (Texas)
Crystal 48MHz	80MHz	SN	80MHz 5th ot will operate on 48MHz 3rd ot.
	or 28·8 MHz 3rd ot		Operates as 48MHz 5th ot.

Substitutions which are not recommended

(*a*) Sinclair Z-12 is not electrically as convenient for modulator.

(*b*) Do not substitute for FX1115 in the pa unit. One constructor found that he could not tame the pa using a well-known make of "suppressor" bead, but that it was perfectly alright with an FX1115. This may not be as critical in the low power unit but tests to support this have not been carried out.

6 Performance of the transmitter with regard to stability

This transmitter is believed to have a stability and freedom

from spurious output better than that of some designs. There has not been any sign of instability when using the low power board. As far as the author is aware it is not possible, using the coil values and tuning method described, to obtain output other than on the correct frequency.

The instability encountered with the pa has occurred when a PC5 is being used as the modulator and where the shielding between the modulator and pa is not 100 per cent. Using a modulator of low output impedance and complete shielding there was no sign of instability. Although tests have not been carried out, it is suspected that phase shift in the PC5 could be the cause.

7 Mismatched loads

A feature of the Mullard circuits is that if the aerial is removed the pa transistor should not fail, even if modulation is being applied at the time!

The low power unit will function with or without a load and no damage appears to result from operating it without a load.

The pa transistor is guaranteed to work on carrier alone with or without a load. It will withstand the high vswr encountered during tuning up. It is also rated not to fail catastrophically at supply voltages up to 20 per cent above normal (up to 16.5V) and to permit simultaneous mistuning or mismatching of the load. The implication of this is that by paying a little more for the pa transistor you get a much more robust product.

In practice the circuits bear out the above. I have operated two BLY33s for a total of 32 transistor-months without failure. One of these has been in the transceiver (see later) and the other (19 months) in the main station two metre transmitter which has been used for general test and demonstration purposes.

One point which does not seem to be fully appreciated is that transistor circuits of this variety (ie using self bias) operate in class C, but unlike a valve there is no collector current until drive is applied. Thus no protection against lack of drive is necessary. In this respect the transistor is like a valve with a built-in negative bias.

8 Difficulties

There has been occasional difficulty in obtaining correct modulation performance. There seems to be three causes of this, viz:

(*a*) Omitting dip links and generally not following advice concerning low power exciter. It is important to install the dip links, solder through wires and to solder the emitter of TR_4 to the top of the board.

(*b*) The low power exciter must be working correctly and giving sufficient output before connecting it to the pa. Full performance will not be obtained with only 100mW drive.

(*c*) Alignment with an oscilloscope is essential for the pa, unless you have access to rf distortion analysers (in which case you will know how to tune up the transmitter). It is not sufficient just to tune for maximum output and assume that the resulting modulation quality will be good enough (*it will not*).

9 Transceiver

A transceiver, using crystal control for the transmitter, has been developed around the Mullard transmitting and receiving [5] circuits and is shown in the photographs. Including the two relays, the current consumption is as follows:

receive—50mA, transmit—0·6A (average).

This is less (on transmit) than the equivalent valve device would consume in heaters alone. No attempt has been made to go to the limit of miniaturization, as the writer preferred a commercial case whose size was fixed by the Eddystone dial and meter.

The meter can be switched to read either battery voltage or rf output on transmit using a 0–20V scale in each case.

As the transceiver has been, and still is being used for experiments, the circuitry does not correspond 100 per cent with that of the article, being slightly more out of date. The idea is to suggest a possible layout of exciter and pa for a practical transmitter.

The exciter and pa are mounted on a tinplate subchassis, which screens the pa from the modulator. The coaxial and change-over relays and the modulation transformer are mounted on top of a narrow aluminium subchassis, with the pre-amplifier mounted underneath, next to the microphone input jack socket. Both the subchassis and the modulator (which doubles as af amplifier on receive) are mounted on to the front panel.

The receiver section consists of three Eddystone diecast boxes, converter mounted vertically on the left, tuneable if in the middle, and 10·7MHz filter and fixed if on the right, as shown in the photograph.

10 Conclusion and acknowledgements

Transistor transmitters using the Mullard circuits with my modifications have been built by many amateurs and found to work satisfactorily.

The design has been adopted by the Worcester Amateur Radio Club as their RAEN transmitter, and without the co-operation of Tony Blackmore (ex WARC) and Mr Cash of Mullard Ltd, this project would not have been possible. Thanks are in order to both Tony Blackmore and Mr Cash, and to John Cleaver, who took the photographs.

References

[1] Mullard *Technical Communications* Vol 10 No 91 pp 2–13.

[2] Mullard *Technical Communications* Vol 9 No 90 pp 279–284.

[3] "*FET series and shunt choppers*," Texas Instruments application note.

[4] J. R. Hartley, 78 B, High St, Bridgnorth. Printed circuit board costs 13s 6d post free. Price list for remainder on receipt of sae.

[5] Mullard *Technical Communications* Vol 10 No 91 pp 14 onwards.

TECHNICAL TOPICS

A monthly feature by PAT HAWKER, G3VA

THE progressive nature of amateur radio as revealed through the typical phrases of constructional articles has been summarized so succinctly by VK7ZDF (*The Australian EEB*, September 1969) that his notes richly deserve reprinting (with only minor embellishment):

1950 Here is a single sideband suppressed carrier transmitter; mount V2 socket and solder R2 to pin 7. . . .

1960 Here is a single sideband transmitter; mount Tr2 socket on printed circuit board, and connect R2 to pin 3. . . .

1966 Here is an ssb transmitter; plug IC2 and IC3 into PCB2. . . .

1970 Here is an ssb transceiver; join coax sockets 2 and 3 on exciter module to plugs 3 and 4 on rf amplifier module. . . .

1973 Here is a miniature hf/vhf ssb transceiver; screw ssb transmitter module type 122 and receiver module type 522 into cabinet type 13C42. . . .

1975 Here is a pocket MHz/GHz ssb/pcm transceiver with built-in active antenna; place one thousand dollars deposit in Envelope A. . . .

And those who may not believe that the humorists of today are only too often proved the prophets of tomorrow should refer to the columns of the old *T & R Bulletins* of the Thirties. For example, in July 1939 the late G6LB published a dialogue of the "future" which, apart from the now strange sounding slang, has proved remarkably perceptive:

1st Ham: "What-ho, how's dx?"

2nd Ham: "Fine, dear old chappie. I worked two new streets last night. That makes 99,000 streets and 73 postal districts. I only want 55,000 more for 'worked all streets'."

1st Ham: "By the way, old man, look out for XYZ77—his name's Heckmondwike and he QSLs. He's the only one on the air with that name. And I've heard he can tune his own transmitter."

2nd Ham: "What a fearful sweat. I always have mine adjusted by Blanks, under their new all-in scheme. They do the whole show for a fiver a week, and they write up your log and your cards as well. . . ."

It all seemed fanciful enough in 1939. But in 1969? A glance at almost any "MOTA" or "Four Metres and Down" will reveal the monthly quota of dx-peditions to barren rocks and little known counties, the QSL managers, and the mushrooming of virtually meaningless operating "awards". The future as seen by G6LB in 1939 is with us now. First the awards were for countries, then towns, then postal districts (not quite sure about streets but they will come, never fear), and even such oddities as the pantomime of a "Robinson Crusoe" certificate (may Hull ARC members forgive me) for which "all QSOs made on Fridays count double" . . . (get it?—Robinson Crusoe . . . Man *Friday*).

It used to be said that the first sign of growing old was when you noticed how young the policemen look. For an amateur, perhaps it is when you first realize that the humorous articles of one's youth have suddenly and devastatingly turned true.

I am not suggesting that amateur radio has deteriorated or that, in the Thirties, it was any better than today (after all there *were* the "baby broadcasters"). Most of us appreciate that such operating awards are not meant to be taken too seriously. But what worries some of us is whether Robinson Crusoe certificates and complete factory-built phone stations are going to convince the International Telecommunications Union that the Amateur Service is still a service of self-training, intercommunication and technical investigations. (The official international definition of the Amateur Service, under paragraph 78 of Article 1, of the ITU "Radio Regulations" is: *A service of self-training, intercommunication and technical investigations carried on by amateurs; that is, by duly authorized persons interested in radio techniques solely with a personal aim and without pecuniary interest.*) Intercommunication, by itself, is hardly likely to impress the ITU when it comes to keeping our frequencies: we must not forget the equally essential elements of self-training, technical investigations, and an interest in radio techniques.

G3PDM high-stability fet Vackar

There have been a number of suggestions in *TT* that the field effect transistor could prove of major value in its application to variable frequency oscillators, using such circuits as the Vackar and the Franklin. This viewpoint receives powerful and convincing support from Peter Martin, G3PDM, who has recently been developing a new master oscillator for the Mark II version of his extremely interesting *Radio Communication Handbook* receiver (page 10.104 *et seq.*): Fig 1.

The stability he has achieved using a 2N3819 junction fet in conjunction with bipolar buffer/isolation in a genuine Vackar circuit covering 5·88 to 6·38MHz is, as G3PDM puts it, "incredible". A warm-up drift of 500Hz (caused by the gate-source capacitance changing as the fet warms up) in the first 60 seconds, and thereafter $\pm$ 2Hz per 30 minutes—that is about 3 parts in 10^7! While possibly nobody could guarantee that such fantastic performance is always going to prove reproducible, Pete Martin notes 15 points to watch. Some of these are well known but it seems well worth presenting his complete list:

(1) Strongly recommend the genuine Vackar circuit, ie with $C1/(C4 + C6) = C3/C2 = 6$ approximately.

(2) Use an fet rather than a valve: they are more stable, last longer, use the same circuits, and are even cheaper.

(3) Use a strong box (diecast or better).

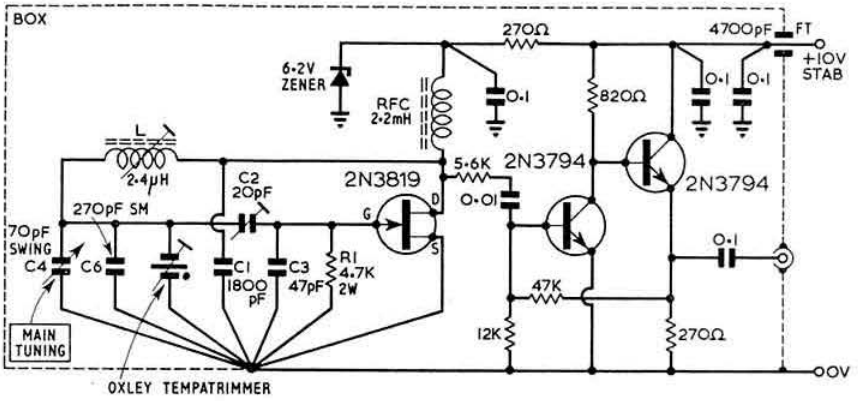


Fig 1. The high-stability fet Vackar oscillator developed by G3PDM to cover 5·88 to 6·93-MHz for the Mark II version of his *Radio Communication Handbook* receiver

(4) Use a high-quality variable capacitor. The so-called slf (straight-line-frequency) laws are for a tuning range of 2 : 1 and are not useful for normal amateur use. However, the RF-26 type capacitors (still available new as Jackson Type U101) provide an almost perfect slf law when tuning 500kHz in this circuit.

(5) To reduce the heating effect of the rf currents in C2, this should be an air-spaced trimmer: this allows adjustment of feedback so that circuit just oscillates, reducing harmonic output and drift due to interaction of harmonic energy.

(6) All variable capacitors should be cleaned with carbon tetrachloride or similar solvent, preferably in an ultrasonic bath (G3PDM stresses that this really does make a difference).

(7) Adjustable temperature compensation can be provided by means of a "Tempatrimmer" (Oxley Developments). Capacity is 6·5pF at ± 2,000 parts per million.

(8) C1, C3 and C6 should be silvered-mica types, Araldited to surrounding solid objects (this reduces "warbling" during the "mallet test").

(9) The gate resistor should be a 2W solid carbon type for minimum heating and low inductance.

(10) Use of a buffer/isolating amplifier is essential. With a feedback pair, the gain is readily adjusted while negative feedback maintains low harmonic content.

(11) Circuits using a diode from gate to earth for rectification outside the fet appear to increase drift.

(12) Power supplies must be very well stabilized, and disc ceramic by-pass capacitors should be liberally used to prevent unwanted feedback along the supply rails.

(13) Oscillator components around the tuned circuit (L, C1, C2, C3, C4, C6, R1 and fet source) should have single common earthing point. (This usually means using one of the fixing screws of C4.)

(14) Ceramic coil formers are preferred (example, *Electroniques* TO-5C for 5 to 6MHz). An iron dust core facilitates vfo calibration, but ferrite cores must be avoided.

(15) Keep leads short, and use stiff wire (16 or 18 swg) for interconnections in the oscillator tank circuit.

Details of performance, in addition to the warm-up drift and long-term stability considered above, are given by G3PDM as: *resetability*—after switching off for 12 hours, returns to within 10Hz of previous frequency; *voltage stability*—(without zener diode), ten per cent change in supply results in shift of 8Hz; "*G3PDM standard mallet test*"—average shift of 6Hz; *scale linearity*—maximum error over 500kHz band, 12kHz "without any codging". G3PDM is planning to try an igfet to see if this might result in even lower warm-up drift.

Some idea of the degree of improvement which such a unit represents over current standards is indicated in Fig 2 where G3PDM has compared the drift of his fet vfo against that of a £200 transceiver as indicated in an RSGB equipment review. The 15 points listed above show that to achieve this type of performance considerable care must be taken in the electrical and mechanical aspects of the unit: but at least the fet makes such an end-result possible.

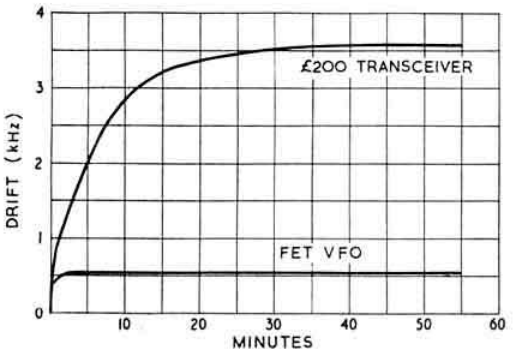


Fig 2. Comparison of the drift characteristics of the G3PDM vfo with those of a representative current £200 transceiver

Continuously variable bandwidth filters

Over the years, in the constant search for new ideas for *TT*, we have frequently found that it is possible to be put on the track of some novel technique while scanning articles having little apparent connection with amateur radio. This is one of the reasons why one must have some reservations about the claims made for computerized information retrieval systems. A major requirement for following up initial references is access to a really good technical library, and it is worth reminding London members that they are extremely fortunate in being able to use freely such first-class libraries as The National Reference Library of Science and Invention —Holborn Division (formerly known as The Patents Office

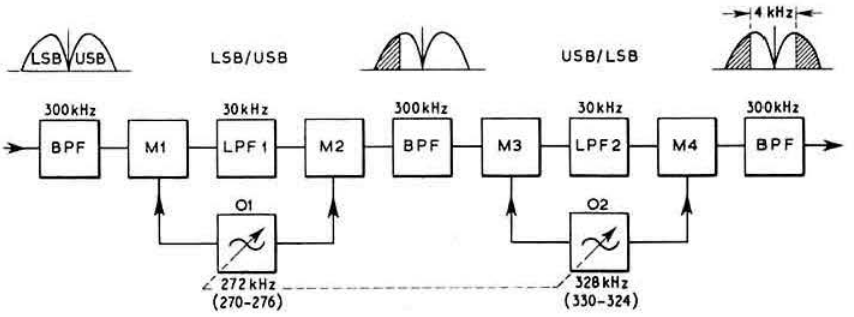


Fig 3. The basic principles of the continuously variable i.f. filter. With frequencies indicated the output bandwidth is ± 2kHz at a i.f. of 300kHz. Note the first slicing operation is on the upper sideband and not the lower sideband as shown

Library) and The Science Museum Library which has recently moved across the road to excellent new accommodation within the new buildings of Imperial College.

These thoughts have been sparked off by discovering in an article concerned with sound broadcasting ("System bandwidth and channel spacing in a.m. sound broadcasting", *EBU Review—Part A*, August 1969) a brief note on a commercial receiver having unusually good characteristics. It is pointed out that this comes extraordinarily close to the "ideal receiver" with square selectivity characteristics. These result from the use of a particular type of i.f. filter with which the bandwidth can be adjusted while retaining the extremely steep slope of the selectivity curve. It is noted that with a bandwidth of ± 6kHz, the shape factor (60dB bandwidth/6dB bandwidth) is 1·07!

This intriguing item led us in turn to an article describing in more detail band-pass filter networks having continuously variable bandwidth ("Bandfilterschaltung mit stetig regelbarer Bandbreite", *Internationale Elektronische Rundschau*, 1967, Nr 5). From this article the principles can be grasped, even with only an elementary knowledge of German. Since this article was written by a Rohde & Schwarz engineer, it seemed worth consulting the 1968-69 English-language catalogue of this firm, which, as is the way of these things, had been resting on my own shelves for many months without arousing curiosity on these particular filters!

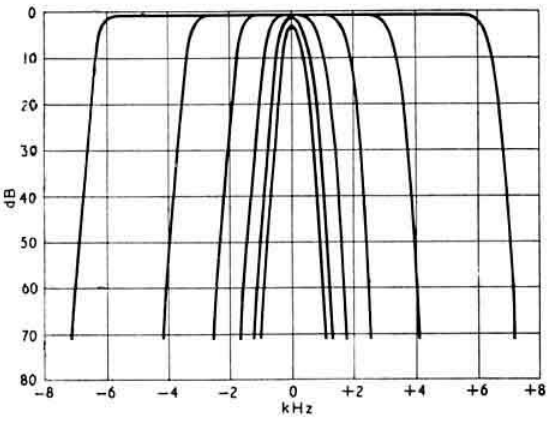


Fig 4. Claimed selectivity curves of the Rohde & Schwarz EK07-80 filter at bandwidths of ± 0·15, ± 0·30, ± 0·75, ± 1·5, ± 3·0 and ± 6·0kHz. Note the similar slopes achieved right down to −70dB at all settings

But enough of the background—rather, what exactly is the principle of this type of long-desired i.f. filter—and has it application to amateur equipments?

The filter (see Fig 3) is based on a dual mixer system (four mixer stages) using two ganged local oscillators to vary the bandwidth and two high-grade 30kHz low-pass filters to provide the steep slopes. It is, in fact, an extended form of the ingenious af filter technique reported by Alex Gartshore, GM3UMW, in *TT* (March 1969). By correct choice of oscillator frequencies and the use in one case of sideband inversion, the two sidebands of the incoming i.f. signal can be shifted towards or away from the sharp cut-off characteristics of two identical 30kHz low-pass filters. After imposing on to the signal the two sharp cut-off edges, it is then converted back to the original i.f. centre frequency, which, in the German commercial filters, is 300kHz. In effect, what one is doing is to synthesize a variable band-pass filter with two fixed low-pass filters, in much the same way as GM3UMW obtained his variable frequency af filter. The system could be used at i.f. or af.

The basic relationships between the oscillator frequencies, the intermediate frequency, the lp filter frequencies and the bandwidth are set out below:

$$f_{o1} = f_{if} - f_g + f_b$$
$$f_{o2} = f_{if} + f_g - f_b$$

where f_{if} is the intermediate frequency; f_g is cut-off frequency of the low-pass filters; $\pm f_b$ is the required bandwidth of filter; f_{o1} is the frequency of the first oscillator; and f_{o2} is the frequency of the second oscillator. The frequencies for a ± 2kHz bandwidth for a 300kHz i.f. are indicated in Fig 3. As the oscillator frequencies change (in opposite directions) towards 270kHz and 330kHz the bandwidth of the filter will be narrowed. By independent adjustment of the oscillator frequencies, various asymmetrical filter characteristics could presumably be set up.

The advantages of this quite complex form of synthesized filter stem from the fact that it should be possible to construct high-grade low-pass filters at about 30kHz having almost ideal slope characteristics, and further that almost exactly the same slope is achieved with narrow bandwidths as with broader bandwidths. The operational advantage of being able to select an optimum bandwidth for the signal conditions needs no stressing. According to the Rohde & Schwartz catalogue, filter type EK07-80 is intended to provide continuous adjustment for bandwidths from 300Hz (ie ± 150Hz) to 12kHz (± 6kHz); another unit, the EK07-81, provides six selectable bandwidths: ± 0·15, ± 0·30, ± 0·75, ± 1·5, ± 3·0 and ± 6·0kHz. It is stated that the filters offer high temperature stability and resistance to ageing. Ripple in the

passband is less than 3dB. The skirt selectivity for a response from 3dB to 6dB down is less than 1·2kHz, independent of the output bandwidth (ie the response curves are almost parallel, see Fig 4).

While we have no idea of the cost of these high-grade commercial filters, we suspect that this is probably well above normal amateur budgets. But, despite the complexity of the system, and the need to design and realise the low-pass filter networks, it might well prove possible to build filters of this general type with reasonable prospects of achieving good performance. It would be useful to know what type of mixers are employed in practice, and whether the 300kHz band-pass filters are more complex than normal i.f. transformers. None of the sources so far consulted have indicated any precise details of the construction of the filters, though it is mentioned that either valves or semiconductors can be used as the active devices. Certainly such a filter, while not a project to be tackled lightly, would, if successful, give an extremely useful flexibility to any communications receiver, and bring us one step nearer the age-old search for effective, square-topped, variable selectivity response curves.

Monitoring drive voltages

Last month we showed the useful diode attenuator used by Phil Horwood, G3FRB, in his latest transistorized ssb exciter. A further idea used in this exciter is his method of pa grid drive voltage monitoring. G3FRB is a firm believer in the value of built-in grid voltmeters for this purpose, but considers this is another simple method. As shown in Fig 5 the normal grid-current meter is switched to become an rf voltmeter when the bias is removed from the grid; the grid forms the "diode anode" of the rf detector. Under such conditions it is essential that no ht must be applied to the pa during measurements, and a spring-biased double-pole change-over toggle switch breaks the ht "on" circuit as a safeguard, in case the user has forgotten to switch off ht before measuring pa grid drive. R1 is chosen to give the appropriate full-scale-deflection of the meter.

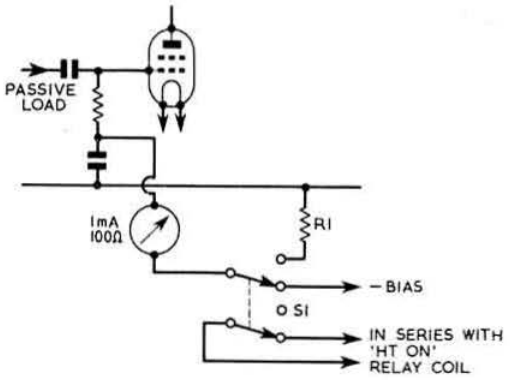


Fig 5. G3FRB's method of monitoring pa grid current/drive voltage. S1 is a spring biased double-pole change-over toggle switch

G3FRB notes that it is a good idea to calculate this to give a *peak* rf drive voltage fsd, rather than rms voltage. It is then possible to equate drive with bias at the onset of grid current. If the grid current meter is shunted to greater than 1mA fsd, it is better to add the extra switching needed to return it to maximum sensitivity when used as an rf voltmeter: if the basic meter movement is more sensitive than 1mA, so much the better.

More on zener noise generators

The notes in the September *TT* on simple zener diode noise generators have prompted John Bluff, G3SJE, to report his experiences with a basically similar arrangement which he made up some months ago. While there remain some curious features of the noise/current relationship, his final summing up is in the form of a firm recommendation as to the usefulness of this type of noise generating element for receiver alignment etc.

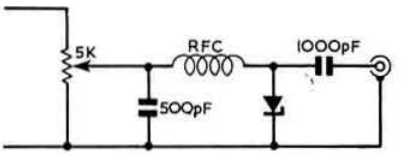


Fig 6. The circuit arrangement used by G3SJE in his zener diode noise generator

G3SJE's generator uses the circuit shown in Fig 6; this is practically identical with that already described in *TT* but was chosen to allow the use of a stud-mounting diode, which just happened to be an STC VR575BA (5·75V, 5·25W). A 5W diode may be expected to have a fairly high junction capacitance which could present matching problems unless one accepts that output will vary appreciably with frequency. The 5k potentiometer was intended to control the output, which it was anticipated would follow the simple relationship of more current, more noise.

The prime purpose of this unit was for hf receiver alignment, and in practice useful output was obtained throughout the range 1·8 to 30MHz. However, it was also found that when used with a 144MHz converter very high noise input was achieved, even though the generator components and lay-out had not been chosen with vhf in mind. G3SJE does not have facilities for accurately measuring how noise varies with frequency, although it was found on hf that noise input to the receiver could be appreciably increased by using an aerial tuning unit between generator and receiver (indicative perhaps of the high junction capacitance). Normally the generator is connected, for example, to a Drake R4B having a nominal 50Ω input socket, through about 3ft of 50Ω coax.

To his surprise, G3SJE found that noise output did not increase with current, but rather there was a sharp and significant peak of noise with a current of about 12mA, even though the diode concerned can pass nearly 1A. Between 100 and 200mA the output is roughly constant (it was this ability of a zener to act as a stable noise source that we highlighted in September). The curve of Fig 7 is an approximation of the noise output at 50MHz, although the peak current appears constant throughout the spectrum. A similar peak in the noise/current curve was obtained using a different zener diode. G3SJE wonders what is the explanation for this sharp peak (about 9dB up on the more constant output with higher diode current). This peak was not mentioned in the *IEE Electronics Letters* references, but these did include the

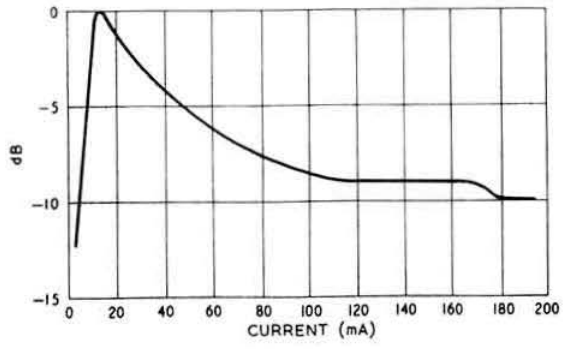


Fig 7. An indication of the pronounced peak of noise output which occurs at low diode currents

statement that "below about 20MHz considerably higher noise levels can be obtained, but these are very dependent on the current through the diode". It is still not clear whether this peak effect would be obtained with diodes having low capacitance junctions.

G3SJE considers that the provision of some means of adjusting current for peak noise is useful if the circuit to be aligned is well off tune so that initially considerable noise input is required. An alternative arrangement might be to use a diode or conventional resistive attenuator between the noise generator and the receiver. But whichever method is adopted it does appear that the zener diode noise generator is a useful addition to the shack.

Printed circuit boards for vhf

"Radio-frequency circuits, particularly at uhf and vhf, always seem to be trying to trip up their designers . . . it is rare for one—even a simple one—to work properly the first time it is tested. Yet the cause is well known: it is stray reactance."

This is the provocative opening paragraph of an article "Reduce stray reactances at vhf and uhf", by R. W. Hankins and H. W. Lamberty, which appears in *Electronic Design* (13 September 1969) and which puts forward several ideas of interest to all who make up their own printed-circuit boards.

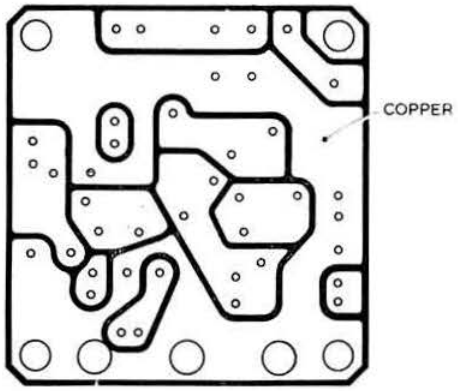


Fig 8. A typical small printed circuit board for uhf based on the "boundary" method and indicating the large amount of foil left on the board in order to reduce stray inductances

Several reasons are listed as to why printed-circuit wiring may often prove inferior to skilled point-to-point wiring. It is suggested that the boards are often made too large. Too many circuits/stages are placed on a single board. For best results the authors consider there should usually be just one circuit per board, with signal connections between boards made via coaxial cable. Each power and control lead should be brought into the board at one point only.

On the boards, it is suggested that interconnecting leads should be made as wide as possible to reduce series inductances. The authors believe that stray inductances can be virtually eliminated by using what they term a "boundary" method of lay-out. The principal aim is to leave *as much foil* on the board as possible: see Fig 8. In planning a board, boundary lines are drawn through the circuit diagram of the various components to separate the current nodes of the circuit; then it is arranged to remove fairly thin lines of foil only along these boundaries, thus leaving relatively large islands of foil connecting the various components. Stray capacitances across the boundaries will be fairly small, since the gaps, though quite narrow, will nevertheless be relatively wide compared with the thickness of the foil. Double-clad board (ie those with copper foil on both sides) should be avoided with this technique, since stray capacitances would build up to an excessive figure.

It is stressed that this boundary method of lay-out is especially suitable for transistor circuits since vhf and uhf transistors have very low input and output impedances, so that even quite small additional series inductive reactances can be disruptive to operation; whereas small shunt capacitances, resulting from the boundary lay-out, are far less important.

Earthed emitter amplifier

The *Electronic Design* article also discusses the self-resonant frequencies of typical capacitors and inductors, as well as the inductive and capacitive reactances inherently associated with resistors. "At vhf and uhf the true complex nature of components becomes painfully apparent—and the effects of stray reactances are an overriding consideration in the selection of components at these frequencies," it is observed.

Good design practice demands that capacitors and inductors should be operated well below their self-resonant frequencies. A 100pF capacitor by-passes at 300MHz better than a larger value, and sometimes several must be used in parallel to achieve adequate by-passing where a larger value is needed.

The third area in which stray reactances can be combated is in the circuit design, including the selection of transistor biasing techniques. The authors discuss the advantages for vhf and uhf amplification of using a second transistor to stabilize collector current (instead of the conventional three-resistor biasing arrangement) to overcome the problem of effective emitter by-passing at vhf and uhf. This scheme is outlined in Fig 9 in which stability is achieved by sampling the current in R1 and amplifying the changes with Tr2. This, in turn, changes the base current of Tr1, which reduces the change in Tr1 collector current.

Since the variations in collector current are controlled by the product of the Betas of the two transistors, R1 can be made much smaller than would be practical with conventional three-resistor biasing for the same degree of stability. It is also pointed out that the dynamic range of the amplifier

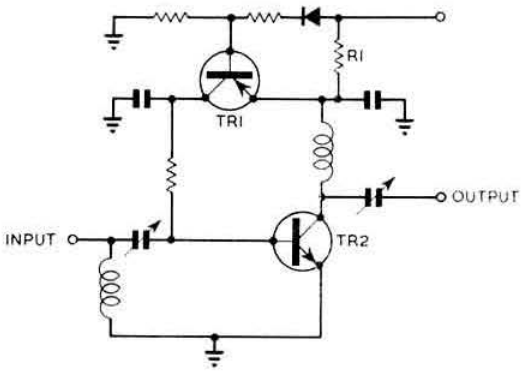


Fig 9. A method of employing feedback to stabilize collector circuit of a uhf amplifier to permit the emitter of TR1 to be earthed. Transistor TR2 is the active element in the feedback loop whose input is the voltage across R1

is increased. The prime aim, however, is the elimination of stray reactances which would otherwise be associated with the by-passing of the emitter resistor. This amplifier technique is also discussed in an earlier article: "Design wideband uhf power amplifiers", by J. H. Horwitz, *Electronic Design*, 24 May 1969.

Active car radio aerial

In the August *TT* (and on several previous occasions) we reviewed briefly some of the fascinating work being done by Professor Hans Meinke on miniature active receiving aerials in which a transistor not only provides amplification but is also used to achieve an accurate noise match, thus preserving the good signal/noise ratio of signals picked up on a small structure. Since then at least two of his designs have appeared in actual commercial equipments.

Rohde and Schwarz have announced the use of active aerials for some specialized aviation applications. And "fuba" (Hans Kolbe and Co) have released information on their new Alpha 3 car radio aerial which is entirely incorporated within a compact wing mirror. Inside the housing is a printed-circuit panel containing aerial loops and two transistor amplifiers (see *Wireless World*, November 1969 or *Electronics*, 15 September). The aerial is intended for use throughout the range 150kHz to 25MHz and also on Band II (vhf/fm). While the price (about £9 in West Germany) is appreciably above that of a conventional telescopic rod, a number of useful advantages are being claimed—not least the reduced likelihood of accidental or deliberate damage often experienced with rod aerials. The aerial incorporates static protection diodes, and it is claimed that as a result of the band-pass characteristics and low signal pick-up, cross-modulation characteristics are very good. The aerial provides an input to the receiver claimed as better than the average telescopic rod. Altogether it is beginning to look as though our earlier guesses that more would be heard of active aerials (see for example *Amateur Radio Techniques*, pages 136-137) were not too far off the beam.

Static protection by spark gaps

On the general question of protecting semiconductor front-ends against aerial pick-up of static voltages, H. O. Bradshaw, G3VTJ, draws attention to an article by A. Ciuciura in *Mullard Technical Communications*, July 1969, (a condensed version can also be found in *Mullard Outlook*, July 1969) on the use of spark-gaps for the protection of radio receivers.

This reviews the devices in use to protect input circuits from damage due to static charges collected on aerials; these include voltage dependent resistors, back-to-back diodes, neon lamps, and modifications to input circuits. The article then goes on to describe in detail the construction and testing of miniature spark gaps, one of the earliest ways of protecting receivers. These have the advantage (from an amateur viewpoint) of not increasing cross-modulation, which can be a serious disadvantage when using germanium back-to-back diodes. The spark gap has a self-capacitance between 8 and 10pF, with an inter-electrode insulation unlikely to fall below 10MΩ, and a performance unaffected by a long period of inactivity in complete darkness.

The spark gaps described in this article are based on the use of 0·001in Makrofol N insulation material which, when suitably perforated, forms a well-defined spacer between two 6BA solder tags, held together by a 6BA by $\frac{1}{4}$in nylon bolt. A rectangular slit in the insulator is made slightly larger than the eyelet so that a free access of air is provided to the electrodes. The spark gap has a dc breakdown voltage of about 400V and in tests has proved effective in protecting input transistors against discharges of up to 15kV in the case of mw/lw receivers. Less satisfactory results were obtained with vhf/fm receivers because the low inductance of the input circuits provided insufficient breakdown conditions. However, it proved possible with many receivers to make circuit modifications which enabled the spark-gap to provide safe operation for discharges up to 10 to 15kV. Common base input transistor vhf amplifiers can be modified by reducing the value of the emitter and base coupling capacitors without degrading performance; this results in less energy applied to the junction so that with careful selection of components the receiver is safe for discharges up to 4 to 5kV, at which point the spark gap takes over.

The article notes that occasionally difficulties are experienced from charges collected on various metal parts of radio receivers such as loudspeaker grilles, frames of wavechange switches, and various brackets; it is advisable to provide a well-bonded path to dc between all major metal parts of the receiver and chassis.

The comparatively large inductances used on mf can ensure good breakdown conditions for a spark-gap, and the low self-capacitance of the device does not interfere with the tracking of the receiver. This suggests that the technique would be particularly suitable for the protection of 1·8MHz mobile equipment.

Multiband stub aerials

In view of the recent reference in *TT* (October) to the use by W1CEJ of stubs instead of traps to provide multiband operation of a dipole structure, we were interested to see at the RSGB Show the new J-beam tri-band for 14, 21 and 28MHz. This appears to make very effective use of concealed stubs, which are formed from 72Ω flat line wound internally on a former accommodated within the elements. A description of this sturdy-looking array by B. D. Sykes, G2HCG, appeared in the May 1969 issue of *SWM*. G2HCG drew attention to the dx gain of beam aerials which is derived from the angle of radiation and which can result in a practical gain appreciably better than the theoretical gain.

Breakthrough

Breakthrough

Breakthrough

Everyone is talking about it, now let's DO something!

Says KAY PRIESTLEY, G3XIW*

TVI? was the sign over the stand of the TVI Clinic making its first appearance at the RSGB Exhibition this year. Judging by the comments and questions we received, and by the reactions of many visitors to the Exhibition, this is a common disease often slow in responding to treatment, and thought by some to be incurable. It is capable of arousing irrational fears and phobias to the extent that a psychological barrier is built up and any discussion of the subject is totally inhibited. We saw you—inspecting the home-constructed equipment, then taking a sidelong glance at the sign ("four-letter word" someone called it), and turning about-face and move smartly out of range of that fearsome female who actually wanted to talk about it! Seriously though, it was good to talk to so many of you; thank you for coming and telling us about your tvi problems.

"Well, you are the expert," some of you said to me, but you are wrong. True, I have acquired some knowledge by close association with problems in the TVI Clinic, but my qualification is the same as that of most of you. Indeed, the only examination in this country which requires a knowledge of interference so far as we know is the Radio Amateur's Examination. So, maybe we are not all experts but let us not forget what we do know, or neglect to use our knowledge in fulfilment of our licence which can be interpreted as compelling us to tackle that tvi—using your station "as part of the self-training of the licensee in communication". There is no self-training in voluntary abstention.

Of the people who came to talk to us, the vast majority were suffering from unpleasant relations with the neighbours, or deficiencies of tv receivers and/or aerial systems. The most popular leaflet was *TVI Investigations—How to cope*. In other words, the social problem looms largest of all.

The most effective way of learning is by experience, and undoubtedly anyone who has experienced an unpleasant complaint of interference would be better equipped to deal with another if they could in the meantime move house and begin again with different neighbours. Unfortunately for most of us, we do not get a fresh start, but rather have to continue to live in an atmosphere of suspicion and sometimes open hostility which drives all but the very thick-skinned off the air in tv time just for the sake of peace.

When your neighbour first knocks on your door, or bangs on the wall, or phones you, by far the best reaction is calm controlled interest and concern. By that I do not mean to imply that you must take all he says lying down and admit liability to anything. Rather take a leaf out of the well-trained salesman's book—he almost welcomes your complaint and is so nice about it that you cannot possibly be cross any longer. He has the advantage that there is always someone else he can blame, but it is not necessary or desirable for an amateur to take responsibility for the deficiencies of a neighbour's tv set or aerial installation. Talk about "breakthrough", not "interference"—this is an accident after all, you are not doing it on purpose. Be fair, it might be harmonics in your transmitter, or spurii, or even a rusty joint on your premises, and if it is you must be willing to do something about it. But your initial friendliness and co-operation will go far toward encouraging the co-operation of your neighbour; a co-operation which, if only one can be far-sighted enough to see it, will become essential to an eventual solution of the problem just mooted.

People feel strongly about tv. It is no exaggeration to say that this is the household god, and nothing—but nothing—must be allowed to interrupt the daily oracle. Tv servicemen tell weird tales of threats, even assaults, in the course of their work. It is not surprising then that the activities of any known amateurs should be suspect and that complaints are almost always made vehemently.

Not many of us are wise enough, tactful enough, or even calm enough in the face of a threat to our own peculiar hobby to deal with our neighbours in such a way as to retain or gain their co-operation. This is where we need a friend. Do get together in small groups at the club and prepare for this; or have a word with another amateur who lives not too far away and come to some mutual agreement, so that when one of you hits trouble you can both jump to it and start with a spirit of co-operation and active desire to make a speedy and effective cure.

Once you have convinced your neighbour of your willingness and ability you can proceed to logical diagnostic testing and possibly find the cause and effect a cure without recourse to the Post Office. It is rather unlikely that an amateur alone will be able to deal entirely with a complaint of breakthrough—for one thing, testing is rather difficult. But when two or three amateurs work together it is a different matter. If the social climate deteriorates in spite of all your efforts, then your neighbour may call the GPO in to mediate. If he has had trouble before he may not even tell you but simply make a complaint, and the first you know about it is when the interference officer calls.

Beware of the trap that has ensnared many amateurs who vainly thought the GPO can clear up the trouble. The interference officer simply tries to discover the cause and make suggestions for a cure. If the fault lies in your transmitter you will have to do your own fault finding and effect your own cure. If the fault is with the tv set then the interference officer will try a filter and may offer to sell one to the complainant. Unfortunately he has no filter designed specifically

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for this job, and often the filter you can knock up in half an hour will out-perform anything in his armoury. Remember the GPO man is only a mediator, not a magician. Ultimately it is *you* who has to do the work.

It is estimated that something like 80 per cent of breakthrough problems are caused by inadequacies of the tv set or receiving aerial installation. Transistorised front end and set top aerials are the main bogeys. The cure for the first is, of course, a high-pass filter which will reject the breakthrough signal. First you must determine what frequency is giving trouble and then filter that frequency out. The signal may be pouring down the outer of the coax feeder as well as, or instead of, the inner, so you may need braid filter(s) as well as, or instead of, a high-pass. Now it is obvious that the help of a friend and the co-operation of the neighbour are an essential part of the cure.

If you can demonstrate that your own tv set does not suffer breakthrough, this is a telling argument in your favour. At least one amateur invites his neighbours in to watch his set if they come complaining that he is spoiling their programme. Another has a complete tv aerial system which he will erect on the neighbour's lawn to prove that with a decent aerial the set would be free from breakthrough. Admittedly, not many amateurs could go that far single handed, but there is no reason why a club could not be prepared to do this.

Perhaps it should be made clear at this point that it is inadvisable to make any adjustments or alterations to the inside of the set. With the owner's permission you may insert filters in the feeder, but any work on the set itself must be referred to a dealer. One amateur told us that he had a very kind neighbour who had allowed tests, and his set had been fitted with a suitable filter. A couple of weeks later the set caught fire and was reduced to a smouldering wreck. The kindly neighbour returned the filter, telling the amateur to keep it handy in case they needed it for the new set!

Only one type of visitor to the TVI Stand really worried me. That was the fellow who admitted to harmonic tvi and claimed it is incurable. This particular form of the disease seems to be infectious and in some parts of the country has reached epidemic proportions—whole clubs, even whole towns, are silent in the evenings because the amateurs concerned are too ignorant and/or idle to do anything about it. "If you can read, you can cure tvi," said G2HW, *RSGB Bulletin* April 1954. If you have not got *Bulletins* going back that far, try this year's issues of *Radio Communication* and chapter 18 of the *Radio Communication Handbook*, then get on and *do* something.

Harmonic tvi can be cured. It rather depends on the local tv field-strength exactly how much work is required, but there are amateurs living in fringe areas who can use their transmitters any time without causing trouble. One told us he does not put his swr bridge in circuit in tv time because that alone would generate enough harmonics to upset the tv sets, but his very carefully screened and filtered transmitter and aerial system is harmonic proof.

The TVI Clinic offers advice to individual amateurs, particularly those who have obtained a licence in the last few years, with any technical problems they may have in cleaning up their transmitters. Amateurs in possession of *RSGB Bulletins* dating back to the fifties have heard all this before, and frankly they should have clean transmitters by now. Our first aim must be to put our own house in order and ensure that our equipment is not causing offence by any spurious radiations.

We also have some useful information about certain tv sets and we would like to collect a lot more. We are interested in anything you can tell us about a particular (Make and model No.) tv set.

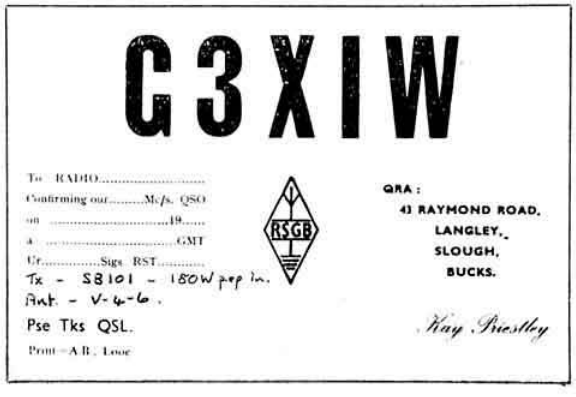
If you have a tvi problem, write to us for a questionnaire. This is designed to encourage you to tell us as much about the problem as possible, so fill it in as fully as you can and write extra pages if you like. We also have some literature available for the more recently licensed members.

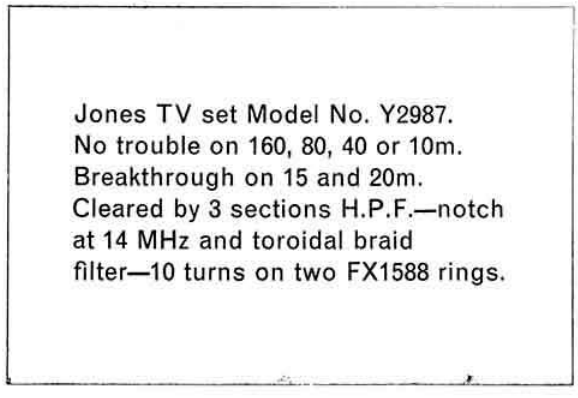
Is there a tvi group in your club? Please write and tell us about your activities and the cures achieved, so that we can spread the news about and give you any useful information that comes our way from other similar groups.

For a long time amateurs have been coping—or not coping—with tvi in a lonely individual way. We think it is time we got together a bit and helped each other. Together we should be able to cut down the number of cases and increase the number of complete cures.

How about it? Will *you* help? Please send me a letter or a QSL card *now* with your callsign and name, the make and model number of your tv set, and briefly what you had to do to it to cure tvi. If the answer to that one is "nothing" we will be even more interested in the make and model!

Here is a sample QSL card. Send me yours NOW





Aerials and planning permission

Practical considerations

This article follows on from *Aerials—Planning and Rating Problems*, by G2BVN, which appeared in the September 1969 issue of *Radio Communication*

By J. A. Crux, G3JAG*

IT should by now be abundantly clear that amateur radio aerial systems are not exempt from the requirements of the Town and Country Planning Acts, but unfortunately little has appeared in print to guide a would-be applicant for planning permission. This is a pity because it may lead to amateurs assuming that the actual application procedure is as simple as that applicable to garages, garden sheds and similar structures.

This article, based on the author's successful but lengthy struggle for official approval of an aerial, is written to point out some of the pitfalls awaiting the unwary.

From the layman's point of view, the purpose of Town and Country Planning is to prevent undesirable development from being carried out, and the word development in this case covers pretty well everything from domestic buildings to motorways and industrial estates. However, for practical purposes where amateur aerials are concerned development may be defined as anything which materially affects the appearance of the property.

Neither the RSGB nor the author would wish to be placed in the position of advising amateurs to ignore the laws on planning, but it must be admitted that in some cases there may be considerable doubt as to whether or not a given aerial does in fact materially affect the appearance of the property. Some types of wire aerial are extremely inconspicuous and it is unlikely that a local authority would insist on planning permission being obtained, though it is advisable to make sure first.

Generally speaking, if the proposed aerial system is clearly visible, or if it requires some supporting structure which is clearly visible, it is safer to assume that planning permission will be required. A point worth remembering is that the law exists to protect as well as to control, and that neighbours are entitled to protection against any new development which may reduce the amenity value of the district, be it a rubbish dump, an aerial system or a row of pylons. Despite frequent claims to the contrary, this includes flag-poles.

In the amateur radio world there seems to be two extremities between which most amateurs find themselves in so far as their neighbours are concerned:

(*a*) Good relations with practically all neighbours; a low or non-existent level of tvi.

(*b*) Open hostility, coupled with endless disputes over tvi.

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Amateurs lucky enough to be in situation (*a*) rarely run into really serious trouble over aerials, largely because those most affected by the presence of the aerial adjacent to their property are not going to make a fuss about it—they may even help to put it up.

For the rest, however, right down to the most unlucky of all in situation (*b*), there is a very definite connection between tvi and the visual appearance of an amateur aerial system. Tvi is now known not to be a planning consideration, but it may well provoke planning objections on amenity grounds. In this instance one can substitute "eyesore" for "amenity" because the impact of an aerial is purely visual. One of the advantages of a successful application for planning permission is that it forestalls any back-door attempts to stop tvi by objecting to the aerial on planning grounds, thereby persuading the local authority to order the removal of the offending structure (and in the process to put the amateur concerned off the air). The author knows of at least one case where this approach very nearly succeeded.

Whatever the actual outcome of such an attempt to curtail an amateur's activities, it seems certain to cause considerable unpleasantness and expense for the victim. Incidentally there is no need to comply at once with an order to remove an aerial. Before actually doing anything obtain competent professional advice because, by exploiting the appeal procedure to the full, the author is assured that it is possible to delay removal of an aerial for some time, perhaps even for a year. This could be useful if in any case one was contemplating moving house. Professional advice is a must, however, to avoid trouble.

Having decided to apply for planning permission it is as well to realize at the very outset that the object of the exercise is to get the plans accepted. So be realistic about what goes on to the forms. A four-element quad at 70ft or 100ft may be ideal, but in a typical urban locality, such as a high-density housing estate, this kind of proposal is not likely to succeed. Likewise multi-element arrays for moon-bounce work may be highly desirable to their owner, but not to the neighbours. There is no substitute for common sense at this stage, and it is entirely up to the applicant to be reasonable about his proposals. The smaller the visual impact of the proposed aerial, the more likely is it to be acceptable, but it is utterly impossible to lay down hard and fast rules which cover every situation. Basically the amateur must be prepared to make out a good case for having an aerial of any

particular kind, not just because it is technically efficient but also because it will be a positive asset to the district. If the authorities can be convinced that amateur radio and aerials are an asset to the district the battle is already half over.

Before actually submitting plans it is essential to take certain precautions. Verbal assurances from local council officials are not to be relied on, as the author discovered to his cost. It is worth finding out in detail exactly how plans in your area are handled and who will deal with them. One thing to watch for is whether they are vetted by any external body, such as the county council, in addition to the local authority. Even if the local people accept the plans they may be overruled by the county planners, or more likely still, the local body will wait for county level approval before taking a decision at all.

Perhaps the most valuable step to take is to lobby the people actually sitting on the local planning sub-committee so that the plans will get a fair hearing at least. It is absolutely essential that the committee understand exactly what is planned. The next step is to track down the official who is actually in charge of planning matters, and then to persuade this individual to help. He will probably be able to supply information on who, if anyone, sees the plans and makes recommendations on behalf of the county council. Bribery is not to be recommended.

All of this may seem to be a lot of trouble, and it may seem that "button-holing" people in influential positions is rather underhanded, but it must be pointed out that opponents of the plans will certainly have no scruples about tackling anyone whom they think can exert pressure in the right direction, not excluding the local MP.

When a planning proposal is likely to affect immediate neighbours, the local authority usually canvasses public opinion in the district. The official who carries out this canvass will not put forward the amateur's point of view and may give a totally misleading impression of what is planned. If any neighbour is left with the impression, however false, that a pylon is about to arise next door or immediately in front of his lounge window, the results will be far from amusing. Visions of "supergrid" pylons marching across the local landscape arouse instant hostility and practically guarantee a flood of complaints. The safest thing to do is to tell the neighbours personally before the council does, at the same time answering enquiries about tvi, lightning hazards and the risk of damage to property. If any of the neighbours are willing to support the planning application, it can be of great help. If they oppose it, they would have done so anyway, regardless of who first brought it to their attention.

If after all this the planning application is refused, it is not the end of the road. Assuming that the plans are reasonable, it is possible to lodge an appeal or to submit an amended plan which overcomes the objections made. If practicable this latter course is the quickest and easiest, although of course it will usually mean accepting an aerial of reduced size in an inferior but less conspicuous position.

If when the dust has settled there is no possibility of an agreement, the only thing left is an appeal. Normally this will take the form of a Public Inquiry before a Ministry Inspector. It must be stressed that there is no point in appealing unless one is prepared to go all out for success. It is not enough to satisfy the inspector that amateur radio is a good thing, because he will already know this, and it is not enough to blind him with science about the efficiency of the proposed aerial, because this is not relevant. The problem is one of convincing the inspector that the aerial is necessary and that it is not unduly detrimental to the amenities of the district. If there is a similar aerial system already in the district it may also be necessary to make out a case for the new aerial on the basis of it not constituting an excessive use. It is arguable as to what constitutes an excessive use in any given circumstances because the term is open to rather wide interpretation. It is easy to appreciate that three closely adjacent fish and chip shops on one housing estate is probably an excessive use, but it is a matter of opinion whether or not three amateur aerials within a half mile of one another is an excessive use. At least one amateur known to the author has been successful in overcoming this particular objection, though to be fair there were other factors in his favour.

It is possible to conduct one's own case at a Public Inquiry, but not unless the appellant knows exactly what he is doing. In any event, apart from presenting a case convincingly, there is the very real problem of what case to present and on what grounds the appeal should be based. That is why the author strongly recommends any would-be d.i.y. appellant to obtain advice first before even lodging a formal appeal. Even with the necessary legal advice there is a great deal of hard work to be done long before the inquiry takes place. The most important job for the appellant to do in person is to go out and interview everybody who owns a house in the vicinity, including those who cannot possibly see the proposed aerial. The reason is simple. Some time before the inquiry the local authority will write round, drawing attention to the inquiry and to the right of the public to both attend and object if they want. If this letter comes to someone who already has met the appellant and who knows all about the aerial, all well and good. If it is the first the recipients have heard of the matter then there is a good chance that some at least will be sufficiently alarmed to go round to their councillor or to their solicitor. The net result is usually trouble.

The objects of visiting are to inform, to reassure (usually about tvi), and to enlist support in the shape of signatures preferably on a document stating clearly that the undersigned know that the proposed aerial will be a three-element beam on a pole or tower 40ft high and that there is no objection to it. Signatures on a document without full information are useless. The author viewed this job with considerable misgivings, but after several evenings tramping the streets he found it turned out to be fairly easy. Even those who did oppose the appeal showed a certain sympathy, and a good number of others went out of their way to be helpful. Nearly 80 houses were visited, but the local authority wrote to about 100, so that the author probably only just did enough. Fortunately no objections came from those who were not included in the visits. More than one visit was made in many instances.

While visiting it is a good plan to watch out for notable eyesores, which may be either planned or unplanned. A huge siren on a 30ft pole only a few feet from the front door of a modern semi is a classic example. Things like this may be useful in showing that the local standard of amenity is not high or that the proposed aerial will not be all that noticeable. How this information can be used to sway the inquiry in favour of the appellant is a job for an expert. It requires a certain amount of nerve to say in public that the proposed aerial will be "slender and graceful, with even pleasing lines" but this may have to be said, preferably with a straight face! It also requires nerve to tell objectors at the inquiry that they

are talking absolute nonsense, and it is infinitely better to get a third party to do this, as tempers usually run high and a slanging match will not impress the inspector very favourably. His job is to ascertain facts first of all, and then to weigh the opinions put forward as to the merits and demerits of the appeal.

Even if all the objectors are known beforehand (and they ought to be) it is impossible to predict what will be said and what ought to be said in reply. That is why in an article of this kind the author has deliberately recommended that professional advice is well worthwhile, particularly for deciding the grounds of appeal and how to present the case in the form of a written statement suitable for reading out at the inquiry. It cannot be emphasized too strongly that because the actual circumstances in every case are so different, the written statement cannot just be copied from one used elsewhere.

It is true that in many cases the same basic grounds of appeal may be perfectly adequate, but no two written statements are likely to be even remotely alike. That is why the help of an expert is well worth spending time and cash on if necessary, in order to get the written statement into the best possible form. The author's adviser in his appeal was at the time professionally occupied to a large extent on planning appeals. The statement he prepared for the author ran to nearly eight pages of foolscap, without a single wasted word. In reply to this the local authority could only produce a case which barely covered a page and a half. Most of the local authority's case was taken up by a series of general statements about the site of the proposed aerial, and as these were not in dispute in any way it can be appreciated that in comparison to the appellant's statement it must have appeared to the inspector as a pretty unconvincing effort.

Many amateurs at this point are probably wondering whether or not it is worth the trouble and how much it costs to mount an appeal properly.

In the author's view it is very definitely worth the trouble involved. The alternative would have been either no amateur radio operation at all or at best a very inferior wire aerial at a low height. The facts of the author's case are very simple and remain on record as an object lesson on how not to win friends and influence people. Having moved to a semi on a small estate, which being fairly recently developed is totally lacking in trees or other suitable aerial supports, it was decided that the large garden could best be used by installing a vertical aerial and ground system. Because of the lack of trees and the open view from many surrounding houses, planning permission was sought (and refused) for a very slender 60ft vertical.

It turned out that the planning committee had simply taken the advice of the county authority, who admitted that they thought the application was for a business radio installation! One member of the planning committee made it abundantly clear that if the author had bothered to see him and the other members first the outcome would have been rather different. The neighbours had been given the impression that a 90ft pylon was about to be inflicted on the district so, naturally, they were not very enthusiastic either. They had also been told by a resident self-appointed expert that tvi was inevitable and that the only answer was to prevent the station being installed in the district.

The appeal was lodged immediately and an inquiry held six months later. The author was represented by his adviser, who not only gave all the evidence but also submitted to cross-examination, thereby saving the author from any risk of making mistakes and also from any personal argument with objectors. After all, the author has had to go on living with his neighbours and it seemed far more satisfactory to let them have an outsider to blame afterwards for what happened at the inquiry. This proved to be true and within a very short time after the appeal had been allowed the whole affair was forgotten.

The vertical has been down rather more than it has been up because of mechanical problems, but no complaints about its appearance have been received—only comments that it is now hardly noticeable and that it has ceased to be a source of annoyance. Tvi seems limited to swamping, as expected, and a Faraday loop filter has cured all but one set which is probably particularly susceptible. The rental company involved has accepted responsibility for curing this particular case, and the neighbour who suffers does not blame the author in any way for the trouble. All in all, a satisfactory outcome.

The cost of getting planning permission is practically nil, provided the plans are accepted at the first attempt. The cost of an actual appeal is also nil because the Ministry only charge for an inquiry in circumstances which are unlikely to concern an amateur. However, each side at the inquiry bears its own costs, including legal representatives, typing, duplicating and everything else. A certain amount of help is available free (or for the cost of photocopying) from the RSGB, but because each case differs so much the Society cannot give more than general advice.

One can learn from reading about earlier cases and it is possible to profit by others' mistakes. The average solicitor is probably not willing to do much more than appear at the inquiry, and of course he will expect to be paid an appropriate fee for what he does. It is very well worthwhile trying to find a solicitor who has experience in or who specializes in the planning field, even if it costs more it will be worth it in the end. The chances of success in a planning appeal are barely 50-50 in most cases and almost nil if the appellant is badly advised.

To sum up, the rules of the planning game for amateur aerials are as follows:

1. Apply for permission, using every legal means to ensure that the plan is accepted right from the start.
2. If refused permission, and if the plan is sensible, appeal against the refusal, with the intention of winning, despite the odds.

Apart from the satisfaction of having an efficient and perfectly legal aerial system, every successful application or appeal is an encouragement to others and a good thing for amateur radio generally. Nothing dents the image of amateur radio more than the sight of an unplanned, badly constructed and frankly hideous array of wires, girders or tubes swaying drunkenly in the breeze. The irresponsible experimenter image is still with us, even among councillors and council officials. This is an excellent opportunity for individual amateurs to set the record straight.

The 1968 Town and Country Planning Act

The preceding part of this article was based on the law as it stood at the time of the author's appeal. Since that time the law has been modified by the new Act. The author is indebted to his legal adviser for the following summary of the major changes.

Firstly, public opinion is to be taken into account to a greater extent than before.

Secondly, the local authority can delegate to their officers the making of planning decisions which were formerly taken by a committee. (The mind boggles at the anomalous decisions which could stem from this!)

Thirdly, the Ministry Inspector can decide simple cases, instead of submitting a report and recommendation to the Minister.

Fourthly, and most important, the local authority have now been given a new weapon to prevent unauthorized development. They can now issue a "stop notice", which means what it says, the development must *stop* forthwith. Earlier in this article it was suggested that by exploiting appeal procedures to the full, *enforcement* could be delayed in the case of an already existing unplanned aerial system. Now, if such a "stop notice" is received, there are penalties for failing to comply with it. Enforcement notices can still be served, and resisted by appealing to the Minister, but the local authority can now use this new weapon to secure removal of an offending structure *before* the appeal is heard.

There is one slight compensation. If the appeal in such a case succeeds, the local authority may have to pay compensation to the developer for any loss caused by the "stop notice".

Two things emerge clearly from all this:

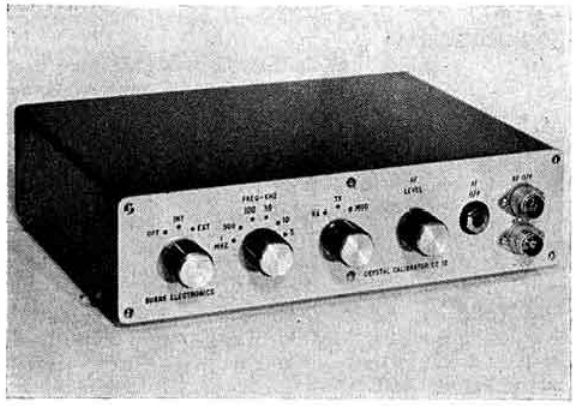
(i) It is now even more important to know how one's neighbours will react and to gain their sympathy, if at all possible.

(ii) The amateur who ignores the law completely (and his neighbours' feelings) runs the very considerable risk of a "stop notice" and in consequence an expensive heap of scrap in the back garden.

EQUIPMENT REVIEW

The Burns Crystal Calibrator Type CC10

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



ONE piece of equipment that is not only useful, but possession of which is a transmitting licence condition, is a frequency measuring device. It is surprising that with the advent of transistors offering low cost circuits there is not much choice of modern frequency measuring equipment when browsing through the advertisements in *Radio Communication*.

At £22 19s 0d—including carriage, Burns Electronics of The Cottage, 35 Beulah Hill, London SE19 offer a crystal calibrator which is the subject of this review.

General description

The main frequency source is a 1MHz hermetically sealed steel canned crystal. The 1MHz oscillator is followed by a series of dividers to generate frequencies at 500, 100, 50, 10 and 5kHz intervals selectable by a switch. The output is fed to a TV-type coaxial socket.

All the components, apart from the controls, are mounted on a single printed circuit board. Twenty-four plastic encapsulated silicon transistors are used; all are the same type. In addition there is one TO39 transistor. A second coaxial connector on the front panel enables a low-level signal from a transmitter to be heterodyned against the internal source. The audio output is taken to a tip and sleeve jack socket. This facility can also be used for monitoring an am transmission when the oscillator and divider chain is switched off.

A switch on the front panel marked OFF INT EXT is, as supplied, purely the on/off switch for the internal battery. However, the handbook suggests that the switch can be used either for switching between internal and external supplies or the internal and external 1MHz oscillators, provided the necessary modifications are carried out by the purchaser.

The supporting chassis and case are cadmium plated steel. Light grey stove enamel is used on the front panel and dark grey for the case. Surprisingly, for a low-price piece of equipment, the markings on the front panel are engraved.

Manufacturer's specification

General

Output frequencies	1MHz, 500kHz, 100kHz, 50kHz, 10kHz, 5kHz and harmonics of same to above 500MHz.
Output level	1MHz fundamental is 5V peak to peak. 450th harmonic of the 1MHz output is not less than 200μV.

Stability	Less than ± 10 ppm frequency change over the temperature range of + 10°C to +40°C and a supply voltage change from 7·5V to 15V.
Frequency calibration	1MHz source is adjusted at room temperature (24°C) and a supply voltage of 9·0V.
Battery	Ever-Ready PP9 or equivalent. Current drain 36mA maximum.

Heterodyne wavemeter function

Sensitivity An input level of 50mV at a frequency of 50·001MHz will give a loud and clear 1kHz tone into 600Ω, or higher, headphones. Do not over-couple transmitter or local rf source into the rf i/p or damage may result.

Modulation monitor function

Sensitivity An input level of 150mV at a frequency of 450MHz and amplitude modulated to 30 per cent at 1kHz will give a loud and clear 1kHz tone in the headphones.

Mechanical data

Case	Mild steel finished in two tone grey stove enamel. Unit rests on four rubber-mounted feet.
Dimensions	Width 8¾in. Height 2⅜in. Depth 6½in. 22·3cm. 5·4cm. 16·6cm.
Weight	4lb 12oz 2·20kg

Tests

Spectrum

The output from the calibrator was displayed on a Hewlett Packard spectrum analyser and the output was shown to extend beyond 500MHz.

Output level

The 1MHz waveform was observed on an oscilloscope with a capability of displaying waveforms well over 100MHz. The output level was 6V peak to peak, and the rise time was 0·01μS. The output level at 433MHz was about 250μV.

Frequency stability and accuracy

No temperature cycling was carried out, but the frequency as supplied was 11c/s low at 1MHz. The internal crystal trimmer has plenty of range, and no difficulty was encountered in trimming out this error.

Heterodyne waveform function

The specification mentions a loud and clear output. This is a little indefinite since it depends on the sensitivity of both headphones and individual. Under the stated specification conditions, assuming 50mV pd and not emf in 50Ω, the output to a 600Ω load was −32dBm, ie less than 0·001mW. This may sound an extremely low level on paper, but did produce a reasonably audible signal in a sensitive pair of headphones.

Modulation monitor function

The quoted specification method of measurement in the original handbook was applied, and by no stretch of the imagination could the output be called loud and clear. A measurement showed −55dBm in 600Ω. At lower frequencies, however, it was a different story, −20dBm at 50MHz and −17dBm at 144MHz. The sensitivity varied quite widely over the frequency range. The best sensitivity was in the 80MHz region. It transpired that the figure of 50mV was in error and should have been 150mV. At 150mV the performance was satisfactory.

In use

When the unit was first fed into a spectrum analyser an output was observed at 50kHz intervals on the 100kHz position. This was also observed when monitoring on 144MHz However, after the unit had accidentally been switched on for 24 hours, this output disappeared and the unit thereafter functioned normally.

With extremely high output at low frequencies, great care has to be taken not to overcouple into a receiver. Absolute minimum coupling has to be used otherwise intermodulation, blocking and receiver spurious responses result in many unwanted and unidentifiable signals. This point is emphasised in the handbook. On vhf and uhf it was found that 6in of wire poked into the output connector of the calibrator gave quite sufficient signal into a converter 2ft away. The heterodyne function was considered not particularly useful since there is no easy way of knowing which, say, 50kHz harmonic the transmitter is heterodyning. On a tunable receiver, however, one can start by finding the 1MHz points and work from there. This assumes that the receiver calibration is correct to within less than 500kHz. The audio output level control was rather noisy on the model tested.

Handbook

The current printed handbook contains all information required to use the instrument and also modify it for an external dc supply or an external 1MHz source. A complete circuit diagram is included. It would have been useful to have waveform diagrams for the benefit of those who have the necessary oscilloscope.

Guarantee

There was no mention of a guarantee in the original handbook. There was a clause which said "A circuit diagram of the CC10 may be had on application by sae, but Burns Electronics reserve the right to void the guarantee if the unit is subsequently returned for repair."

This seemed somewhat unjust and the matter was raised with Burns. The following is an extract from the letter received in reply: "The wording of the guarantee in the new CC10 handbook is—Burns Electronics guarantee to replace free of charge any part or component which fails within twelve months of purchase provided that there is no evidence of mis-use."

Conclusions

The Burns CC10 is an extremely useful instrument and its finish and presentation is such that it would not look out of place in the most professional laboratory. It achieves its primary function of frequency generation in a very satisfactory manner.

FOUR METRES AND DOWN

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

Decade counting

Turn-o'-the-year time is traditionally when retrospect and anticipation come together: turn-o'-the-decade time even more so—you may have noticed that the approaching Seventies are now only a couple of stops down the road.

Well, what sort of a decade is it going to be? He would be foolish who dared to guess any further than to say that with a nice shiny new bandplan ready to start on 1 January, the sense of order which has always infused vhf operating in this country will be maintained; or that the developments of the past decade will be deployed even more effectively in the next.

Yes, but *what* a decade it has been! And *what* developments! Earth to Earth communication via the natural lunar satellite and via artificial amateur radionic ones; the difficult frequencies of a year or two back becoming the commonplace ones to the extent that 70cm participation in VHF National Field Day is a now a routine (it would not have been in the Fifties), with 23cm almost so, and the "super highs" moving steadily into the picture as each September's event unfolds.

As for VHF National Field Day itself, initiated in the early Sixties it now commands virtually as large a following as its 36-year-old senior counterpart on the lower frequency bands, if not in numbers of stations entered then certainly in numbers of persons participating. This climax in the vhf contestants' calendar, supplemented over the past ten years by an increasing number of other contest offerings by the VHF Contests Committee, imposes the joint discipline of reliable construction allied to first-class operating (and an iron larynx).

Still in the area of competitive amateur radio, something else that was established in the Sixties and may safely be said to have a developing future in the Seventies is the concept of RSGB operating awards in recognition of outstanding performance on vhf and uhf. In the nine years in which "Four Metres and Down" certificates have been on offer something like 400 claims have been ratified, a tribute indeed to the worth of members' constructional and operating expertise, for these certificates are by no means a pushover to obtain.

Beacons in bands where none existed before, the B-licence helping to swell the metre-wave population and the T-licence the video population, a dozen vhf groups proliferating where only one existed before: all these and many other aspects of vhf which the Sixties displayed have been recorded as they happened during the passing months and years of "Four Metres and Down"—a continuing story of bursting activity which makes intriguing the prospect of what the metre-wave scene will be like when it comes to be reviewed at the end of the next ten-year stretch.

* * *

A harbinger of the coming decade which has already made its flight across the two-dimensional space of these pages and gives promise of three-dimensional orbitry in remoter space before the Seventies are many years old is Project Trident. . . .

". . . important that Britain be represented"

Reaction to last month's advance notice about Project Trident, the design study for a British satellite system to receive on 144 and send on 432MHz, has been swift and enthusiastic. What has been embarrassing has been members' offers of financial help "to underwrite the project," as one donor of a quite considerable sum put it (his cheque is being lodged with the VHF Committee for the time being).

Please, fellows, no cash, not yet, at any rate! When precise costings have followed the already completed design study your help with the financial backing will be sought.

Both over the air and in correspondence the welcome to Project Trident has been unqualified (and some of the correspondence has been addressed simply Project Trident care of your conductor's QTH). Comments such as the following are typical:

"I have long thought it important that Britain be represented in the amateur satellite world";

"I would very much like to be associated with any project group designing amateur satellites and would be happy to help in any way";

"The project is essential, both from the utility point of view and to regain some of the prestige that I fear the British amateur (perhaps amateurs generally) has lost in the last few years . . . ";

"£300 may not be too much for a dedicated group, but to avoid disappointment it is essential to recognize that even the most realistic estimate of cost is likely to be materially low. Thus the project group should aim (albeit tacitly) to have at least double the estimated sum in the kitty."

". . . shall be on pension soon so cannot commit myself heavily, but a viable Project Trident would come high on the list of essentials for my well-being."

With a thought for next April comes this one: "What about a discussion on Project Trident at the next VHF Convention, and perhaps a whip round?"

Some useful technical advice: "The inclusion of a 10m beacon with or without telemetry might attract support from members 'to whom vhf is not everything'. This would of course depend on technical problems and cost."

* Houghton-on-the-Hill, Leicester, LE7 9JJ. Send reports for the January issue by 6 December, and for the February issue by 12 January.

Many other comments in like enthusiastic vein which have been received range from offers to undertake component design, to help with assembly manufacturing (from a member who is not a vhf man at all) and even, from a retired member with a famous pre-war call, to take on the secretaryship for the project.

No one is so unrealistically optimistic as to expect the proposed British amateur satellite to take shape—and flight—in a matter of months; but what is evident is that if today's welcome for the project is sustained over the months, perhaps years, of construction and testing which must precede a launch, the device will go aloft with a very hefty kick of British amateur goodwill behind it.

Transatlantic Six-to-Four

Project Trident, like moonbounce or working all the UK on 70cm or reaching fabulous distances with transistor fleapower, represents the vhf *persona* putting his bands to the full technological stretch. Now here is something else:

VE2AIO using a kilowatt transmitter on 50MHz that works consistently from Montreal through to the western coasts of North America via the auroral path feels that the east-about path, too, holds potential for this order of dx propagation. Realizing that 50MHz activity in Europe is out because television fills this frequency area, he feels nevertheless that attempts to break down the path by using "Six" at the Canadian end and "Four" at the British are well worth making. This hope, in the light of the recent successful opening up of the UK-to-Iceland path on 70MHz, may well be a credible one.

VE2AIO therefore invites any well-sited UK station who can run the full permissible 50W on "Four," and who has a sufficiently gainy aerial system, to write to him to initiate regular cross-band schedules. There could perhaps be a talk-link on one of the lower frequency bands, as indeed there was when the G-TF record on "Four" was attempted.

It was in fact during the course of a contact on 10m with G3KPO of Peterborough that VE2AIO expressed his hope that the first "Four-to-Six" cross-band contact Canada to the UK would not be long in coming. He told G3KPO: "I am convinced it should be possible to work from Montreal into the UK on 70MHz cross-band with 50MHz, via the aurora path, which as far as my observations go is completely independent of the condition of the sun. The path to the west coast of North America is approximately the same distance as between Montreal and the UK."

The prospect is certainly a challenge to the British operators who have done so much to demonstrate the dx possibilities of 4m over lesser distances. Who will be first to span the Atlantic on this band?

Edinburgh fiesta

The back room committee who organized this year's Scottish VHF Convention—it was held in Edinburgh on 26 October—must have been well pleased with the way everything worked out. There was an attendance that was not far short of the 100 mark to enjoy a programme skilfully compounded of the technical and the social.

Back on his native heath, Tom Douglas, G3BA, was an appropriate person to open the tech-lecture session. While delineating the delights of ssb at vhf, he took care to point out its pitfalls, with particular reference to the use of filters to help clean up the signal. Commenting on breakthrough of amateur sound into television receivers he described how fm vhf transmitters could go a long way to alleviate this problem.

Second man in to bat in the tech session was Bob Kerr, GM8CFL, who talked about and demonstrated what was described as a power conversion device. Then came Geoff Stone, G3FZL, the Society's VHF Committee chairman, to give a fascinating glimpse into the future of amateur com munication at metre wavelengths, which may well embrace the tracking of satellites on 2m with transponded 70cm signals coming out of them to give ranges of perhaps 2,500 miles at 432MHz.

Also on the technical front, there was a good display of home-built equipment, with attention focused on the prize-winning receiver phase-locked on 200kHz to Droitwich, built by David Guest, GM3TFY.

On the social side there was applause from the gathering for Tom Simpson, GM3BCD, when Geoff Stone presented him with the Jock Kyle Memorial Trophy for good work done in the vhf field; and more came for the Glasgow City Group, which carried off the Scottish NFD Trophy using GM3PHB/P and GM3SSB/P.

Finally, Convention Chairman Vic Stewart announced that next year's convention would be held in the west, and GM3LTW and GM3MVY would be organizing it.

Contest anticipation

From G3JKY, hon sec of the VHF Contests Committee, comes the good news that the 70cm Cumulatives are to return. In the past they have been held on Saturday nights for a couple of hours each leg. In 1970 they will occur on a different day on each of the five weeks for which they are scheduled: you will be able to pick the most convenient three, for only three of them will count for points. It will of course be a good plan to come on for all five, not only to meet the other 70cm *aficionados* who have consistently supported the cumulatives in the past, but so that the highest scoring three out of the five may be submitted for entry.

Both in the cumulatives and in the 144MHz ssb events there will be three sections, Home, Multi-operator (eg clubs) and Portable, although for such short-duration contests not many people go out portable. Yet you never can tell who may have a go at "Stroke P", even at the height

At the Scottish VHF Convention in Edinburgh, Tom Simpson, GM3BCD, receives the Jock Kyle Memorial Trophy from Geoff Stone, G3FZL, who is RSGB VHF Committee chairman

of winter, more especially those condemned by poor sites not to work much on 70cm.

Coming contests will be spotlighted here in due time: but two thoughts which have emerged from the deliberations of the VHF Contests Committee deserve wide publicity.

The first of them concerns the use of modulated cw, hitherto barred from RSGB contests. The ban on A2 is to be lifted, which will be welcomed by the increasing number of contestants who have no bfo facilities on what is often ex-commercial gear pressed into amateur service (our own opinion about such gear has always been: strip the lot and use the bits to build a proper amateur rig. But that is another story). Shaky phone contacts under contest conditions can become good mcw ones, so long as there is someone around who can read the code.

Secondly, G3JKY reports that the VHF Contests Committee continues to receive a lot of comments from contestants to the tune of "QRM from over-modulated local stations". He goes on to say, "Before any question of disqualification can arise, we are bound to ask whether the operator making the complaint took the time to let the offender know, or whether any other station confirmed the interference. The rules say that stations *that persistently over modulate*, etc. This is intended to mean that nobody will be gonged for a slip of the gain control but may be for ignoring other people's reports."

States-side E-M-E on "Thirteen"

Prompted by the periodical references on this page to 13cm developments and Earth-Moon-Earth activity, W3GKP, Bill Smith, of Spencerville in Maryland, has come up with some information about the E-M-E work which has been done at his station on "Thirteen".

He has come up also with some very full details of the equipment used; they are published as a "Tech Corner" note on another page.

It was encouragement by W4HHK, who received the W3GKP moon reflected signals on 2,304MHz earlier this year, that prompted Bill Smith to start building a parametric amplifier for the band. By 15 August, when the moon was in the right position, he heard his cw signals coming back to him from the moon.

Thereafter a programme of continuous improvement of the 13cm equipment described in "Tech Corner" has been in hand. Now W3GKP can hear his own echoes on any day that the moon is high enough, and some extended tape recordings of them should shortly be available for British E-M-E investigators to hear.

And the chance of a transatlantic QSO on 13cm? Says Bill Smith, "I would transmit to anyone on 2,304MHz with a bare minimum chance of hearing . . . probably would require a good paramp and a dish 10ft or larger". He would like to correspond with other 13cm experimenters. He can be reached at 1525 Spencerville Road, Spencerville, Maryland 20868.

The date: 5 September, 1969. The place: the white cliffs of Dover. The person: Dr Dain Evans, G3RPE. And the occasion? The cross-Channel QSO on 3cm between G3RPE/P and F2FO/P. Contrast the size of the 3cm "signal squirter" with the 2m talk link aerial above. (Full story: page 792, November)

BEACON STATIONS

Call-sign	Location	Nominal Frequency	Emission	Aerial Direction
GB3ANG	Craigowl Hill, Dundee	145.950 MHz	A1	S
GB3CTC	Redruth, Cornwall	144.13 MHz	A1	NE
GB3GW	Swansea	144.250 MHz	A1	ENE
GB3GM	Thurso	70.305 MHz	A1	N/S
GB3GEC	W. London	434.000 MHz	F1	N/W
GB3SC	Sutton Coldfield*	433.50 MHz	A1	N/S
GB3SU	Sheffield (temporary location)	70·695 MHz	A1	Omni
GB3SX	Crowborough, Sussex*	28.195 MHz	A1	E/Omni
GB3SX	Crowborough *	70 699 MHz	A1	Omni
GB3VHF	Wrotham, Kent	144.500 MHz	F1	North-West

* Not operational

ZB2VHF is now operational on 50·0092, 70·311 and 145·1298 MHz. Reports to G3JHM.

"Stroke T" on Two point Three

What is thought to be the first video transmission on 13cm was made on 2 November between the Berkshire stations G3NNG (using G6SSW/T) and G8CUL, over a path of about a quarter of a mile, which was not line-of-sight.

At the G8CUL end, a G8AGM tunable converter (BFY90 in cavity oscillator circuit) was used, while at G3NNG two varactor multipliers (X4, X4 from 144MHz) were employed. Series gate video modulation at 144MHz produced good definition pictures even after multiple summation to 2304 MHz, graded junction diodes being used to help achieve this order of performance.

Says Kevin Erents, G8AGY, who witnessed the demonstration: "Congratulations go to G8CUL for hanging dangerously out of his window with a 1ft corner reflector (firing into the roof), and to Des, G3NNG, for good camera

operation while finding the best position for his 13cm dipole (6ft above ground!)"

The estimated power output of the transmitter was 200mW. The varactor system, with corner reflector only, has already produced 5-9 phone signals both ways to G3MCS, over a 40-mile path. High Q trough line circuits are used throughout to minimize radiation of unwanted harmonics.

"Vision On" Corner

Any visitor who dropped in on the last meeting of the Birmingham and Coventry VHF Group, which was held at Meriden ("the centre of England") must have come away impressed by the strong interest in amateur television which exists among the members. One of the leading protagonists in the West Midlands is G6MXW/T, whose activities have already been described and illustrated here. Another is old-timer G5QI, recently licensed as new-timer G6ADX/T. Another dozen within "picture distance" of Greater Birmingham appear in the "Stroke T" section of the 1970 *RSGB Amateur Radio Call Book*, and altogether the level of video liveliness is high in the region as a whole.

Farther east the activities of G6MUR/T over the years have been instrumental in encouraging the construction of many wideband converters by members in the East Midlands: one of the latest to acknowledge his practical help is G8CER of Oadby, who is now set up to receive on the band.

This situation, where one or two locally active amateur television stations trigger interest in a wide "clientele", is repeated in many other areas. From Rotherham news comes from Bert Corker, licensed as G6AEP/T as from 10 September (and G8CUE as from 22 August, so not yet QTHR) that no fewer than five Class B licensees and four Class A are equipped to receive amateur video in his district. He will welcome schedules to put out pictures to any members either transmitting or receiving.

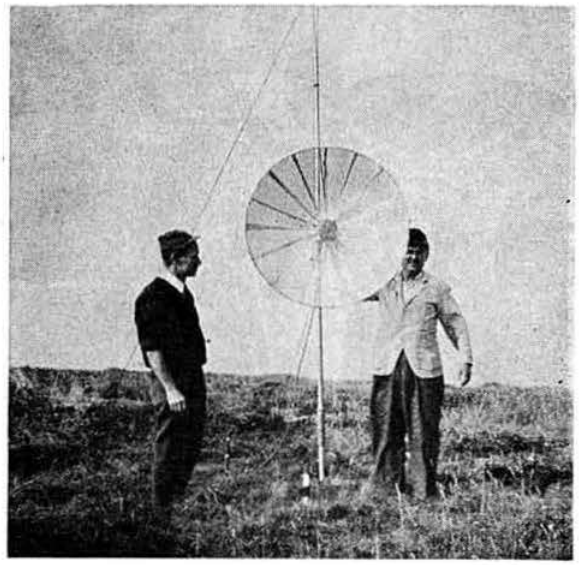
Well sited at 420ft asl, G6AEP/T is active from 9 pm every night and all day Sundays with video going out (60W of it) on 433·9MHz, plus a 100W sound channel. There are a 1in vidicon camera and a flying spot scanner for 405 lines. Correspondence should go to him at 5 West Crescent, Sunnyside, near Rotherham, Yorkshire.

To a majority of participants in VHF National Field Day, 1969, these men were dx. They belong to the Cornish VHF Group, and their pictures were taken at the station they set up overlooking the Atlantic at St Agnes Beacon

Above: G3TTG, noted 4m exponent from his home station, takes time off for tea while the light still burns outside the tent after an all night session that pushed the 70MHz signal as far north as Westmorland

Below: G2BHW adjusts the 23cm dish, G3LPB at left. Although no contacts were made on 1296MHz the group hopes to work across to South Wales next year

Bottom left: refuelling session demonstrated by G2BHW. His callsign was used on 70cm, where the best contact, with GD-land, was good dx by anyone's reckoning



As has been said here before, a signal at S9 plus on 70cm needs to be laid down between two points before video is attempted. But although a "local" service area represents the norm, there are occasions when dx can be worked, and that is when the big lifts in propagation occur. During those of October, G6NOX/T gave full-brightness 100 per cent lockable pictures on 625 line definition from Essex across to the Continentals.

The October lift

As everyone knows who was around at the time, there were, especially in October, several satisfying 2m openings of the characteristic autumn-time pattern which gave to those who were prepared to stay the course the chance to hoist their country and county collections a few notches further towards prized Four Metres and Down Certificates.

Dozens down south marvelled at—and worked—the loud 2m signal pounding in from GM5YK/A in Aberdeenshire. In the same county GM8BRM worked 60 Continentals in 11 hours of 18 October, including nine OZ, three SM and 41 in Germany, West and East, and this, mark you, without the aid of cw, he being a Class B man.

Kent's G6RH hauled five SMs that same day, and here the value of the key was demonstrated by the fact that four of them were on cw, the fifth on ssb. Later a weak and watery HB9MY was netted on 27 October, again on A1. Sideband raised an Austrian for Bob Holmes's 20th country on "Two".

The same Austrian, OE2OML, was worked on 27 October by G3MCS, who is between High Wycombe and Aylesbury. Bill Hawthorne has just completed a new ssb sender specifically to help him to go out and get that 15th country he needed for his Senior Award. Circuitally, the new 'MCS transmitter has the following line-up: a home-built (no, it was not brewed, it was quite solid) . . . as we were saying, a home-built exciter, half-lattice filter on 6·6MHz mixing with a 5MHz vfo to produce 11·6MHz and 2W from a 5763 into a transverter consisting of a 12AT7 and 33·3MHz crystal, an E180F, then a QQV03/10 balanced mixer followed by a 3/10 amplifier at 145·41 which gives into the 6/40A pa running 60W pep.

Ron Ham, BRS15744, checking the progress of conditions on his instrumentation at Storrington, tells how they lifted almost exactly according to the book when after a couple of days of high pressure there was a drop on 18 October—and up popped six countries on "Two." Obligingly, another barometric change occurred just in time for the RSGB ssb contest in November; stations from Northumberland to Cornwall were logged at Storrington on and around 145·41.

Peter Blair, G3LTF, of Chelmsford, rates conditions around 18-19 October as "the best on 2m in all the time I've been on the band. Most of the contacts on the 19th were over 1,100 miles. I first worked SM3AKW back in 1962 via meteor scatter: I never thought I'd work him on tropo."

This SM was one of 19 Swedish contacts made during the 18-19 October period, three of them on ssb, the rest on the key. Among the dx worked on the evening of the 19th was OH0AA, to give 'LTF his 28th country worked on "Two". Patient waiting with the beam trained on Finland for the next hour and a half produced four more OH contacts, all five on A1, reports incoming and outgoing averaging around the 559 mark.

During October's second opening, on the 27th, G3LTF and OE2OML, encouraged by the enormous strength of the ssb signals they were exchanging on "Two", decided to try 70cm. Even here reports each way were 40dB over S9. This gave 'LTF his 19th country on 70cm.

* * *

What of the lessons to be learned from openings of the October pattern, when quite literally hundreds of UK-to-Scandinavia contacts result and the nearer Europeans sound like locals, on 70cm as well as on "Two"? Peter Cleall, G8AFN, of Maldon in Essex, has set to work to collate the results achieved during the 18-19 October period and to relate them to the upper air situation at the time. He gets the impression that the ducting which was occurring then extended as high as 800MHz, which of course would account for some of the phenomenal dx exchanges reported on 432MHz.

He therefore asks operators who achieved success with long distance contacts over the two days in question to send him details of such contacts, particularly the time (in gmt), the strength of signals in both directions, and a brief resumé of station location and equipment. He adds: "I would particularly like details from stations at the extremities of the UK to help build up an overall picture"—and as stations were known to be active and working long hauls from Cornwall to Aberdeen it is to be hoped that a good supply of information will flow in to G8AFN. His QTH is 32 Granger Avenue, Maldon, Essex.

Xtal Xchange

Anxious to put himself in the new Warwickshire Zone on 70cm, G8AVX of Birmingham is prepared to exchange his third overtone 24·067MHz crystal for any crystal, any mounting, that will produce 432·7 to 432·9. The crystal he offers is a hermetically-sealed modern FTC interchangeable with FT243. It multiplies to 433·2MHz. Write him at 19 Burcote Road, Pype Hayes, Birmingham 24.

* * *

G8BGI of 147 Malcolm Road, Tangmere, Chichester, Sussex, offers the following: 6000kHz type 10XCF; 6025kHz FT243; 8015kHz 10XAJ. He wishes to obtain crystals at 8028 to 8061kHz; 24·083 to 24·183MHz and 36·125 to 36·275MHz, any type of holder, overtone or fundamental mode.

* * *

GM8APX offers the following (manufacturers' nominal frequency; no guarantee of accuracy):

In HC6U:	In FT243:
144·30 (2 off) (New Zone A)	144·20 (New Zone A)
144·49 (New Zone A)	144·37 (New Zone A)
144·90 (New Zone B)	144·53 (New Zone B)
	145·20 (New Zone C)
	144·88 (New Zone B)

Wanted: HC6U for new Zone D (145·5 to 145·95 fundamental 8 or 12MHz). Letters to W. H. Jarvis, GM8APX, Rannoch School, Via Rannoch Station, Perthshire.

Tech Corner

From W3GKP (William L. Smith, Spencerville, Maryland) Here is some information about the 2,304MHz equipment used at W3GKP for moon-bounce experiments.

The gear here is a glorified transceiver, ie it heterodynes up to transmit as well as down to receive. The low-frequency part consists of Collins 75-S2 receiver and 32-S1 transmitter. Four frequency conversions are made between 2,304MHz and 455kHz. To minimize differential drift in the oscillators the three highest conversions are made using harmonics of a single temperature-controlled crystal oscillator. The lowest mix is controllable by the dial(s) on the Collins stuff, and it can be run strictly as a transceiver or with independent frequency control.

The final amplifier and the paramp are located in my garage about 90ft distant (by coax) from the exciter. The connections are made by RG-19/U, which is a bit bigger than garden hose, and costs me about 6dB. The final is a Varian V-802B four-cavity klystron amplifier. It runs 4kV at 250mA input, and the output seems to be about 275W. The paramp is a Microwave Associates MA4537 diode pumped at 9·2GHz by a small klystron oscillator. For most of the tests the little klystron has been stabilized in frequency by locking it to a 115MHz crystal, most of the multiplying being done in a Hewlett-Packard 5082-0375 step-recovery diode.

The feed line between the garage and the feed point of the antenna consists mainly of 1⅝in diameter Styroflex (book loss 0·6dB for the 40ft run). It also includes several relays, connectors, adapters, etc, plus a few flexible jumpers of RG-8/U or RG-9/U (6ft = 1dB) so the total loss might be 2dB or so.

The antenna parabolic reflector is 28ft in diameter, was made in 1948 by D. S. Kennedy Company, and weighs about 1,600 pounds. The feed "horn" is a section of straight cylindrical guide, made from a juice can. It contains two exciting probes at right angles. Initially I used linear polarization, obtained by connecting to just one probe. Later I inserted a relay so I could switch from one probe to the other (eg to transmit on vertical and receive on horizontal). Later still I have inserted a 90° 3dB coupler between the relay and the probes, so as to obtain switchable circular polarization.

The antenna sits on a home-made transit mount, ie it points due south and can be adjusted in elevation only. At low elevation angles the southern sky is obscured by tall trees, so there was no point in making the support high enough to let it tilt down to the horizon. The range of elevation is from 43° to 80°, and with this I can point at the moon once daily when the declination is north of 8° south, ie rather more than half the days in the month. The pivots on which the antenna rotates are ball joints taken from a 1955 car, and they are welded to the tops of posts about 7ft high (made to support sagging floor joists), just sitting on the earth but well guyed.

The computed beamwidth of the antenna is just a little over 1°, so on each passage of the moon it would provide ust a few minutes of air time. To extend this period the beam is deflected by moving the feed horn from side to side. The mechanism which does this is a real "make do" special, and includes such things as a ball-bearing chassis slide, some bicycle chain and a small sprocket, a dc motor and a selsyn. The dc motor is energized from the operating position, where a mating selsyn keeps track of the position. (Most of this was put together by W4CC in an afternoon.)

The big klystron and the dish were government surplus and came from the Army Military Affiliate Radio System. The multiple-LO chain is surplus from one of the Bell System early microwave systems, much modified for this job. Most of the rest was truly home-made, largely from what was available (wonderful what a 35-year collection contains!). A few of the exotic components were purchased and others donated by sympathetic salesmen. Radio amateurs almost too numerous to mention have provided advice, labor and parts.

With this gear I can hear my own echoes any day the moon is high enough. Although many small changes have been made in the last few weeks there has been no substantial improvement in echo signal level. I think from here on the dB will come hard.

From G8AYN (Roger Whitbread, Croydon)

An increasing number of vhf operators are now using narrow band frequency modulation and enjoying the relative immunity to tv sound breakthrough which the mode affords.

I know very little about nbfm and wish that some operators were not so loth to part with information. What follows is a brief account of the method adopted to get it going at G8AYN.

The circuit of the existing Colpitts crystal oscillator was modified as shown in Fig 1, and provides 3kHz deviation without distortion. Recommendation: do not try to obtain too much deviation.

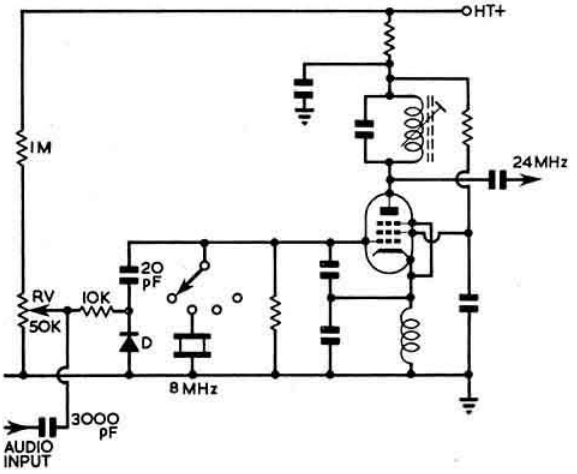


Fig 1. The G8AYN method of modifying a Colpitts harmonic crystal oscillator to provide frequency modulation at 2m

The diode shown has been in the writer's case no more than an OA200; a varicap diode would probably work better, but almost any silicon junction diode will work—it is worth trying several. The setting of RV depends on the diode capacitance-voltage characteristic but should be set up to give an equal frequency swing either side of the carrier. It is possible to bias the diode to give a fairly linear capacitance swing. However, the capacitance swing across the crystal is not linear due to the series capacitor and loading effects. But a linear capacitance swing across the crystal would not result in a linear frequency swing anyway, so one can only hope that the non-linearities cancel out, and with my own oscillator they seem to.

The audio feed to the unit may consist of a single ECL80, triode driving pentode, utilizing the ht supply from the original am modulator but *not* the ht from the transmitter. Another method of audio feed is via a tape recorder amplifier output matched into the oscillator via a suitable step-up audio transformer.

To G3ISZ a thank-you for help rendered in setting up the nbfm unit.

* * *

There have been on sale in G. W. Smith's, in Lisle Street, ex-A.M. units containing two 7026 Londex coax relays at 39s 6d. These are in good condition and work fine on 70cm (remember the details for using Belling-Lee double sockets in an old *Bulletin*?) If you get two do not use one on 2m: use them both on 70cm to switch drive into the 23cm tripler.

The accompanying diagram shows both relays in the unenergized state for receive.

Energize (1) for 70cm transmit or (2) for 23cm transmit. The strip connecting the two relays can be the existing strip in the A.M. box. There is a small socket in the side which can either be used as a sampler or can be moved by unscrewing the centre pin of the small socket, sawing off the rest of the small socket and then plugging the hole with a small piece of brass soldered over. This has been in use at G8ARM for some time and is now in use at G8AYN.

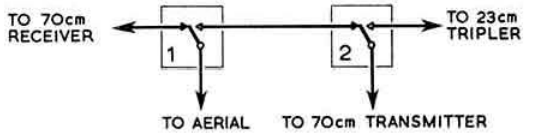


Fig 2. Proposed method by G8AYN of using dual Londex relays. Energize (1) for 70cm transmit and (2) for 23cm transmit. Relays shown in unenergized state for receive

From G3UCM (Steve Gall, Coulsdon, Surrey)

Many users of the HW17 transmitter-receiver who feel frustrated at missing cw contacts when using this device may like to know that it can be converted to A1 by keying the T/R switching line, but it is imperative that the secondary of the modulation transformer be disconnected from the pa end on cw, otherwise there will be damage to the af output transistors. A bfo can easily be added to the receive side, and little coupling is required.

Sidetone can be fed to the slider of the volume control, or may be provided by a separate af oscillator keyed from the keying rail. The maximum resistance in the key line must not exceed about 9Ω or the T/R switch will not function.

I have had several A1 contacts using the present dipole aerial and reports on the above method of HW17A keying suggest that it is satisfactory except for a slight chirp, which is to be expected.

What they say

"Apropos comments on QSLs and stamped addressed envelopes: I have sent one Midlands gentleman four QSLs and two saes for a 70cm contact with his county in November 1967. I would not mind if he said he would not QSL but on the three occasions I have met him he has said he will. Already he holds the Four Metres and Down Certificate for 70cm, so other people have sent *him* the required number!"—G8AYN of London.

"Have worked over 100 Gs from my new Cardiganshire QTH; could be many more if only they would use A1 or repeat their calls more often on A3 instead of calling CQ umpteen times and giving their call-signs about twice at the end. And it would be a good idea if they stated location during calls: one would then know where to put the beam"—GW5NF of Ystrad Meurig.

* * *

". . . have now worked the required counties and countries on 2m for the Senior Award, but am still awaiting a few cards. I would like to thank all the fellow members who made it possible, especially the intrepid few who went to the far-flung quarters Stroke P"—G3MCS, Bucks.

Here and there

Another one for the A1 clip: Steve Gall, G3UCM, of Coulsdon in Surrey, operates Thursday and Friday evenings and at weekends on 144·036MHz. He has an alternative QRG at 144·054.

* * *

Expect some venerable two-letter call-signs to appear in the Four Metres and Down Certificates table before long. Gerry Jeapes, G2XV, of Cambridge, had worked more than the requisite 3 plus 20 on 70cm years before the official starting date of 1 January, 1961, and is now collecting anew to put in an up-to-date claim. And Bob Holmes, G6RH, of Bexley in Kent, had knocked off the 5 plus 30 on "Two" back in the Fifties; during the October opening he notched his 20th country by working OE2OML and is now hoping, with sae help, to net the needful QSLs to stake a claim for a "Senior". But some of those UK county cards are maddeningly slow in coming.

* * *

People waiting at a London suburban bus stop must have been surprised to see someone in the queue quietly talking into a small box. It was Joe Kasser, G8BTB, of Hendon, enjoying a 2m contact over an eight-mile range using his 90mW rig, with dipole. Getting off street corners on to better sites he has worked up to 22 miles with it. The transmitter has a 2N918 pa and a 72MHz co. Wisely, he has put an rf stage ahead of the super-regen receive device. "Who needs high power for local contacts?" he says.

* * *

Bill Jarvis, GM8APX/P, will be on tour as follows over the Christmas period: Glasgow, 23-26 December; Newton Stewart, Wigtown, 27-28 December; Morecambe, Lancs, 29 December to 1 January; Oxford, 2-6 January; Newcastle on Tyne, 7-9 January. To fix a schedule for a 2m contact from any of these locations write to Mr W. H. Jarvis, Rannoch School, Perthshire.

* * *

Colour films mean fewer pictures. Or to put it another way, if you take photographs of radio interest intended for this journal, take them in black and white: we cannot reproduce colour. Many a good field day picture has had to be rejected for this reason, simply because the majority of amateur photographers these days use colour. Oh, and another thing: interest is added to radio-pics if these avoid the usual photo-clichés of aerials against the sky, plus a tent or two. Those by the Cornish Group on the fourth page of "Four Metres and Down" are exemplary, with plenty of human interest as well as radio interest about them.

A bistable for relay control

By W. H. BOND, FRCS, G3XGP*

THE G3XGP ten-watt transistorized transmitter/receiver Mark III, designed as a mobile unit, required tx/rx switching by remote control. Obviously, relay changeover was required but there are objections to carrying full battery voltage to remote ptt buttons. Furthermore, latching switches were objectionable and subject to failure; push buttons have to be held down during transmission, vox objectionable on am and unsuitable for mobile working.

The solution was a bistable circuit to operate the relay, energized by one or more remote control buttons running on low voltage; capable of switching 150mA; sufficiently slow acting not to "bounce" electronically when contacts became roughened or dirty, and always switching to the receive position when first energized. However, when published bistable circuits were examined they were found to operate in the kilocycle region at very low currents; to require a third switching transistor to operate an external load, and, commonly, additional power supplies.

A little hard thought and experiment resulted in a stable circuit fully meeting all the design criteria using a minimum of components. A by-product of the design was a facility for an additional load point indicating the relay was in operation and in the receive position.

Fig 1 details the circuit, little explanation being called for.

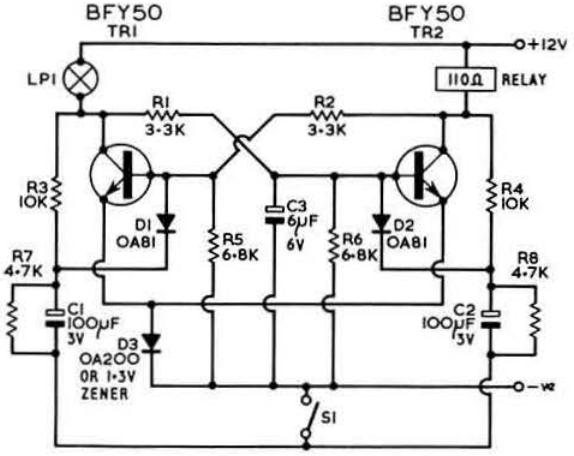
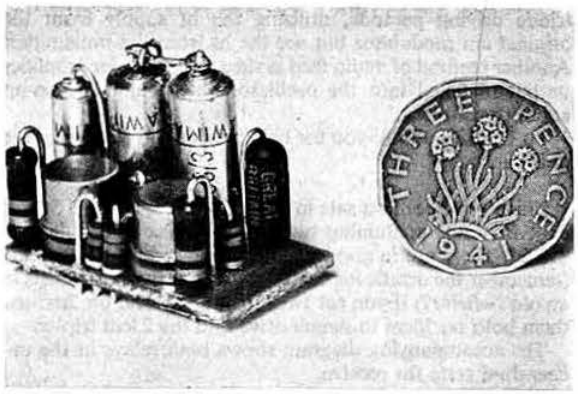


Fig 1. The bistable relay control circuit



Size comparison photograph of the bistable relay control

Diodes D1 and D2 operate in the usual way, being reverse biased when their associated transistor is off and steering the negative pulse from C1 and C2 to the appropriate base. Base resistors R5 and R6 maintain the on transistor fully bottomed; the inoperative transistor is given a small reverse bias by D3 and a second diode in series may be added if power supply fluctuation causes instability: alternatively, D3 may be replaced by a 1·3V zener diode.

C3 maintains the associated transistor base negative at initial switch on to ensure that the relay remains in the unenergized position on receive.

Resistors R7 and R8 are necessary to leak away the charge on C1 and C2, but do not interfere with the action

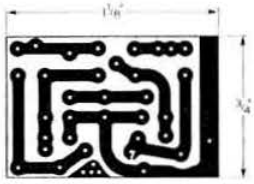


Fig 2. The pc board, actual size.

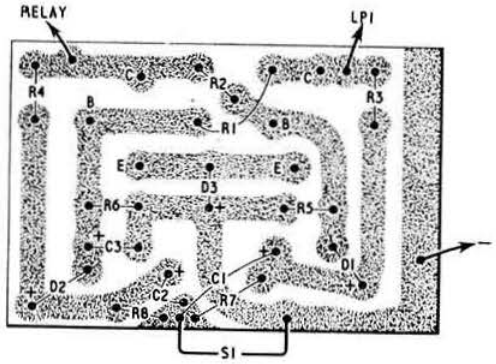


Fig 3. Enlarged view of the "idealized" pc board

* The Queen Elizabeth Hospital, Edgbaston, Birmingham 15, Warwickshire.

of the bistable, which changes state by simple earthing of C1 and C2.

Construction

Space being limited the circuit was made on a pcb measuring 1⅛in × ⅜in, possible only because the fully bottomed transistors dissipate so little heat. For most purposes a board double this size is tiny enough and easily placed in the average mobile transmitter chassis. The bistable meets all requirements and operates satisfactorily—depending on the relay—from 6 to 18v.

Components

Tr1, Tr2	BFY 50 or equivalent
D1, D2	OA 81
D3	OA 200 or 1·3V zener
C1, C2	100mfd 3V wkg (WIMA)
C3	6mfd 6V wkg (WIMA)
R1, R2	3·3k
R3, R4	10k
R5, R6	6·8k
R7, R8	4·7k
Relay 110 Ω	

Band pass filters

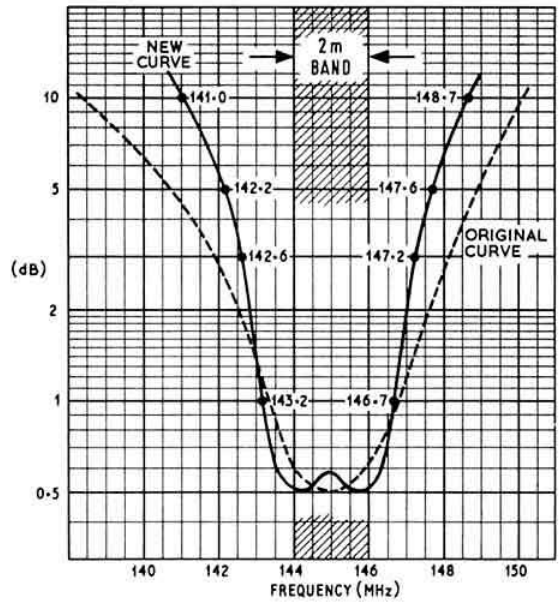
By G. R. JESSOP, G6JP*

Following the article "Simple filters for transmitters on 144 and 432MHz" in the July 1969 issue of Radio Communication, *further work in this field has been carried out by H. L. Gibson, G8CGA, and the following additional and revised data is now available:*

The input and output coupling capacitors of the 144MHz filter are not optimum and should be approximately 4·4pF for 50Ω and 3·2 to 3·4pF for 75Ω.

With 4·4pF for a 50Ω line, the band pass characteristic is improved over that originally given.

(i) the nose of the response is wider, just over 2MHz wide.

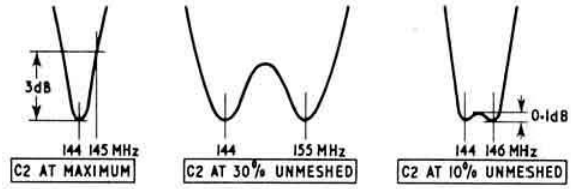


(ii) 1dB points 143·2 to 146·7MHz band width 3·5MHz
3dB 142·6 to 147·2MHz band width 4·6MHz
5dB 142·2 to 147·6MHz band width 5·4MHz
10dB 141 to 148·7MHz band width 7·7MHz

The curve shows the improvement.

Philips 2–8pf beehive trimmers have been found satisfactory provided they are kept in step (same value) when setting up. Silver mica capacitors would no doubt be suitable at reasonable power level and are fairly readily available in suitable size. They are, however, unsatisfactory at over 100W due to some breakdown internally, probably "fringing".

The centre line with C_2 set at max. tunes to about 144MHz. Hence when the input and output lines are tuned to resonance the overall response is sharp and is about 3dB down at ± 1MHz. However, as C_2 is decreased in value the higher frequency cut-off moves upwards and a double humped response develops. With C_2 at about 10 per cent unmeshed there is an almost square shaped response 2MHz wide with a slight dip in the middle of around 0·1dB.



Alignment procedure

Set the coupling capacitors (Philips 2–8pF trimmers) meshed by ⅛ in and C_2 at 10 per cent unmeshed. Apply a signal and peak the output by adjustment of C_1 (both). Slightly readjust coupling capacitors in step returning C_1 until maximum power transfer is achieved. Replace and fix the box lid before the final adjustment of the capacitors C_1.

If transmitter output at several frequencies in the band is available make the adjustment at the centre of the wanted range. If after this the higher frequencies show reduced output, reduce C_2 slightly. If, however, there is some loss at the lower frequencies, retune both C_1 to optimise the lower frequencies, and adjust C_2 to maintain output at the higher wanted frequency.

*32 North View, Eastcote, Pinner, Middlesex.

SOCIETY AFFAIRS

A brief report on the Council Meeting held at Society HQ on 19 October 1969, commencing at 10am

Present: J. W. Swinnerton, President (in the Chair), B. Armstrong, N. Caws, J. Etherington, J. C. Graham, A. F. Hunter, G. R. Jessop, H. E. McNally, L. E. Newnham, J. R. Petty, R. F. Stevens, G. M. C. Stone, D. M. Thomas, F. C. Ward, E. W. Yeomanson (Members of Council); R. G. B. Vaughan, general manager, and A. W. Hutchinson, editor.

Apologies for absence were received from Messrs R. J. Hughes, E. G. Ingram, G. Twist and Dr J. A. Saxton.

Membership and affiliation

Council resolved: (i) to elect 291 corporate members and 89 associate members.
(ii) to grant corporate membership to 25 associates.
(iii) to waive the subscriptions of seven members due to blindness or other disability.

Applications for affiliation

Council granted affiliation to the following:
Kingston and Malden Scout Radio and Electronics Group.
Royal Air Force Lyneham Amateur Radio and Electronics Group.
Swansea Telephone Area Radio Society.
Parmiters School Amateur Radio Society.

Unlicensed operation

It was noted that the Post Office is seeking the co-operation of all members and a comment would be published in *Radio Communication*. (See November issue, page 761).

Recommendations of committees

Council accepted the recommendations of the VHF Contests Committee detailing the results of four vhf contests for publication in *Radio Communication*.

Honorary treasurer

On his expressing willingness to continue in office, Mr N. Caws was re-appointed as treasurer of the Society for the three-year period commencing in 1970. Mr Caws thanked Council for its continued confidence.

Expansion of the American 'phone bands

A letter from the ARRL was tabled asking for opinions about the proposal to extend the telephony allocation for US amateurs in certain bands.

After discussion the following comments were agreed:

3·5MHz No strong feelings.

7·0MHz UK frequency allocation not affected.

(NB. By the terms of the current Geneva Regulations, cross-band communication between US amateurs in the sector 7,100 to 7,300kHz and UK amateurs below 7,100kHz is not permitted)

14·0MHz The RSGB is strongly opposed to American operation between 14·1MHz and 14·2MHz.

21·0MHz No strong feelings.

President's visit to the Channel Islands

The President tabled his report which was discussed by Council. The changes in the organisation of the Post Office led to the difficulty of using SAES for the QSL Bureau, as Channel Islands local stamps are not obtainable in the UK. It was agreed to explore the possibility of a separate bureau for the Channel Islands.

There is also some difficulty in obtaining an examiner for the Morse test. Some candidates had experienced delays of 12 months. The matter will be investigated in order to find a solution to the difficulty.

The possibility of separate callsign prefixes for the Bailiwicks of Jersey and Guernsey was being investigated.

Preservation of Society records

Mr Ward expressed concern about old records and other documents which were in Headquarters. He was prepared to consider the production of a tape and slide lecture from the material available. The general manager assured Mr Ward that all material would be carefully examined before deciding to dispose of it.

Council approved all minutes of committees, including those held over from the September meeting.

Council was in session for 5¾ hours.

Committee Profile

The Membership and Representation Committee

This committee is composed of all the Council Members elected on a zonal basis, together with one or two others whom Council appoint from time to time.

The terms of reference for this committee which Council have laid down are as follows:

1. To advise the Council on all matters of policy concerning the admission and status of members.
2. To advise the Council on the operation of the scheme of representation and matters relative thereto.
3. To advise the Council on means of increasing the membership of the Society.
4. To be responsible for organizing the RSGB News Bulletin Service.

In order to carry out these terms the committee as a rule meets once a month and checks all applications for membership, applications for affiliation from clubs, groups and societies.

Applications for waivers of subscriptions from blind and disabled persons are also investigated, and reasons for any resignations carefully scrutinized.

The Society's scheme of representation is watched in order to see that due representation is provided for all members wherever they may be situated. Where no representative has been proposed by the members, the committee endeavours to find a member willing to represent the area or region concerned and report accordingly to Council with their recommendation.

The committee also endeavours to keep all the official representatives in touch with news applicable to them either by way of direct information or through the medium of the Society's journal, *Radio Communication*.

Further, the committee watches the publicity given to the Society by the national and local press and also advises on the method and amount of direct advertising the Society should have in order to keep the benefits of membership of a national radio society before the interested public.

Finally, the committee recommends to Council any changes in GB2RS necessary to keep adequate coverage of the membership in all parts of Great Britain with the weekly news bulletin.

All the recommendations which the committee make are passed to the next meeting of the full Council for ratification or otherwise.

It is hoped that this brief review of the work of the Membership and Representation Committee will indicate how important to a member this committee is, dealing as it does with all the actual contacts which Council can make with him, and conversely with the contact he can have through his representative with the members of Council.

Obituaries

Alan MacDonald, G3UCO

It is with deep sorrow we report the passing on 1 September 1969, of Alan MacDonald, who died suddenly while at work.

Alan was a very keen member of the Worcester & District Amateur Radio Club and the newly formed Mid-Severn Valley RAEN Group. He served on the club committee as programme secretary for three years, in which time he made many friends.

To his father, mother and relatives we wish to extend our deepest sympathy.

R.L.A.

Victor Bartlett, GW5BI.

The death occurred on 24 September of Victor Bartlett, GW5BI, while on holiday at Keswick. Aged 55, he was issued with the artificial aerial call 2ANN in 1930, and with the call G5BI in 1932. Living at that time in Tredegar, within a year or so he moved to Cardiff, and for some years he was the only licensed amateur in the city. The Cardiff RSGB Group was formed in 1934, and Vic was an enthusiastic member until his death. He was the group treasurer for some 12 years.

During the second world war he served in the Royal Signals in this country and in the Far East. This led him to become an active member of the Burma Star organization, and in fact he had attended a week-end conference connected with it in Manchester just prior to his death.

In the field of amateur radio it is difficult to accurately record his place. To be with him either at the National Show or at rallies and other meetings which he loved to attend was a unique experience. It seemed impossible that one man could know and be held in such high regard by so many people. The reasons, however, were neither deep nor complex to understand. His happy personality, his great love of the hobby, best described as selfless rather than unselfish, his humility and tolerance combined to place him in a class apart. He would be the last person to claim any degree of technical eminence. His talents were in human relationships expressed through the medium of his superb operating ability. He used all bands from two metres to top band, was equally happy working local friends or dx on 'phone or immaculate cw. Above all, however, he realized that amateur radio was essentially a co-operative activity, and not a medium for personal prestige. In short, were there ever a need to define the ideal radio amateur, it would not be necessary to look further for an example than Vic Bartlett.

His loss will be felt deeply by many people both in this country and overseas, but nowhere more keenly than among his friends in South Wales, who combine to extend their sympathy to his brother, sister-in-law and family.

The funeral took place at Thornhill Crematorium, Cardiff, on 29 September. The Society was represented by the zonal, regional and area representatives, GW3RWX, GW8NP and GW3GHC. Among the many call-signs present were G2HH, G3BEZ, G3RIH, G6BK, GW2BG, 2IP, 2BUF, 2DHN, 2FOF, 3AJ, 3VL, 3ANU, 3BFH, 3BQY, 3DDY, 3FSP, 3HAW, 3JBH, 3SLA, 3SYE, 3UVG, 3VNO, 3WLN, 3XJC, 5AB, 5UV, 5VX, 6PO, 8CT, 8UH and BRS275.

C.H.P.

R. I. G. Whittington, G3VWB

VHF amateurs, particularly those in the north London area will have been shocked to learn of the death of Dick Whittington. A victim of a heart attack on 26 October, his characteristic transmission was well known on "Two" and will be missed by many.

Acutely aware of the many idiosyncrasies of modern life, Dick always had a fund of stories to relate about such things as computers, officialdom and irrationality. He was not afraid to tell a story against himself.

Frequently and unjustly to be heard decrying his knowledge of radio, Dick was always available and willing to give advice and practical assistance to those of us whose radio projects tended to be of a higher electrical than mechanical standard.

Our sympathy is extended to his wife; his son, John, G3SHZ, and other surviving relatives.

J. C. F.

Alan Wordsworth Fawcett, GW2HQ

11 October 1969 saw the passing of one of the true old timers of amateur radio, Alan Fawcett, GW2HQ.

His interest in radio transmission started at an early age, and as a schoolboy in Bristol he made his first transmissions before the first world war. He was a skilful and meticulous engineer with great expertise at the lathe, which enabled him to make the many components necessary for his early experiments.

During the first world war he served in the Royal Navy on a destroyer, and on demobilisation went to Edinburgh University where he qualified in medicine in 1923. His particular interest was surgery, and in 1927 he became a Fellow of the Royal College of Surgeons. Later he was appointed to the staff of the Royal Infirmary, Sheffield, first as a general surgeon and later as consultant thoracic surgeon, a post which he held until his retirement in 1962.

Having worked with him in the hospital, I can speak from experience of the patience, skill and ingenuity which he was able to exercise in the still early days of chest and heart surgery, and he combined his electronic and engineering knowledge with deft surgical technique to solve many of the difficult problems encountered in this relatively unexplored field of surgery. Some of the special instruments which he devised and made in his own workshop are still in use in the Infirmary operating theatres.

In the amateur radio field he was a firm believer in home-made equipment which was always built to meticulous standards, and until his illness at the beginning of this year he continued to make such items as transformers, variable capacitors, valve holders, gear boxes, bearings, and even a lattice tower, in addition to mundane things like receivers and vhf converters.

He was a pioneer in the field of amateur single sideband operation in this country, and built an exact replica of the 20A exciter which remained operational up to the time of his death, although in recent years he allowed himself the luxury of some commercial sideband equipment.

Other interests in the radio field included mobile operation, especially on ssb, and a long standing interest in the higher frequencies—5m in pre-war days and 2m in the post-war era.

He was a keen and talented photographer, especially in the cine field, and had a rare eye for the truly picturesque scene. During his many motoring holidays in Europe he made a number of superb films, and when he gave a film show he was able to commentate on the scenes and places in the most minute detail.

As if these many talents were not enough he was a meticulous model maker—the scale model of the destroyer on which he served in the first world war took 12 years to complete and won for him the first prize in a national "Doctors' Hobbies" competition.

After retirement Alan and his wife moved to his beloved Aberdovey, which he had visited practically every year since 1911. Here he had a delightful home on the south-facing hillside overlooking the Dovey estuary and Cardigan Bay, with space enough for his aerials and beams and a beautiful garden which occupied much of his time and energy.

One of the great joys of his retirement years was the many visits by his radio friends both from this country and the corners of the earth. He kept more or less open house, and indeed it was quite unusual for him to be without visitors during the greater part of the year. Any visitor was assured of a warm, friendly welcome and quickly learned to appreciate his wife's magnificent cooking.

Alan Fawcett was a fine and gifted man who gave much and expected little except honesty and friendship in return. I am proud and fortunate to have known him for over 30 years, both as a radio amateur and a professional colleague. He will be greatly missed by his medical colleagues, the members of RAOTA, and by his many radio friends in this country and throughout the world.

He is survived by his wife (herself a doctor), a daughter and two sons (one a surgeon and one an engineer).

G. M. K.

Reflections on a bridge

By H. S. CHADWICK, G8ON*

AN article in this journal has one feature in common with an average aerial—the space available is not unlimited. Perhaps it is for this reason that while we have had several excellent articles on swr bridges, low-pass filters, resistive loads and aerial matching units, each has treated the unit under discussion as a separate and isolated piece of equipment. It is the author's present task to gather up the pieces of cable and to connect them together, and we hope for someone's benefit to encounter as many snags as possible on our way. The difficulty lies in recalling all of them, for their name is legion.

First let us consider a transmitter—or generator—of low impedance output, feeding power into an infinite length of coaxial cable. There will be no power reflected because it never gets there and so can hardly start on its way back. The definition of the impedance of this cable is that a resistive load of the *same impedance* may be inserted at point X and the remainder of the cable removed. And point X may be wherever you will. The resistive load is our dummy aerial, concerning which we will get critical later; and the infinite and terminated lines are shown in Fig 1.

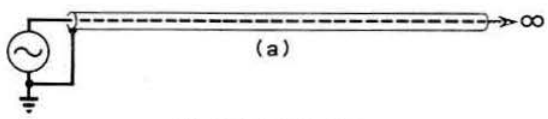


Fig 1(a). Infinite line

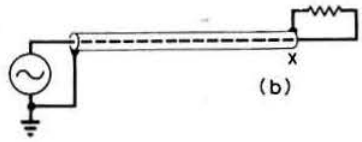


Fig 1(b). Unterminated matched line

The power which would have gone on flowing to eternity will now be converted entirely into heat in the dummy aerial, and there will still be no power reflected back towards the generator. We will have a one-to-one standing wave ratio, a beast so rare that we shall probably never see any other than the one which now exists only, unfortunately, in our imagination. And remember, every unit we interpose between the generator and the load must be of precisely the same impedance as the line, or this state of affairs will cease to exist.

At this point the writer wishes to introduce a favourite beast of his own—an rf ammeter enclosed in a shielding box and having input and output leads of heavy copper tubing, such that the box-to-tubing diameters ratio produces something like the impedance of the line. It will not be a perfect match, and will not lack for company in that respect. Let us now remove the long cable, and in its place put a series of short lengths, each terminated by a plug which matches the line, and connected by a coupler which also matches. This is the greatest strain the writer will put on your imagination—and it is great enough! In the average case the line is now a mass of minute discontinuities in impedance. Now insert the ammeter in turn at every joint in the line. If we have a true one-to-one swr the reading will be the same at every point. We have thus a rough check as to whether our swr bridge will be telling us the truth, the approximate truth, or nothing like the truth. And it may well do just that.

Now we open another joint and insert the swr bridge and get a one-to-one reading. Do we trust it? Not necessarily. If moving the ammeter to several different joints in the cable does not disclose variations in current, it may be fairly correct. Test it by changing the frequency to 30MHz and try the experiment again. Turn up the sensitivity control to maximum. If you really have got a one-to-one, there will still be no reverse current flowing. If you have a small reverse current, it may be due to the plug joints, the ammeter, the swr bridge or—let us face it—the dummy load. *Truly* resistive dummy loads are very hard to achieve. You can check their dc resistance with a good ohmmeter, and see whether they have reactance by checking that the swr indicated on the bridge remains constant on each frequency band. If it does, the load is reasonably non-reactive, which is very lucky. But more about loads later.

But suppose our swr meter now shows some reverse current. Unless great care has been taken in the design and construction, this is probably due to the mismatch of the bridge itself. A 70 bridge will introduce an swr other than one-to-one in an 80Ω line. The designer's instructions usually quote the impedance of his bridge, and provided we allow for the mismatch we can often afford to disregard it. In fact it may be a good thing—if it is before us as a constant reminder that our line is not perfectly 'flat'. At this stage we may care to look up the subject in the excellent *VHF-UHF Manual*, where we will note the margin of inaccuracy quoted for these instruments—even for the very good one described. And for anything made out of junk-box components, perhaps with diodes not scrupulously matched, poor lay-out and screening, we will see why, in most cases, we only fool ourselves when we try to read off to a decimal point—an accuracy which is not there to begin with.

How important is an swr? So far as effective radiation is concerned we may tolerate a ratio as bad as two-to-one. (The professionals do, in hf communication.) The loss in radiated power will be about 1·2dB, and probably you are the only one who will ever notice you are losing a quarter of an S point. A ratio of two up to four is undesirable and above five-to-one it becomes bad. Even then, loss of radiation is not the main concern, but the fact that at some points on the cable the current can be high enough, and the line hot enough, to melt the insulation between the inner and outer conductors—resulting in a short circuit. And one quarter-wavelength nearer the transmitter the voltage may be high

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enough to cause flash-over, the dreaded bang in the pi-network. Further, any low-pass filter in the line may experience either the heat or the flash, and even if they can stand it they will not filter efficiently.

If our swr is still sufficiently low, we can now insert the low-pass filter. If it is not low, we cannot expect much sympathy from the manufacturer to whom we ruefully return it. We check our ratio again, and it will be surprising if it has not risen. It is very difficult to design a filter to be efficient and to have a low swr unless it is to filter on one band only, such as the "half-wave" filters. And by this point in the proceedings we will be quite pleased with any indication below one-and-a-half to one. Note the word "indication" —all it means is that the system so far is "good", and not "undesirable" or "bad".

Now we are ready to insert the aerial matching unit at the next cable joint. The writer prefers the term amu to the more usual atu, because this unit cannot *tune* the aerial—it it self-tuned by its own inductance and capacitance. All we can do is to match its input impedance. The amu is the radio equivalent of a gear-box, and a gear-box matches input power to its load—it does not tune out the gradient. Many of the magical powers which proud owners ascribe to their pet googy-match are quite illusory. Very few of them will match a wide range of input impedances to a wide range of output impedances over a wide band of frequencies, without considerable loss of efficiency. So clearly, if, and we repeat the "if", the aerial has the same impedance as the dummy load, we are as well off without the amu, which has nothing to add but its losses.

However, it is unsafe to assume such an "if", and we must proceed on the assumption that the aerial will be reactive, or if not, may be resistive at a different value from the line. In passing, the common assumption that a dipole with an 80Ω feeder presents an 80Ω load has no foundation in fact. Probably the most elementary rf gear-box is shown in Fig 2(*a*)—simply an auto-transformer. The number of turns across the input line should be adjusted for the lowest swr on the bridge (use low power for this), and then the aerial is tapped up the coil, starting from the earthy end. But before we do this, let us try using the dummy load, as an aerial, fed through the aerial matching unit. There should be an output point to match it, and by first reading the current with the rf meter on the generator side of the amu, and then again on the load side, we will be able to find the power wasted in the matching unit. A rather better amu in which the coil has more turns, and has a capacitor to resonate it, is the type used by the writer, Fig. 2(*b*). But if the aerial to be used differs widely in impedance from the dummy load, the loss figure will be no more than an indication, though even that is better than having no idea at all.

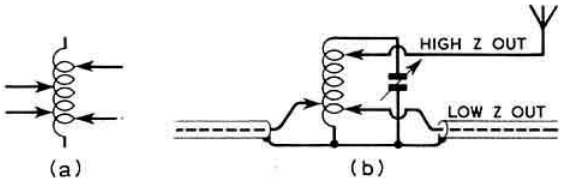

Fig 2(a). Aerial coupler of auto-transformer type

Fig 2(b) Aerial coupler for end-fed aerials

Now we dispense with our dummy load and connect the aerial, selecting the tapping on the amu coil which gives the heavy loading we require without flattening the tuning of the amu (remember, the transmitter tuning controls must *never* be moved to please some other piece of apparatus, once they have been set for maximum into the dummy load.) Note that, from the definition of a matched line, any aerial having a feeder which must be of some certain length *cannot* be truly matched. If it were, feeder length could not matter. This does not mean it will not work, but it does mean that we must be prepared for changes of its impedance from band to band, and design the amu to fit this. At the risk of repetition, when any line is used in an unmatched condition, its characteristic impedance will become irrelevant, ie a Zepp feeder is not a 600Ω line, because in a Zepp aerial it is not matched to 600Ω.

Now a glance at the ubiquitous dipole. It has a centre impedance of about 80Ω—but that is in free space, a bit higher than we hang the washing! Near the ground an aerial has a lower impedance, which rises to, and then swings around, the 80Ω value as it is raised. But assuming we place it $\lambda/2$ above earth, just how much of the centre of the aerial subtends an impedance of 80Ω? A fair rough guide is to cut out 1in for every 5m of wavelength, and fan the cable to make an equilateral triangle; for 50Ω cable, 1in for every 7m. And if we cut away all of this length from one side of the centre, instead of symmetrically, and connect the outer braid to the exact centre of the aerial, and the inner conductor to the shortened end of the aerial, we can save ourselves a balun with very small loss of efficiency, If a balun is used it must have the right kind of ferrite, and enough of it. Otherwise it may saturate magnetically, generate square waves, and cause tvi.

We must also remember that dipoles which have their ends shortened or bent will not generally have the correct centre impedance. Short, bent, low dipoles may provide a mystery trip. Bends in an aerial can cause changes in impedance, and make matching tedious if not impossible. They can also alter the resonant frequency.

So far we have got along by ignoring the resistance and losses of the cable, but it is common knowledge that if we had an infinite cable of normal manufacture, we would get no reflection from a very long length, even if it were very badly mismatched. The losses on the cable would be so great that no reflected power would get back as far as the swr bridge without almost complete attenuation. We would then have a "low swr" on a very badly mismatched line. So it follows that with practical lines which have a loss per 100ft of so many decibels, the longer the line the more does the swr indicator become over-optimistic. To take an example from *Radio Communication Handbook* (page 13.18), a tower 100ft high and 100ft away, fed by coaxial cable, could reasonably deliver as little as 64 per cent of its power to the aerial If it were all reflected, another 64 per cent would be lost on the way back.

The square of 0·64 is 0·41. Since the power now going backwards through our bridge is being compared with an unattenuated power going forwards, our *total* reflection shows an swr of only about 2·5 to 1. We could thus imagine we were losing only about 1½dB when in fact we were losing the lot, so far as effective radiation is concerned. The example is not too good, as many other factors enter into it, but it shows clearly that the longer the line the more scrupulous

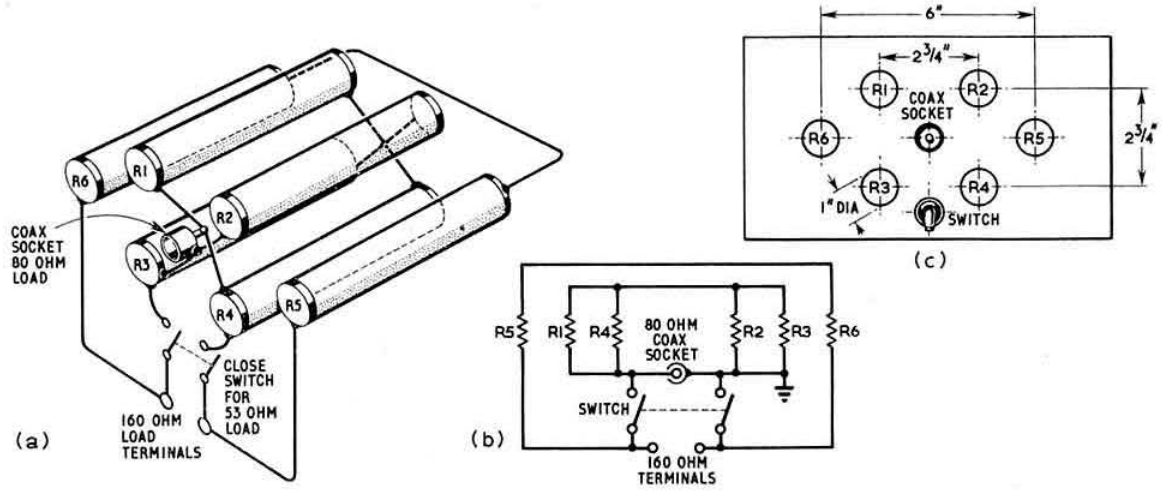

Fig 3. The low reactance dummy load constructed by the author. When used in the unbalanced 80Ω configuration the maximum power rating is 200W continuous or 600W pep

our matching should be. It is not impossible for a beam on a steeple to radiate less than a dipole on the garden fence!

Having in turn inserted and examined our filter, swr indicator, aerial matching unit, and at last the aerial, let us return for a look at the dummy load. After all, it has been used as our standard of resistive impedance, as well as our power/heat conversion unit. To fill this role it must retain its original resistance even when it is heated by our maximum rf power; and it must not radiate. Again to quote an extreme—if it turned half the power into heat and the other half into radiation it would reflect none; if it reflected the half it could not radiate it would show as a three-to-one mismatch. Another, if less material example of a false-"one-to-one".

In practice it can hardly be so bad, but the type of load in which the resistor is the inner conductor and a screened box the outer, is rather to be preferred; and the ratio of the diameters of resistor and screening box should obey the customary formula for the impedance of what is now an extension of the coaxial line. To be meticulous, both box and resistor should be connected to the line by coaxial cones so that even the leads to the resistive lines should be of line

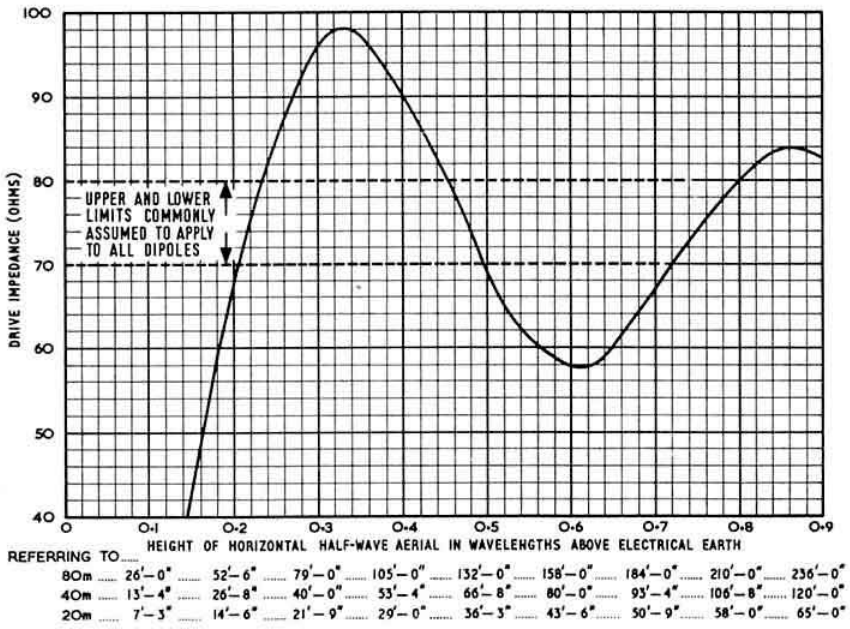

Fig 4. Feed impedance variation as a function of height above electrical earth

impedance. And so far as heat is concerned, most carbon tube resistors assume lower resistance with higher temperature, so they should be amply rated. You can fill the can with oil or distilled water, but it would mismatch the line impedance from that of the resistor if you do.

To overcome some of these snags, the writer uses four 80Ω 50W carbonized tubes, capable of standing 400W pep output, in series-parallel pairs, mounted with their axes centred on a 2¾in square. This gives a four-wire transmission line of about 80 ohm impedance. At the input the diagonal pairs are shorted, one set connected to the cable inner conductor, the other pair to the outer. At the "far" end, all four are heavily shorted together. The metal box, well ventilated, connects to the outer line. Outside this four-wire system is another pair of the same tubes, in series, 6in between centres. This can be switched in parallel across the line to give a 50Ω load. The meter, if we still have faith, says this has a 1·1 to 1 swr. Not elegant, just fairly adequate—the sixth attempt to get near to satisfaction. In this construction one is not tied to a box-to-resistor diameter ratio, and the line is fairly self-cancelling so far as radiation is concerned.

To quote G6JP in the *VHF-UHF Manual*, a one-to-one standing wave ratio is "rarely, if ever, achieved" despite the number of them to be heard of on the air. A searching question might be, "even if you had it, could you prove it?" Not that it always matters so much, but a low swr is definitely to be desired.

But when next asked about our standing waves, we should think well before our scornful disclaimer, remember the captain of the *Pinafore* and reply "Well . . hardly ever!"

Changing to metric in the UK

By E. CHICKEN, CEng, MIERE*

Introduction

Most residents of the British Isles are by now well aware that the British currency system is in the process of change from the existing 240 pennies to £1 sterling, to a new decimal system which uses 100 pennies to £1.

The date for complete changeover to the new decimal coins is 15 February, 1971 (Decimal or D Day), and by this change the Government claims to bring us into line with the majority of the world's nations with whom we do the bulk of our trade.

What is not so widely appreciated, however, is that the nation as a whole is fully committed to a total changeover from the use of the existing Imperial system of weights and measures to a Metric system of weights and measures. This changeover commenced on 1 January, 1969—this year!—and is due to be completely in force in *all sectors* by 1975.

It is obvious to the author, one of whose duties it is to organize the metrication of his own sphere of activities, that a great number of people—possibly the majority—are blissfully unaware of the magnitude of the impact that this change will have on their normal daily lives.

The effects will be far more widespread and potentially confusing than the change to decimal currency, in that weights and measures are involved with everything we buy, build, beg, borrow, steal, eat, read, etc.

The main reason for the change from Imperial to Metric in weights and measures is that it will bring us into line with the majority of the rest of the world, in the hope that international trading will be simplified to our advantage as a nation.

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It cannot be denied that our Imperial system is irrational and often confusing, eg:

Linear Measure

12 inches = 1 foot
3 feet = 1 yard
1,760 yards = 1 mile

(Not to mention furlong, chain, "thou" inch, micro inch, fathom, nautical mile)

Square measure

144 square inches = 1 square foot
4,840 square yards = 1 acre

(Not forgetting the rood.)

Capacity

4 gills = 1 pint
2 pints = 1 quart
4 quarts = 1 gallon (which differs from the US gal.)

(Plus, of course, the bushel, peck, fluid ounce, fluid drachm and minim.)

Mass (invariably confused with weight, which is mass acted upon by the force of gravity.)

16 ounces = 1 pound
14 pounds = 1 stone
112 pounds = 1 hundredweight (a *hundred* of what?)
20 hundredweights = 1 ton

(and what about the dram, grain, scruple, pennyweight?)

Acceleration

Force of gravity = 32 feet per second per second.

All of which lead to unwieldy and almost unmanageable units and dimensions for energy (work, heat) with their therms, horsepower/hours, British Thermal Units, foot

poundals, together with complex oddities for densities, forces, moments of inertia, pressures, viscosities, etc, etc.

Fortunately, due to the wisdom of our forebears, our schools many years ago had the foresight to align themselves, particularly in the field of science, with the French system of weights and measures known as the cgs system, which was a decimal system (involving multiples of ten throughout) using as its basic units, the centimetre, the gramme and the second.

But instead of simplifying, this made life far more difficult for the unfortunate student who now had to perform mental gymnastics to alternate from one system to the other during his working day in order to cope with mechanics (Imperial) or science (cgs).

With the passage of time it became obvious that the educational system must be rationalized, hence a revised version of the decimal weights amd measures system was introduced, known as the mks system, which used as its basic units the metre, the kilogramme and the second.

Which would have been *very* rational, if only they had dropped the Imperial and cgs systems, but it is true to say that the author's daughter is at this present time using all three systems simultaneously in her studies for " O " levels!

Britain is not alone in being the odd man out, however. While it is true to say that the majority of the world's nations use a decimal system, there are in fact many variations which are almost as potentially confusing as our own Imperial system.

Now, at last, there is more than a glimmer of hope that common sense may prevail.

There has been widespread international agreement in principle (but not so evident in practice) to adopt a common decimal system of weights and measures, based on a rationalised version of the existing mks system, to be known as the International System of Units, abbreviated to SI from the French, *Système Intenational d'Unités*.

Britain is one of the agreeing nations, and so we have undertaken to change over to the SI, more popularly interpreted as " Going metric".

Without being a pessimist or a wet blanket, it is interesting to note that the British Treasury's new accounting system for dealing with the decimal currency and the British Standards Institution's method for the presentation of decimal numbers are already completely at variance with the rest of the world, even with the neighbouring Common Market countries. How very British!

SI (The International System of Units)

The SI is based on only six basic units, ie:

Quantity	*Unit*	*Symbol*
Length	metre	m
Mass	kilogramme	kg
Time	second	s
Electric current	ampere	A
Temperature	Kelvin	K
Luminous intensity	candela	cd

It is called a coherent system of units, which means that when two units are multiplied together the same units appear in the resultant quantity eg:

$$\text{area} = \text{metres} \times \text{metres} = \text{m} \times \text{m} = \text{m}^2$$

unlike the Imperial system where

$$\text{area} = \text{yards} \times \text{yards} = \text{acres}$$

In addition to the six basic units, there are supplementary SI units for plane and solid angles:

plane angle	radian	rad
solid angle	steradian	sr

Naturally, there must be other units to deal with quantities such as force, energy, power. These are known as "derived units ", and are stated in terms of the basic units.

For example, the SI unit for velocity is metre per second (m/s)

Sometimes a special name is given to a derived unit. For example, the unit of force is the newton, which is equal to 1 kilogramme metre per second per second or 1 kg m/s².

The derived units are tabulated below

Quantity	Name of SI Unit	Symbol	Expressed in terms of SI basic units or derived units.
Frequency	hertz	Hz	1 Hz = 1/s
Force	newton	N	1 N = kg m/s²
Work energy, quantity of heat	joule	J	1 J = 1 N m
Power	watt	W	1 W = 1 J/s
Quantity of electricity	coulomb	C	1 C = 1 A s
Electric potential, potential difference tension, electromotive force	volt	V	1 V = 1 W/A
Electric capacitance	farad	F	1 F = 1 A s/V
Electric resistance	ohm	Ω	1Ω = 1 V/A
Flux of magnetic induction, magnetic flux	weber	Wb	1 Wb = 1 V s
Magnetic flux density, magnetic induction	tesla	T	1 T = 1 Wb/m²
Inductance	henry	H	1 H = 1 V s/A
Luminous flux	lumen	lm	1 lm = 1 cd sr
Illumination	lux	lx	1 lx = 1 lm/m²

Decimal multiples and submultiples of the SI units follow the familiar designations of deca, hecto, kilo, mega, giga, tera in ascending powers, and deci, centi, milli, micro, nano, pico, femto, atto in descending powers.

The everyday multiples and submultiples, ie kilo, mega, milli, micro, pico, will present no difficulty, but it is worth noting that the SI preference is to restrict powers to multiples of three.

This precludes the use of the familiar centimetre in linear measure, where the preferred units become the millimetre and the metre,

Thus, all engineering and architectural drawings will be either in millimetres or metres.

General advantages

Leaving aside the potential advantage of easier international trading, it can be readily seen that in the long term, once the initial difficulties of familiarization with new terminologies have been overcome, the use of a system wherein every unit is directly related to its associated units by factors of ten will make calculations considerably less tedious than in the Imperial system. It cannot be too firmly stressed that the change to metric SI is more a case of familiarization with new terms than of retraining. Theories and formulae remain unchanged.

The cgs and Imperial systems will be dropped, leaving only one system to be mastered, and when one considers that the SI and mks systems are identical in so many respects, the actual changeover for students in particular should be painless.

In electrical and electronic engineering the changes are negligible, as the use of the mks system (metre, kilogramme, second) has been standard practice for many years now. Also, the standard units of electrical measurements remain unaltered in SI, ie the volt, ampere, ohm, coulomb and watt will continue as before.

Cable sizes and lengths will, of course, be classified in a different manner, eg instead of ordering 50 yards of 7/·036 cable, we will now perhaps order 50 metres of 7/0·85, remembering that 7/·036 means seven wires, each of 0·036 inches diameter, which is very close to 0.85 millimetres diameter, and that a yard is only about three inches shorter than a metre.

Similarly, involving weights and measures, we will order a half kilogramme reel of solder to replace the one pound reel because the SI basic unit of weight, the kilogramme, is roughly equal to two Imperial pounds.

Kilohertz and megahertz for expression of frequency have already been phased in as standard terms.

It is possibly the mechanical engineer or student engineer who will find the change to SI most difficult to digest, due, surprisingly enough, to a simplification of the existing extremely complicated and confusing system of weights and measures in which the force of gravity is so dexterously juxtapositioned from one formula to another to produce—he hopes—the right answer.

In SI, the basic units are completely independent of the force of gravity.

Unit acceleration = 1 metre per second per second
= 1 m/s^2

(Compare that for ease of handling with the Imperial 32 feet per second per second, and gone are the dynes, kiloponds, tonsforce, lbf and poundal!)

Force will now be expressed only in newtons where

Unit force = 1 newton
= 1 kilogramme metre per second per second = 1 $kg\ m/s^2$

ie Force = mass × acceleration = kg × m/s^2

Pressure, which is a force acting on an area, becomes newtons per square metre, (superseding, for example, the familiar psi, which was really pounds *force* per square inch and which brought in gravity!)

A major rationalisation will be felt in dealing with work, energy and quantity of heat, where the basic unit becomes the joule (J) which takes over from the therm, horsepower hour, kilowatt hour, British thermal unit, ft lbf, etc.

1 joule = 1 newton metre = force × distance

In power and heat flow rate, the watt ousts the horsepower and the erg. *All* power, mechanical or otherwise, will be expressed in watts.

For example, one horsepower is approximately 0·75 kilowatt, so a ten hp engine will be about 7·5 kW.

1 watt = 1 joule/second

The astute reader will by now have noticed that capital letters are used for symbols when the name of a person is involved in the unit, eg ampere—A, newton—N, joule—J.

While on the subject of names, do not be alarmed at the SI adoption of the Kelvin, K, as the basic unit of temperature. In practice, °C will still be used, although C now stands for Celsius not centigrade—goodness only knows why!

For practical purposes temperature *intervals* expressed in °C or °K are identical (although the actual *temperatures* are considerably different). In other words, a rise in temperature of 3°K is identical to a rise in temperature of 3°C, but 0°K (absolute zero) = −273°C, or °K = °C + 273.

Programme of change

As stated at the beginning of this article, the national programme of change to SI began on 1 January 1969, to be completed by 1975.

It must, of necessity, be a gradual change, as it involves so many facets of industry and commerce. For example, the construction industry cannot begin building to metric designs until metric dimensioned components are available.

Design work in all sectors relies on the availability of metric versions of essential reference data—British Standards, IEE Regulations, Heating and Ventilating Guides, Steam Tables, etc.

The revision and publication of all that sort of information is in itself a formidable task.

Legislation is being considered in relation to the legal aspects, eg 30mph = 48·28 kilometres per hour, which would require legislation before it could be rounded off to, say, 50km/h. (Incidentally, the breathalyser is already in metric units.)

After 1 January 1970 electric cables will be available *only* in metric sizes, and copper products will be sold by metric weight and decimal pounds sterling.

The paper industry has already gone metric.

The construction industry is taking advantage of the opportunity to simultaneously rationalize dimensions of building components—bricks, window frames, beams, ceiling heights, etc, in a programme of dimensional coordination, so that all components and building sizes will be multiples of preferred basic modules of 100mm, 300mm, 1m, 3m. This should considerably speed up the building programmes for hospitals, schools, houses and factories by allowing a more widespread adoption of system-building techniques.

There can be no doubt that, in the long term, the adoption of an agreed international metric system for weights and measures will prove beneficial to this country. But it would be foolish to ignore the reality that such a change will be very costly to implement, and one could argue against the decision to introduce the new system at this time of national economic crisis. But it would be more foolish to ignore the fact that we are, as a nation, at this very moment, irrevocably committed to the change.

It is, therefore, in everyone's own interest to take immediate steps to familiarize himself with the new units, terminologies and dimensions.

Forget all about Fahrenheit, for example, and think of the weather only in °C (it is sad that the television weather forecasts continue to display both °C and °F simultaneously, because human nature makes the individual observe *only* that which he knows!). Think of your footsteps as being one metre long, your height as nearly two metres and your pinta as ½ litre.

Very soon now you will have no option but to rethink. Far better to take your medicine in easy stages than all at once! The former can be very beneficial, the latter can prove fatal.

THE MONTH ON THE AIR

A monthly feature by JOHN ALLAWAY, G3FKM*

ONCE again the festive season is almost upon us and your scribe would like to take this opportunity to pass along his best wishes for Christmas and the New Year to all readers, with continued good dxing during 1970. Sincere thanks are due to all those who have supplied information throughout the year—one of the most encouraging features of 1969 has been the keenness with which some of the listener members have contributed and the frequency with which the writer has received news of yet another embryo dxer who has received his callsign. Certainly a most healthy state of affairs, and may 1970 continue in the same manner. Particular thanks are due to Dr G. Lange-Hesse, DJ2BC, of the Lindau Ionospheric Institute, for supplying the information used in the preparation of the Propagation Prediction tables.

A very useful Christmas present for anyone interested in certificate hunting would be a copy of K6BX's *Directory of Certificates and Awards*. This mine of information is published quarterly and contains full details of many hundreds of awards. Copies may be obtained in the UK via G2BVN (R. F. Stevens, 51 Pettits Lane, Romford RM1 4HJ, Essex) price 21s. 3d. Orders are forwarded to K6BX so that the latest copy is posted direct to the purchaser. Present delivery time appears to be at least six weeks from date of ordering.

Many queries are received concerning countries lists. The Society produces its own very useful list which may be obtained from HQ, price 1s 4d inc postage. Those who desire an official ARRL DXCC list should write to ARRL Headquarters, 225 Main Street, Newington, Conn, 06111, U.S.A., enclosing an IRC with their request.

G3ABG is organizing a **WAB Social** which is to take place at the Masonic Hall, Rugby, on the last Saturday of April 1970. Guests will be welcome and the maximum inclusive cost (including tea and full dinner) will be 30s. Interested parties are asked to contact John at 24 Walhouse St, Cannock, Staffs, as if the event is to take place it is necessary to have 150 firm bookings by the end of the year. Rugby is, of course, very easy to reach by road or rail.

Sincere apologies for a slip up in October *MOTA*—the President of the NJDXA who has become a silent key was Walt Knoops, W2LA (ex-W2PXR). W2LV is also a member of the club and is fortunately still fit and well.

Top Band news

Readers will be sorry to learn that Stew, W1BB, feels that it is nearly time for him to cease production of his most valuable *160 Meter DX Bulletin*. This publication contains comprehensive news of all the dx worked and heard on Top Band throughout the world, and its demise would be a sad blow for all enthusiasts. It is to be hoped that Stew will not discontinue his efforts during 1970 as he predicts, or that as the world's leading 160m dx operator he will find some other way of keeping in touch with us.

As mentioned last month this season's **Transatlantic Tests** will take place between 0500 and 0730 on 14 and 28 December, 11 January and 1 and 15 February. W/VE stations will call "CQ DX Test" for the first five minutes of the hour, listening during the alternate five minute spells. Others will call CQ during the second, etc, five minute period. European stations are advised to transmit between 1,824 and 1,830kHz or between 1,851 and 1,861kHz, and to listen between 1,800 and 1,810kHz for east coast replies, and 1,990 and 2,000kHz for west coast stations. These tests have been running since 1932, and Stew points out that they are *tests* not *contests*. A series of **Trans-Pacific Tests** on similar lines is also being organized between 1330 and 1600 on 13 and 27 December, 10 and 31 January and 14 February. Procedures as for the transatlantic efforts. JA stations use 1,907·5 to 1,912·5kHz, ZLs 1,876 to 1,886 (approx), and VK around 1,802kHz.

First transatlantic crossings of the new season would appear to have taken place on 7 September (G3VMB/W1BB), 14 September (G3OLI/W1BB), and 21 September (G3OLI, G3MYI, G3VGK and others worked W1BB). There is a possibility that 9X5SP and EP2BQ may be on during the winter, and also that DL9KRA may once again activate CE3CZ on the band. A review of conditions during the weekend of the CQ WW DX Contest by G3XDY shows that no dx was heard on the Saturday, but that on Sunday K1PBW, K2ANR and KV4FZ (peaking S8) were heard but did not have any European contacts. W1BB/1 and KP4TL appear to have made some cw QSOs. It seems that CT8GN/1, EA8GN/1, EA8GN/F, F8GN/GC and F8GN/GD are the same pirate. John says that conditions have been quite good for the time of year, with considerable transatlantic traffic, although things are still a bit patchy.

News from overseas

Ben, G3GPQ, has now moved from his 9J2BK location and is living in Pietermaritzburg in the Republic of South Africa. He has not received a ZS5 call yet so is using G3GPQ/ZS5. Ben wishes to thank all the hundreds of British amateurs he worked during his 11-year stay in Zambia for all the interesting QSOs. Zambia appears to be well placed for contacts into Britain and G3s NWT and NRY and G2BQC have appeared in the log almost weekly (on 10m) through the years.

Mike Matthews, G3JFF, now on the Far East flagship HMS *London*, has been given permission to use the call G3JFF/MM from on board, and will be found on 14,025,

* 10 Knightlow Road, Birmingham 17.

G3JFF—Mike Matthews, 32 Briar Close, Cowplain, Hants. Founder member of RNARS, also member of FOC, TOPS, CHC/FHC and holder of calls VS1HU, 9M2MA, VR1M, VR2EA, YJ1MA and ZB2AM. UK rig KW 2000A with G5RV—DXCC 189, also holder of CHC 200 top honours.

14,260 or 21,025kHz as conditions permit. At the time of writing, Mike had visited Auckland, Gisborne, Wellington and Lyttleton in New Zealand, and was en route for Australia before returning to Singapore for Christmas. Following this he expects to be in the Far East for 15 months.

LA9BL asks that all who need QSLs from JW1CI apply to him at the address given in *QTH Corner*. John says that JW1CI, who is located on Bear Is. in the Svalbard group, is active on all bands on cw and ssb with his FT DX500. There will be some delay in QSLing but things should be running smoothly by the time this is in print. IRCs are requested from those who would like a direct reply.

The October issue of *NARS News* gives the information that after the recent departure of 5N2s AAX, ABF and ABI, there are now only eight active stations in Nigeria among a population of 60 million. They are 5N2s AAF, AAJ, AAK, AAU, ABB, ABG, ABH and NAS. The only inactive station with a current licence is thought to be 5N2AAY. No fresh licences have been issued for a considerable time.

TA1RF is at present in Loughborough studying for his MScEE, and would very much like to meet some British amateurs. Nur Serinken's address is: Royce Hall, Ashby Road, Loughborough, Leics. Please note that the address given in August *QTH Corner* for Nur's QSL manager DJ4SK was incorrect, for the correct version see this month's *QTH Corner*.

Norman Addison, MP4MBJ, (otherwise known as 9M4LQ, VS1LQ and G3POA) has now returned to London after a year's stay in Masirah in the Arabian Gulf. During his MP4MBJ operations he made about 10,000 contacts on cw and ssb on 14 and 21MHz, and this total included 1,900 UK stations and 214 countries. He still has 1,000 QSLs to send out via the bureau, but anyone wanting a direct card is invited to write to the address in *QTH Corner*. Norman says that the BBC now has a station on the island and that some of their licensed operators can be expected to appear with MP4M calls soon. The MP4MBC station (RAF) is not on the air at present due to lack of operators. Masirah Is is five miles wide, 40 miles long and 22 miles from the Sultanate of Muscat and Oman (for which it counts for DXCC purposes). It is ex-volcanic, devoid of vegetation and has no rain, and in the winter months the temperature dropped to the lower eighties! Fifty miles of golden beaches and wonderful swimming and fishing, if you could out-swim the sharks and barracuda, did not apparently compensate for the complete absence of women on the island.

G3VDO/MM left the mv *London Independence* in July and has now joined the mv *London Citizen*. After his /MM licence has been transferred he hopes to be looking for UK contacts on 10, 15, 20 and 40m. His new ship is a general dry cargo vessel and will be travelling between the USA, Central America and the Far East. Equipment consists of an FT100 transceiver and vertical dipole, and both cw and ssb will be used. QSLs should be sent to the address in *QTH Corner*.

G3VEW, who is at present on Ascension Is, reports that 10 and 15m are open to the UK most days and that 40 and 80m are full of European signals during the evening. He has no equipment at present but has access to that belonging to ZD8RB.

VE1ACU reports that VE1ASJ is *not* QSL manager for JX2BH. He originally undertook the task but has received no logs and JX2BH has now left Jan Mayen. It is suggested that cards are sent via the Norwegian bureau. QSLs received by VE1ASJ accompanied by return postage have been returned and the others forwarded to NARL. Stations for whom he does act as manager are HP9FC/MM, HQ2GK, HR1KAS, KG4DO, VP7NF and VP8JT. His address is PO Box 51, St John, NB, Canada. VE1ACU was formerly VO2AW/3B2AW (until July 1968) and will QSL contacts with either call (Don Welling, 36 Sherwood Drive, East St John, NB, Canada). He points out that VO2AW has now been re-issued and that the current holder requests cards via the VO2 QSL Bureau, PO Box 232, Goose Bay, Labrador, Canada.

Awards

The Cook Bi-Centenary Award.

Awards Manager, WIA, PO Box 67, East Melbourne, Vic, Australia 3002.

Stations outside Australian territory must contact 50 different Australian stations using the special AX prefix between 1 January and 31 December, 1970. Applications should include a list of the stations worked (in order of call-signs and by call areas) showing the date, time, band, mode and reports exchanged. This should be certified by two other amateurs that they have seen the log entries on which the claim is based, and no QSLs need be submitted. Applications should be marked "Cook Award" on the back of the envelope and should arrive at the above address before 31 December, 1971. There is no charge unless airmail postage on the certificate is desired in which case eight IRCs should be enclosed.

The Five Band Worked All States Award.

This is to be issued to those who obtain confirmed contacts with all 50 USA states on five bands after 31 December, 1969. It will be issued in addition to the normal WAS Award. There will be no mode endorsements issued and cross-mode or cross-band contacts will not be counted. A special application form will be available from ARRL HQ, and the sum of $10 which is charged for the award will cover the cost of the special plaque and return of the 500 QSLs by first-class registered mail. Only written QSO confirmations will be accepted and no credit will be given for confirmations via contest logs. The 5BWAS is available to all amateurs, but applicants in the USA, Canada, Puerto Rico and USA overseas territories must be full ARRL members. This award should prove to be quite a challenge to European aspirants!

The Polska Award

Issued by PZK Awards Manager, PO Box 320, Warszawa 1, Poland. Applicants require confirmed contacts/swl reports with stations in all 17 Polish provinces, since 1 January, 1946. The independent cities of Warsaw, Lodz, Krakow, Poznan, and Wroclaw are counted as their surrounding province. There is an hf (3·5 to 28 MHz) and a vhf award (144 MHz up), and separate cw, am, and 2 way ssb certificates are available. There is a fee of 7 IRCs.

More information has been received from the National Amateur Radio Union of Greece concerning their awards programme previously mentioned in April *MOTA*.

The Europe SWL Diploma **The Europe AM Diploma.**
The Europe SSB Diploma **The Europe CW Diploma.**

All these require the production of QSLs confirming QSOs since 17 April 1968 with Greece and 19 other European countries on the appropriate mode. QSLs need not be sent if a certified list is submitted, and there is no charge.

The World SWL Diploma **The World AM Diploma.**
The World SSB Diploma **The World CW Diploma.**

These call for confirmed contacts with Greece and 99 other countries as above. Applications should be accompanied by one's own QSL card and should be sent to: Awards Manager, N.A.R.U. of Greece, P.O. Box 1442, Athens, Greece, The same organisation sponsors the **Acropolis Award** for QSOs/SWL confirmations from 10 SV1 stations (not SV0) since 5 June 1969, and also runs a quarterly QSL competition. The prizes in this consist of statuettes, and applicants may only submit a particular design of card once.

Latest news on the **WAB Award** is that there is a net most evenings near 3,760kHz and a new cw net on Tuesdays at 1900 on 3,530kHz. WAB books have now been sent all over the world, and many are donating a copy to a member of RAIBC. All profits are being donated to RAIBC and towards the cost of the Society's QSL Bureau.

Dx news

XT2AA reports that his trip to Mali will most likely not take place until 1970. Another African station of interest is 5T5AD, Alban, who is often to be found near 14,270kHz at 0715. 5T5YL is his wife and they are the only two stations on the air from Mauretania at present. FH8CD will be leaving the Comoro Is during November and returning to France.

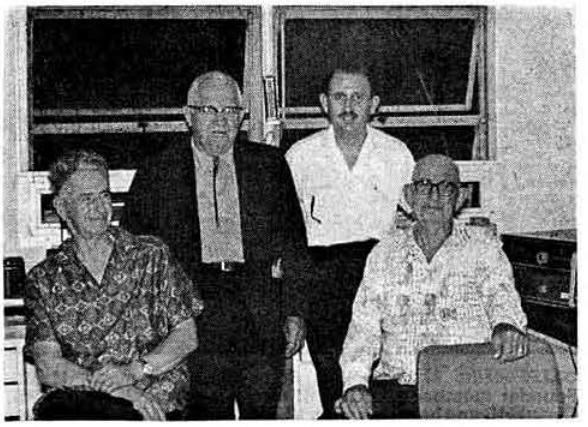
KH6GLU now has a quad up for use on 40m, and KS6CY expects to be able to be on all bands on cw and ssb by December. KW6EJ has now left Wake Is and is expected to be in KC6 soon. Father Dave Reddy, K2BUI, has been assigned to Easter Is as chaplain; it is possible that he may acquire a CE0 call in due course.

Some ssb activity is promised from Egypt soon as SU1MA is expecting delivery of a transceiver.

F2MO now has logs from FB8XX covering the period 23 January to 27 August, 1969.

WA5LES says that he is not QSL manager for the station who has been reported using the callsign HC8AI. This seems to confirm the doubts about the genuineness of HC8AI. He is QSL manager for VP2AZ for contacts during July 1966 and July 1969 only, for all contacts with VP2GTL, and for VP2LD for July 1969 only.

According to SU1IM there are at present seven licensed stations in Egypt. These are SU1s AL, KH, KG and MA, who only use phone; SU1s IM and AR, who are on phone and cw, and SU1AR who is inactive.



An impromptu hamfest at the home of VR2EK at Deuba, Fiji. Left to right: Owen (ZL3AW), "Musty" Mustermann (W2TP), Les Hickinbotham (VR2FT/G3HZG) and Bill (VR2EK/W6AL).

M1I was on during the CQ WW DX Contest (phone) and should be QSLd via I1GAD. A Swan Cygnet plus a linear and a beam are reported to be en route to M1H, this should result in more San Marino activity.

ZS2MI, Marion Is, has been active again. The new operator's name is Des and he has said that he will be on the air daily from 0300 until after 1600 and mostly between 14,297 and 14,320kHz am. QSL via ZS6LW.

VQ8CFB (St Brandon Is) is on regularly around 14,027kHz after 1300.

Peculiar prefixes seem to be on the increase. 9I5 was used by Zambian stations to celebrate the fifth anniversary of their country's independence. OG and OI appear to have been used by Finnish stations during some contest activity, and stations from Uruguay were heard using CW in place of CX also during a contest. The series 3CA to 3CZ has been allocated to Equatorial Guinea (formerly EA0), and CS and CU may be used by Portuguese stations during the CQ WW DX Contest. The use of 4J9DX by UA9AN and others during the same contest has also been predicted, the QTH of this station will be the South Urals.

VP9MI, son of G2MI, will soon be heard on 80m ssb. He is in Region II, which entitles him to operate between 3·8 and 4MHz but he hopes to work into Europe on 3,795kHz around 2200 and between 0200 and 0300. The Caribbean net has now recommenced activities and meets every Sunday on 14,170kHz at 1130. The postcards which VP2ME is sending out to confirm contacts are not valid for awards as they do not mention that a contact took place!

ZD7SD is fairly active on 20m ssb with his HW32 transceiver and dipole antenna at 48ft. A favourite operating time seems to be 0700 to 0800. A new station is on the air from Nepal—9N1RA. Jinny has only one crystal and has been heard near 21,076kHz, QSLs go via K6OE. FR7ZP/E has now left Europa Is for Bassas da India Is, and FR7ZL is believed to be taking his place. FR7ZQ/E and FR7ZU/E are expected to show up from Europa soon.

Dxpeditions

It is rumoured that Bob, OD5BZ, has a licence and permission to operate from **Qatar** during late November or early December, his call may be MP4QGC.

YV1PP and other Venezuelan operators hope to be on the air from **Aves Is** (YV0) around 15 December. They should be there over a weekend and will have a tri-band beam for 10, 15 and 20m, and a dipole for 40m. They may possibly use a 4M0 call.

CE3HG is reported to be making frequent trips to **Juan Fernandez Is** and it is said that he may be on the air with a CE0X call at weekends during December and January.

West Coast DX Bulletin reports that two amateurs are negotiating for permission to operate from the monastery at **Mount Athos.** This is a territory owned by the Church in Greece and it is a matter of speculation that it might possibly count as a new "country."

Readers who may be inclined to think that assisting an expedition may be a profitable experience will be interested to know that the VK0WR expedition has proved to be the reverse as far as VK2AVA is concerned. It may be remembered that a Swan 350C was donated to Bill Roher, W7ZFY, by Arie and W3RX on the understanding that it would be sold after the trip and that the proceeds would be sent to them to help to defray the considerable sum involved. This has not happened; so far no communication had been received from W7ZFY up to nine months after the conclusion of the trip, and letters have remained unanswered.

One of the projected visits to **Cocos Is** (TI9) mentioned in earlier *MOTA*s is likely to be taking place at the time this reaches readers. TI8PE and a group of other operators are due to sail from Costa Rica on 1 December and should arrive 40 hours later. They expect to be on the island for seven days and may be using the callsigns TI9TI and TI9CI, although this is not certain. All-band operation is planned.

Gus, W4BPD, seems to be serious in his intention to return to the Indian Ocean area next year and says that transport is already laid on. An April start is rumoured, followed by a return home in August. W2MZV is helping with the organization of this trip.

According to the *West Coast DX Bulletin*, DL7FT hopes to make his visit to **Albania** around Easter 1970 and believes that all is going well so far. It is expected that the Albanian authorities will assign three "attenders" to sup rvise operations. An expedition lasting one week is Frank's target.

Readers will be pleased to know that VP8KO (S Orkneys) has been reported active again following his transmitter trouble which has presumably now been put right.

Those still needing **Rio de Oro** may like to know that EA9EJ is to be found around 14,040, 14,080, 7,020, 7,040, and 3,520kHz and will be on the air on 5, 11, 17, 23, 29 December from 0030. He usually starts on 14MHz, then goes to 7MHz around 0230, and to 3·5MHz at 0300.

ZM1BN/A will be on the air from **Snares Is** (48°S, 166°E) until February next, and will be on all bands cw and ssb. This island is 200 miles from ZL so will probably only count as New Zealand, but trips to other islands may be made. QSLs will be dealt with by ZL2AFZ.

VS6DR is organizing an expedition to **Spratley Is** and hoping to carry it out in January. VS6AA reports that the operators taking part will most likely be W4AMG, HS3DR and himself. Present plans call for HS3DR and VS6AA to join W4AMG in Brunei and then sail to Spratley in W4AMG's new 36ft yacht. This should take three days. Phil, VS6DR, is trying to organize equipment and a generator, and Maurice says that the expedition will definitely be "on" if these are obtained. The callsign to be used is not known as the island is claimed by several countries. Ken, VS6AL, returned to the UK in November and will now be found using the call G8ARZ.

The expedition to **Revilla Gigedo** (XE4) scheduled to have taken place in November has been postponed and will now start on 16 December.

1969 Countries Table

	1·8 MHz	3·5 MHz	7 MHz	14 MHz	21 MHz	28 MHz	Total
G3LNS	—	102	122	174	161	131	690
G3JVJ	12	76	27	114	18	29	276
G3HCT	—	85	73	47	61	111	377
G3UML	—	63	22	101	23	18	227
G3TXF	8	52	51	103	53	76	343
G3XBY	3	44	58	68	71	76	312
G2MI	1	42	51	138	122	75	429
G3TZU	5	37	64	132	143	167	548
G3KS	1	31	29	95	84	87	327
G4RS	4	25	10	63	66	21	189
G8VG	3	25	28	30	57	45	188
G3WPO	17	10	37	31	1	23	109
G3IAR	2	23	21	25	23	26	120
G3PQF	6	13	12	30	8	5	74
G3VPS	3	15	19	84	30	33	184
G3VLM	1	16	25	71	39	48	200
G3XYP	—	16	51	175	121	86	449
G3JHI	—	10	16	19	19	13	77
G3PEJ	4	5	21	43	59	38	170
G3VUM	4	4	8	70	51	57	194
G3KDB	—	5	100	158	109	69	441
G3VJG	—	3	24	10	9	54	100
A5390	9	87	69	174	164	106	609
A6148	8	86	78	130	107	124	533
BRS25429	4	75	98	167	126	95	565
BRS26870	5	59	65	134	102	108	473
BRS24529	4	55	80	153	94	75	380
A5489	—	59	22	103	91	54	329
A6590	3	55	—	38	87	111	294
A6337	5	52	43	104	108	51	363
BRS31164	4	52	47	127	107	81	418
A6254	6	47	26	128	159	96	462
A5662	18	31	31	127	114	86	407
A6023	7	40	16	72	70	42	247
A6201	1	43	31	53	31	20	179
A6431	9	34	31	92	83	46	295
BRS27806	6	35	20	67	64	4	236
BRS30694	9	31	40	98	129	67	374
A6248	6	33	45	120	100	56	360
A5154	2	35	18	111	83	62	314
A6923	4	29	14	54	40	27	168
A6278	2	30	32	130	75	20	289
A5466	8	24	27	41	30	37	167
A6003	5	25	24	46	93	61	254
A6444	3	26	18	85	27	19	178
BRS28198	2	27	32	1	—	20	82
A6143	4	24	46	63	107	51	295
BRS31172	8	16	23	65	57	35	204
A6179	4	18	15	65	35	9	143
A6098	5	16	30	39	10	10	110
A6593	1	17	13	74	69	40	214
A6498	4	14	4	35	9	11	77
A6220	1	16	24	95	15	18	169
A6553	2	13	8	41	92	60	216
A4255	1	14	8	32	31	15	101
A6242	1	8	7	80	58	35	189
A6144	—	4	15	62	—	—	81
ORS31427	—	3	13	153	114	72	355

(This month's table is in order of 1·8 plus 3·5MHz totals)

QTH Corner

A2CAF	via W4NJF, 1416 Rutland Drive, Virginia Beach, Va, 23454, USA.
C31CQ	via K2MME, Howard Ferber, Laura Lane, Pomona, NY USA.
DJ6QT/CT3	via W2GHK (see 4M1A).
FM7WW	B. P. 10, Francois, Martinique.
FR7ZP/E	Box 4, Clotilde, Reunion Is.
G3VDO/MA	I. Hacking, 9 Thornhill Av, Rishton, Blackburn, Lancs,
G3VDO/MM	BB1 4EZ
GD5APJ	via F2QQ, Richard Gemehl, 30 Rue Paul Deroulede, 92 Bois Colombes, France.
HB0FXW	via DJ2SX, Wolfgang Zimmermann, Poststr 9, 6843, Biblis, Germany.
I1MOL	(via W2GHK—see 4M1A)
JW1CI	via LA9BL, Box 26, N2059 Trandhum, Norway.
M1I	via I1GAD, Enrico Gardini, Via A Borghi Mamo 11, 40137 Bologna, Italy.
MP4MBJ	Norman Addison, 17 Wilberforce House, York Rd, Battersea, London SW11.
MP4TCN	via G3UUN, J. T. Gillett, 124 Weston Rd, Lichfield, Staffs.
OH0AM	(25–26 Oct) via OH2BH, Martti Laine, Angervontie 8-B-17, Helsinki 32, Finland.
PJ0DX	via W3AZD, D. B. Search, 9509Wire Av, Silver Spring, Md, USA.
TA1NC	Bahri Kacan, Kastenbauerstr 5, 8 Muenchen 80, Germany.
TA1RF	Hubert Haenchen, Hecht Str 1, 7 Stuttgart-Moenchfeld, Germany.
VK2WX/VK9	via VK2FU, G. Pollock, 158 Matthew Parade, Blaxland 2774, NSW, Australia.
VP2EUU	VE3EUU, A. H. Iseman, 67 Tavistock Rd, Downsview, Ont, Canada.
VP2VI	PO Box 75, Tortola, British Virgin Is.
VP2VP	via VE3ACD, M. J. Wolfson, 305 Rosemary Rd, Toronto 10, Ont, Canada.
VS5AP	via DJ4AB, Hans Puffer, Aegidistr 178–A, 425 Bottrop, Germany.
W6 QSL Bureau (new)	Box 11, Los Altos, Calif, 94022, USA.
ZB2BT	P/O Bradshaw, HMS *Rooke*, Gibraltar.
ZS2MI	via ZS6LW, A. D. Van der Watt, PO Box 838, Germiston, Tvl, Rep. of South Africa.
G3GPQ/ZS5	B. F. Killick, 50 Walter Short Rd, Scottsville, Pietermaritzburg, Rep of South Africa.

RSGB QSL Bureau, G2MI, Bromley, Kent.

Contests

Results of the **1969 ARRL DX Competition** have now been received. They are as follows:

Phone section

G3IAR	**1,262,608 points**	G3XYP	342,468 points
G2QT	1,156,263 ,,	G3KMA	259,584
GW3NWV	**1,122,407** ,,	G3UQR	169 905 ,,
G3WTV	576,232 ,,	G3COJ	18,585 ,,

G3JOC (Multi-operator—G3s IOR, JOC, LDT, MPN) **2,680,509 points**

CW section

G2RO	**1,585,440 points**	G3JYP	453,333 points
GC3IEW	**1,578,060** ,,	G3ESF	445,809 ,,
G3FXB	1,306,032 ,,	GW3JI	399,996 ,,
G3TXF	716,552 ,,	G3APN	211,629 ,,
GW3NJW	**660,756** ,,	**GM2HCZ**	**177,908** ,,
G2QT	620,550 ,,	G6VC	136,476 ,,
G3KMA	517,362 ,,	G3WP	8,556 ,,

GW3ITZ (Multi-operator-6 ops) **659,149 points**

G2RO is to be particularly congratulated on reaching the "Top Ten" of dx entrants in the cw section. The 1970 competitions will take place on February 7–8 and March 7–8 (phone), and February 21–22 and March 21–22 (cw). Details will be given in January *MOTA*. Entry forms and log sheets will be available from G3FKM.

The Pacific DX Net QSO Party

0400 to 1000 3 January, 1970.

Net stations work anyone, non-members work net stations only. Exchange QSO number and report. Each QSO is worth two points to non-members and the multiplier is the number of net countries worked. Net stations will be found between 14,260 and 14,270kHz on ssb. A special Pacific DX Net Award will be given to anyone working 25 net members in at least ten countries and contacts in this contest may be used for credit, the fee is eight IRCS to non-members. Mail logs before 1 February to: KH6GLU, PO Box 762, Kaunakakai, Hawaii, 96748, USA.

Nevada QSO Party

Nevada QSO Party, PO Box 73, Boulder City, Nev, 89005, USA.

0001 6 December to 0800 8 December. Exchange QSO number, report and QTH. Five points for each Nevada station worked, multiplied by number of counties worked (maximum 17). Same station may be worked on each band and mode for points. Look around 3,735. 14,090, 14,135, 14,335, 21,135, 21,100, 21.435, 28,035, 29,000 and 29,010kHz. All winners certificates will be signed by the State Governor. This QSO Party may help those still looking for Nevada for WAS. Mail logs to the address above before 22 December.

Winners of the **1968 IOTA Contest** have now been announced. The world leader was IIAA (945 points). **G8JM** was top UK scorer with 896 points, and Stewart Foster, **ISWL/G-10173,** was leading UK listener with 350 points.

The Quelimane Contest.

An award will be made to all who contact one station in Quelimane, one in the district of Zambezia, and three other CR7 stations located anywhere during the period between 1200 on 16 January and 2400 on 18 January. Regional artwork trophies will be awarded to the three entrants from outside Mozambique who have the largest number of CR7 QSOs during the period. Any mode or band may be used, but a station may only be worked once for credit. A list of QSOs should be sent (with QSLs for the stations worked) to R.E.M., PO Box 265, Quelimane, Mozambique. An entry fee of four IRCS should be enclosed, and if the award is desired (and QSLs by air) this should be increased to ten IRCS. Listeners may also take part. Mozambique districts are indicated by the following letters: QL—Quelimane, CD—Cabo Delgado, GZ—Gaza, IB—Inhambane, LM—Lourenço Marques, MS—Mancia e Sofala, MQ—Mozambique, NS—Niassa, TT—Tete and ZB—Zambezia.

It should be noted that in the **CHC International Contests** referred to last month the 50 bonus points for each 100 QSO points on 160 and 80m only apply to single band entrants operating on either of these bands.

Band reports

During the past month conditions have begun to show a more typical winter pattern. Dx on 160m and 80m has improved in the early mornings and the hf bands are now closing during

Propagation Predictions

Propagation conditions usually deteriorate during December compared with those of previous months and mid-winter conditions will reach their peak.

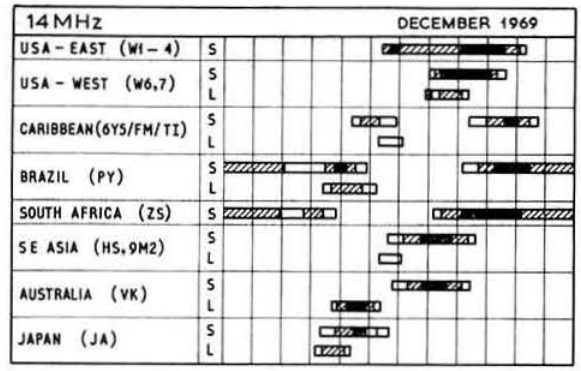
On **28MHz** Eastern North America will only be reached on favourable days, ie those with above average F2 mufs. Possibilities for working Western North America and East Asia will be better in Southern Europe than in the countries further north.

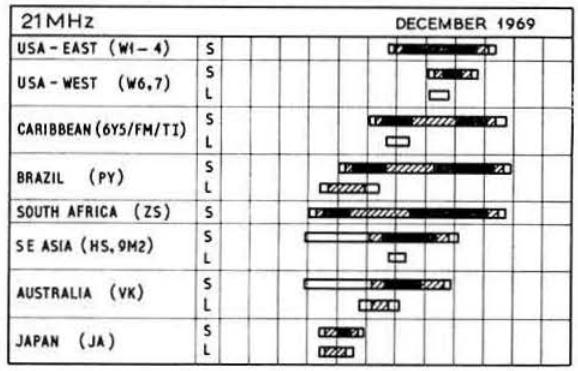
All continents should remain workable with certainty on **21MHz**. The mid-winter conditions will also enable contacts to be made with various zones via the long path, especially with South America and East Asia. Contacts are most favourable via the long path when the signal path approximately coincides with the twilight zone.

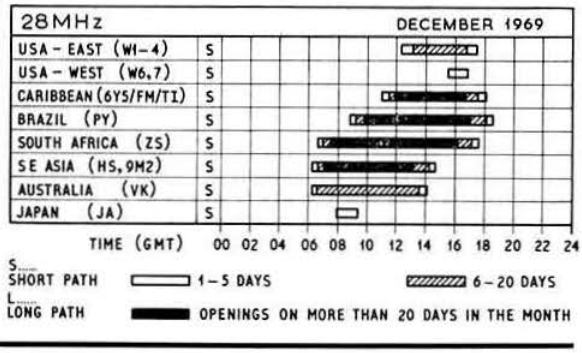
Various zones should be workable via the long path on **14MHz**, especially South America, East Asia and Western North America. In the latter half of the night this band will only remain open for dx traffic on favourable days.

7 and **3·5MHz** will take over as the main dx bands during the long winter nights, QRM permitting. Local traffic on 3·5MHz may be interrupted by the dead zone, especially in the period before sunrise.

The provisional sunspot number for October was 89·9 with the greatest activity occurring during the last nine days of the month. The predicted smoothed sunspot numbers continue to decline slowly, and the numbers for February, March and April, 1970, are 85, 84 and 83, respectively.







the night. Many thanks to the following for their contributions to this section: G2BOZ, G2BW, G2FYT, G2HKU, GW3AX, G3HCT, G3IGW, G3JVJ, G3TZU, G3URX, G3VJG, G3WNT, G3XDY, G3XWO, G3YWX, GM4QK, G5JL, G8VG, BRS2098, BRS26870, BRS30694, BRS31172, A5489, A6098, A6148, A6179, A6248, A6444 and A6498.

Calls listed in italics below were on cw, the rest on ssb:

80m. 0000 EP2BQ. **0500** CE2CAP, JW3XK, *KV4FZ*, OA4BS, *VP9GJ*, YS1HF. **0600** HC4BS, 9Y4AA. **0700** HC0BY/HR1, PJ0DX, ZLs. **2100** CN8s DL, HL, EA9BK, FP8AP, *JX3DH*, OY9LV, 5H3KJ, 5Z4KL. **2200** DJ6QT/CT3, JW1CI, UA9KAX, 5H3LV, 9G1DY, 9J2BR, 9X5SP.

40m. 0000 *VU2BEO*, 9X5SP. **0100** *HB0XFY* (QSL via DL8RH), 4M1A. **0500** *CO8SG*, *CT2AK*, M1I, *TI2WR*, *XE1OOL*, *5N2AAF*. **0700** VP9EP, YV1EM. **0800** YV7BI. **2000** VKs **2200** *JA6AD*, 9Y4KR. **2300** HK1BHP, PJ9VR (QSL via VE3GMT), YV6GG.

20m. 0500 KC4USN, *K4NSD/KS6*, VK9LB, VP2DAO, VR6TC. **0600** FG7TI/FS7, VR1L. **0700** ZD7SD. **0800** FK8BO, KC6CT, VR2BJ, 5T5AD. **0900** M1B. **1300** *VK6HD*. **1600** DU9FV, VQ8CS. **1700** *VS9MZ*. **1800** FR7ZL. **1900** CT2AA, KL7BZO, 4S7YL, 7P8AB. **2000** *HP1IE*, VK2BKM/VK2 (Lord Howe Is), 4M6A. **2100** FY7YQ, TR8MB, VP8s KD, KO. **2200** HK0BKX, HP1XWS/HP5. **2300** FG7XX.

15m. 0500 *SU1IM*. **0600** FL8MB. **0900** KW6EG, TU2s AZ, BB, 9X5LM. **1000** VK2WX/VK9, *XW8CS*, *9N1RA*. **1100** VK6HD, F6ABP/FC. **1400** FB8ZZ (QSL via F8US), OA1BT, *TA1QR*, *YB0AAF*. **1500** VQ8CR. **1600** *FM7WF*, FL8AO. **1700** KG4DS, K5FXY/KL7. **1800** CE3OE, CR6s, FG7TI/FS7, 5R8AS. **1900** KH6s GLU, GPM, SP, VP8KO, VP9MI. **2000** KL7s EQG, FCH, JDO, FP8AP. **2100** TR8DJ, YN1BUD. **2200** *HK3RQ/G5RV*.

10m. 0800 KG6AQY, *SU1IM*. **0900** HL9UU, JW1CI. **1000** CR9AK, VU2BEO (QSL via W3BZW), *XW8BP*, ZD3K. **1100** 4S7PT. **1200** VP2VP. **1300** JX3DH, PJ1AA, ZF1GC (QSL via VE4XN). **1400** VQ8CV, XT2AA. **1500** FP8CY. **1600** *VP2VJ*, *ZD8BB*, 6Y5DW. **1700** *CE8AA*, DJ6QT/CT3, FG7TI/FS7, *PJ7JC*, VP2DAJ (QSL via WB4EFE), *VP8JR*, W6/W7 most days. **1900** CP5ED.

Many thanks to the following for the information supplied from their publications: **NARS Newsletter** (*5N2AAF*), **Long Skip** (*VE3DLC*), **On the Air** (*ON4AD*), the **West Coast DX Bulletin** (*WA6AUD*), **DX-press** (*PA0TO*), **DX News Sheet** (*Geoff Watts*), the **DX'ers Magazine** (*W4BPD*), the **Florida DX Report** (*W4BRB*) and **CQ DX** (*ARI*).

Please send all items for the **January** issue **to reach G3FKM** no later than **10 December,** for **February** by **14 January,** and for **March** by **11 February.**

Project Oscar

By W. BROWNING, G2AOX,*

Australis Oscar 5

THE technical details of this Australian built amateur satellite were published in the October issue, and it is now expected that it will be put into a retrograde type of orbit, as described, on 17 December, or very early in January 1970, on a Thor-Delta two-stage rocket being used to place TIROS M into space.

The "command" receiver has produced some last minute problems on final test, owing to interference from the vhf transmitter at certain low and high temperatures giving very low sensitivity, and it may not therefore be possible to "command" the hf transmitter ON or OFF. According to present plans, it will be launched with the hf transmitter operating on 29·450MHz already ON and it may stay always switched ON. This will reduce the total life of operation of both the hf and vhf transmitters to about six weeks.

* Project Australis Regional Director for Europe and Africa, 47 Brampton Grove, Hendon, London NW4.

It is suggested that at all times initial searching is done on the vhf frequency of 144·050MHz, and Channel 1 of the telemetry checked. If the frequency is about 1,050–1,100Hz (50–60mA current drain) this will indicate that the hf transmitter is ON; a frequency of about 775–850Hz (25–30mA) indicates that it is OFF.

Copies of an example set of orbit predictions to be expected for the first five days are available from G2AOX in order to show the general pattern, but as they are calculated on estimated orbit parameters and launch time, they may need alteration after the actual launch. Also available are a set of four up-to-date telemetry graphs, and report forms and compiling instructions. All these require a 9in by 4in sae.

Reprints of Parts I, II and III of "Keeping track of OSCAR," covering all 11 pages of the original articles in the *Bulletin* and *Radio Communication*, are also available from G2AOX, and require at least an 11in by 5in sae.

Further information, when available, will be given out on the RSGB News Bulletin every Sunday, and after the launch G2AOX will be heard on approximately 145·000MHz discussing the day-to-day predictions and telemetry results.

It is particularly requested that the vhf frequency of 144·050MHz is kept clear during the times this satellite will be audible in the UK.

Contests

6–7 December—Tops CW Club 80m Contest.

6–7 December—CHC International DX-CW.

7 December—Fifth 70 MHz (CW) Contest.

13–14 December—CHC International DX-ssb.

31 January–1 February—1970 French Contest, CW.

7–8 February 1970—ARRL Phone Contest (first part).

21–22 February—ARRL CW Contest (first part).

28 February–1 March—1970 French Contest, Phone.

28 February–15 March—IARC Propagation Research Contest (cw and rtty).

7–8 March—ARRL Phone Contest (second part).

21–22 March—ARRL CW Contest (second part).

28 March–19 April—IARC Propagation Research Contest (phone).

HF Contests Calendar, 1970

Contest	Date(s)
AFS	10–11 January
1st 1·8MHz	14–15 February
BERU	7–8 March
Low power 80m	5 April
NFD	6–7 June
Summer 1·8MHz	4–5 July
High Power Field Day	11–12 July
80m Field Day	13 September
28MHz	10–11 October
7MHz CW	24–25 October
7MHz Phone	7–8 November
Second 1·8MHz	14–15 November

Looking Ahead

5 December—RSGB AGM, Royal Society of Arts, London.

30 January 1970—RSGB Dinner Club, Kingsley Hotel, WC1.

5 July 1970—1970 South Shields Mobile Rally.

25–26 July 1970—British Amateur Television Club Convention Cambridge.

Mobile Rallies

19 April 1970—North Midlands Mobile Rally.

Channel Islands Postage

Following the changeover of the British GPO from a Government department to a public corporation, the Channel Islands now have their own Post Office departments.

As a result UK stamps are no longer valid on correspondence from the Channel Islands, which now issue their own stamps. Consequently, stamped addressed envelopes, carrying UK stamps should no longer be sent for posting in the Channel Islands. (Any which are will be surcharged at double the rate and this will have to be paid by the recipient.) Such envelopes should be accompanied by a Commonwealth or International Reply Coupon to the value of 4d in the Channel Islands.

RADIO AMATEUR EMERGENCY NETWORK

By S. W. LAW, G3PAZ

Although early in the month it behoves us to wish the compliments of the season to all RAEN members, and to convey these good wishes also to those radio amateurs in many other countries who hold themselves ready to assist their fellows in time of emergency. May your festivities be uninterrupted by disaster wherever you may be.

Our opposite numbers

On a Great Circle path somewhat right of centre is that great dx of ZL; New Zealand. We are grateful to one of our correspondents for drawing our attention to a recent article in *The Gisbourne News* which featured outpost station operator Ross Glover, ZL2AYI; his section leader, John Wallen; base station operators Trevor Hughes and Peter Day, and outpost operator Les Lewis.

The article went on to describe the work of the Amateur Radio Emergency Corps (AREC) and its close liaison with the Search and Rescue Organisation for which it supplies communications in the event of it having to go into operation. In addition AREC supplies the police and Post Office with extra communications facilities to supplement normal channels when required. All work is voluntary, but the Corps does receive a small Government allowance to augment the finance which it provides from its own pockets.

As a further point of interest to the dedicated dx hounds, AREC run a National Field Day of their own prior to Christmas. We are only too sorry that we have been unable so far to get any information on the frequencies in use, but if anyone does light on them we would be delighted to hear from them.

Not all honey

Still on the overseas theme, we hear from Erland Belrup, SM7COS, that there is increasing interest in the possibility of creating a Radio Amateur Emergency Network in Sweden. Erland points out that the gales of this autumn have proved that there is ample room in his country for such an organisation.

Unfortunately, the only people who appear to be benefiting from the publicity over there at the moment are the citizen's band operators. Oddly enough, it would appear that the radio amateur proper has a very poor public image, the populace at large ranking the "ham" no higher than the "teenage gang" menace which is now a world-wide problem. As Erland says, "Our public relations is just about non-existent!"

Needless to say, this provides a sorry picture, and our own RAEN Committee will see that every assistance is given through the channels of the appropriate organisations and the Swedish "mag" *QTC*.

The RAEN Trophy

As you will have read elsewhere, the RAEN Committee has awarded the RAEN Trophy this year jointly to the Sussex Groups in appreciation of the rapid expansion and consolidation that they have achieved in 1969. A certificate is to be presented to each of the three Groups, namely North, East and West Sussex.

RAEN Committee

A report on the RAEN Committee meeting held on 29 November will appear in the January issue of *Radio Communication*.

Honorary Registrations Secretary:
Mrs. Jane Balestrini, "Merrivale", Willow Walk, Culverstone, Gravesend, Kent.
Honorary Secretary, RAEN Committee:
Mr. E. R. L. Bassett, 57 Upper St. Helens Road, Hedge End, Southampton, SO3 4LG.

Mobile Rallies

Scottish Mobile Rally and Radio Exhibition

The first ever RSGB Mobile Rally and Radio Exhibition to be held in Region 12 took place on 5 October 1969 at the Beach Ballroom, Aberdeen.

Weather was good, and support terrific. According to newspaper reports 2,000 people attended. Of that number, 150 were "mobileers." Furthest travelled competitor was G3UMW (Putney).

RSGB officials present were Mr L. Newnham, G6NZ, Council member; Mr A. F. Hunter, GM3LTW, zonal Council member; Mr A. W. Smith, GM3AEL, regional representative and Mr P. I. Park, GM3PIP, area representative.

Programme

Special station GB3ABB. Talk-in station on 80m by members of the Aberdeen Amateur Radio Society, GM3BSQ. Talk-in station on 2m by members of the Moray Firth Amateur Radio Society, GM3TKV. Talk-in station on 4m by members of Ayrshire RAEN Group.

Demonstrations were given by Radio Astronomy Group, Department of Natural Philosophy. Aberdeen University; Robert Gordon's Institute of Technology, and Aberdeen Aeromodellers (radio controlled model aircraft).

Displays were provided by Pye Telecommunications Ltd; Redifon Ltd; Granada TV Rentals; J. & A. Tweedie (Electronic Supplies Ltd); Halson Electrical Services; L. Hardie, GM3FHH; W. G. H. Blanchard, G3LHB; National Giro; 51st Signal Squadron (V) of 32nd Signal Regiment, and Sarah Coventry Jewellery.

There were the usual competitions and a grand draw. Competition winners were: GM3WML, GM4HR/M, GM8AGM, GM3KHH, GM3UWM, G3UMW and Gordon Rhind.

Prizes were presented by Dr P. R. Foster of the Department of Natural Philosophy, Aberdeen University.

Much appreciated were gifts from "Electroniques", Eddystone Radio Ltd; Adcola; Spacemark Ltd; Mullard Ltd; J. & A. Tweedie Ltd; Jackson Bros. Ltd; Partridge Electronics Ltd; Daystrom Ltd, and Brooke Bond Oxo Ltd.

To all who assisted, most grateful thanks are extended!

The Anglian Mobile Rally

Saturday 25 October was a bleak and dreary day, and the outlook for the rally on the next day was very gloomy indeed. It appeared that the first rally by the Colchester Radio Society and the Ipswich Radio Club on the Suffolk Show Ground was doomed to failure, but the day dawned very bright and many club members who saw it worked magnificently to have the hall and the talk-in stations ready by 9.30am.

By 10.00am there were 350 in the ground—no one had anticipated such an early attendance, the gates were not even manned. It was a swinging start and it turned out to be a swinging day. The estimated attendance was in the region of 2,500.

The trade stands were well represented, and there was no need for the enthusiast to go home empty handed. Many amateurs were at a loss what to buy due to the vast variety of items. The Bring and Buy was a huge success and needed many "hands" to keep it going. This section proved to be the most popular stand in the rally.

It can be safely said that the event was a huge success, so much so that the trades people have already written asking for space next year, and they have even thanked the organisers—through the local newspapers—for the space allocated to them.

Amateurs travelled from quite a distance—Scarborough and the London area. Thirty contacts were made on top band, 25 on 2, 75 on 80, and 75 contacts on the HF station—VKs and many were "talked" home again.

This was a day out for the amateur, the XYL, the YL and the children. It is hoped to run a similar event next year, and room will be available for caravans to stop the night. It is also hoped to organize a social evening on rally eve.

Thanks to all members, non-members, trades people, and the participants for making this first attempt a successful one, and we hope that they will help again next year.

CONTEST NEWS

VHF Contests Calendar, 1970

12 January	144MHz SSB
16 January	432MHz Cumulative First Round
25 January	144MHz CW
29 January	432MHz Cumulative Second Round
8 February	70MHz Fixed Station
11 February	432MHz Cumulative Third Round
3 March	432MHz Cumulative Fourth Round
7/8 March *	144MHz Open
23 March	432MHz Cumulative Fifth and Final Round
11/12 April	70MHz Open
2/3 May *	144MHz Portable Long Section
3 May *	144MHz Portable Short Section
30/31 May	432MHz Open
30/31 May	1296MHz Open
21 June	70MHz Portable
4/5 July *	144MHz Open
26 July	432MHz Open
10 August	144MHz SSB
15/16 August	70MHz CW
5/6 September *	VHF NFD and IARU Region 1 VHF Contest
3/4 October *	IARU Region 1 UHF/SHF Contest
7/8 November *	144MHz CW
6 December	144MHz Fixed Station

* To coincide with IARU Contests
All dates subject to amendment

January 1970 144MHz SSB Contest

1900 to 2200 gmt on 12 January
All entries and checklogs must be sent to the adjudicator addressed to: VHF Contests Committee, c/o G3USB, 32 Harbour Avenue, Comberton, Cambridgeshire, CB3 7DD.

The following general rules to be published in the January issue of *Radio Communication*, will apply: 2, 3, 4b, 5a, 6a, 7a, 8d, 9c, 10, 11, 12a, 13–24.

January 1970 144MHz CW Contest

0600 to 1200 gmt on 25 January
All entries and check logs must be sent to the adjudicator addressed to: VHF Contests Committee, c/o G2HIF, 20 Harcourt Road, Wantage, Berkshire.

The following general rules, to be published in the January issue of *Radio Communication*, will apply: 2, 3, 4b, 5a, 6a, 7a, 8b, 9b, 11, 12a, 13–24.

1970 432MHz Cumulative Activity Contest

1900 to 2030 gmt on the following dates:
16 and 29 January (Friday and Thursday)
11 February (Wednesday)
3 and 23 March (Tuesday and Monday)
Entries and check logs must be postmarked between 24 March and 6 April and addressed to VHF Contests Committee, c/o G3LAS, 7 Barclay Close, Hertford Heath, Hertford.

The following general rules, to be published in the January issue of *Radio Communication*, will apply: 2, 3, 4b, 5a, 6a, 7a, 8d, 9a, 10, 11, 12b, 13–24.

Affiliated Societies' Contest 1970

The General Rules for RSGB HF Contests, as published in the January 1970 *Radio Communication*, will apply.
When: From 1800 gmt to 2200 gmt on Saturday, 10 January 1970, and from 1800 gmt to 2200 gmt on Sunday, 11 January 1970.

Eligible entrants; All fully paid-up affiliated societies.
(*a*) As the contest is to encourage club activity, it is not in the spirit of the contest that a competing station should be operated by only one operator for all, or nearly all, of the time. Entries which indicate this method of operation may be disallowed.
(*b*) All entries will be classed as multi-operator.
(*c*) Entries will only be accepted from stations operating within a ten-mile radius of the normal meeting place or HQ of the affiliated society.
(*d*) Callsigns which have been issued to affiliated societies must be used.
(*e*) More than one entry will be accepted from an affiliated society, providing that where a club callsign has been issued, that callsign is used by the "A" station.
Contacts: CW (A1) only in the 1·8-2·0MHz band.

Competing stations only (as defined in Rule 3) must send AFS to identify themselves after the report-serial number group, eg 579012 AFS. Repeat contacts may be made during the second session.
Scoring: 15 points for each contact with an AFS station, and one point for other stations.
Logs: Column (5) must be headed "Enter AFS if received". Entries must be addressed to: HF Contests Committee, c/o J. C. Graham, Esq., G3TR, "The Willows", Church Road, Lowfield Heath, Crawley, Sussex.
Trophy: The Edgware Trophy will be awarded to the affiliated society submitting the highest checked score.

South West Africa local contest

A local contest to assist dxers to contact ZS3 stations will run from 1300 gmt 6 December to 1300 gmt 7 December. All bands, 80m–10m, will be used and all modes may be used. Only RS(T) reports will be required.

The WASWA Award is available to any amateur contacting five ZS3 amateurs. (Zone 38 stations need 15 contacts.) A certified copy of the log (no QSLs) together with ten ircs should be submitted to: The Branch Secretary, South Africa Radio League, PO Box 1100, Windhoek, South West Africa.

October 1969 432MHz Open Contest

A total entry of 34 was received for this contest, which represents a satisfactory level of interest. However, it does not approach the entry received for similar 144MHz contests, so it is to be hoped that the level of participation will increase. Undoubtedly one of the reasons was the concurrence of the 1,296MHz Open Contest.

Top slot in Section A goes to Roger Taylor, G8BBB, followed closely by Henry Neale, G3REH. These two are far in front of the third place and both have higher scores than the winners in Section B and C, which is an indication of their excellent performances. David Parsons, G3SLJ/A, leads section B, while "Des," G3NNG/P, holds a comfortable lead in Section C. Just to prove that there is no favouritism, VHF Contests Committee Secretary G3JKY "props up" the bottom of Section A!

Many stations worked some good French dx early in the contest, but by far the best was G8ATK's contact with F9NL at 860km. Antennas were evenly divided between conventional yagis and parabeams, although G3OBD used a 48-element stack-portable!

Comments received included:

"Thought I'd send in a log—someone has to be last!"—G3LAS

"Please have contests at different times"—G3REH

"The time of commencement seems wrong to me as lift conditions are very prevalent in the early morning"—G8ATK

"I would like to see the one point per km scoring system used"—G8AAY

Posn	Call-sign	Score	QSOs	C'nty	Best dx	km	Aerial
Section A							
1	G8BBB	298	57	CE	ON5LM	290	18 ele pb
2	G3REH	241	46	LN	GD2HDZ	337	2x 18 ele pb
3	G8ATK	130	40	SY	F9NL	860	8/8 slot
4	G8AVC	117	25	DY	G2JF	275	18 ele pb
5	G8BAK	97	35	BD	G8AWS/P	175	14 ele yagi
6	G8BGQ	87	40	HF	G3ABH	145	18 ele pb
7	G8AAY	80	17	DT	G3REH	249	8 ele
8	G2RD	79	31	SY	G3YFM/P	184	pb
9	G8AKT	77	27	BD	G8AAY	198	24 ele
10	G3XEB	73	34	HF	G8AWS/P	195	18 ele pb
11	G8AWO	68	27	HF	G8AHN	—	18 ele pb
12	G5UM	50	15	LR	G3DAH	189	14 ele yagi
13	G8BAV	38	15	DY	G8AKT	120	pb
14	G8BQH	36	22	BS	G3REH	140	18 ele pb
15	G3WFM	24	15	HF	G8AHM	120	8/8 slot
16	G3LAS	20	11	HF	G3REH	105	14 ele yagi
17	G8AUE	19	8	DY	G3BNL/P	100	+ 2×18 ele para
18	G8BKR	15	10	GR	G3EEZ/P	103	8/8 slot
19	G3JKY	8	6	KT	G8BGQ	60	corner reflector
Section B							
1	G3SLJ/A	185	42	EX	ON4HN	370	8/8/8/8
2	G3OXD/A	79	21	WR	—	—	18 ele para
3	G8ADP/A	35	12	GR	G3NEO	230	14 ele yagi
Section C							
1	G3NNG/P	201	45	BE	F9XG/P	260	8/8/8/8
2	G3YFM/P	154	32	ST	G3OBD/P	272	18 ele pb
3	G3OBD/P	151	27	KT	PA0EZ	304	48 ele stack
4	GW8BBR/P	125	25	FL	—	—	8/8 slot
5	G3SFG/P	117	36	BS	G3SBL/P	160	18 ele pb
6	G3EEZ/P	94	20	SE	G3KEQ	210	11 ele yagi
7	G3SBL/P	81	25	SD	G3YFM/P	205	18 ele pb
8	G8BGW/P	60	19	DY	G3SLJ/A	216	8/8 slot
9	G2WS/P	41	12	ST	G3REH	238	11 ele yagi
10	G8AZU/P	40	15	HE	G3YFM/P	128	8/8 slot

G8CKX disqualified, Rule 17. G5FK disqualified, Rule 4A.
Check log received from G8AFA/P

Stratford upon Avon DF Contest, 2 November 1969

Thirteen teams assembled at the start near Alcester to take part in this contest, competing for an Open Cup, and the Rugby Shield for the leading member of Rugby Radio Club. Signals from both transmitters were heard at good strength, and the competitors chose roughly equally between the two for their first search.

Transmitter A, G3XTI, was six miles away on a track flanked by thick hedges and wire fences. These wires were connected to the aerial system and gave confusing bearings at close range. G3ORI was first at this transmitter, and was pleased to meet E. Mollart as he was leaving, only to discover that he had already found transmitter B.

Transmitter B, G3RPJ, was in a thick wood about three miles from the start and only 100 yards from the edge of the map. Experienced df hunters were not taken in, and managed to find the nearest approach by road which was actually off the map. Some found the final approach to the transmitter through dense undergrowth rather tiring.

Posn	Competitor	Club	Time of arrival Station A	Station B
1	Hawkins	Chelmsford	1441	1352
2	Mollart	Oxford	1442	1403
3	B. Bristow	Chiltern	1450	1415
4	Williams	Slade	1519	1421
5	Newman	Rugby	1519½	1428
6	Smart	Slade	1520	1421½
7	North	Chiltern	1532	1436½
8	Mahony	Rugby	1532½	1436
9	Vickers	Stratford on Avon	1433	1553
10	Gage	Oxford	1441½	1600
11	Drakely	Slade	—	1533½
12	Grant	Rugby	—	1557
13	Simmons	Slade	—	1602

The Rugby Shield was awarded to D. Newman, and the Open Cup to M. Hawkins.

September 1969 144MHz Fixed Station Contest

Conditions on the Saturday augured well for the contest but, as happens all too often, went flat for the Sunday. Most contestants reported better conditions early in the day and heavy QSB for the last few hours. There were surprisingly few comments on the timing of the contest—8am to 2pm clock time, this was something of an experiment by the VHF Contests Committee to help the operator with family and other commitments. If there was any bias, it was for starting and finishing an hour later.

Contestants comments:
"... timing was ideal ..."—G6GN and G3TIR.
"What a diabolical hour to start"—G3NNG.
"The sooner this stupid business of exchanging QTH and well as QRA is dropped the better"—G3NOH.
"How about phone only—give the G8s a chance"—G8BZN.
"Hardly any cw ..."—G3BDQ.
"Cloth ears prevalent"—G8ATK.
Subject to Council approval, certificates will be awarded to G6GN and G8BBB. B.D.A.

Posn	Call-sign	Score	QSOs	C'nty	Best dx Station	Km	Power
1	G6GN	548	75	GR	PA0NAP	560	90
2	G8BBB	541	85	CE	F9FT	541	120
3	G3LAS	523	82	HF	GD2HDZ	388	100
4	GD2HDZ	506	41	IM	G2JF	493	75
5	G3NEO	485	55	YS	ON5CG	455	150
6	G3TIR	415	78	SX	GD2HDZ	450	80
7	G3REH	408	67	LN	PA0HGV	330	50
8	G3BDQ	407	56	SX	G2AMV	370	150
9	G3PWJ	349	67	SD	GC2FZC	325	150
10	GW3MFY	300	45	GM	G2DQ	280	40
11	G3NNG	290	46	BE	GD2HDZ	343	30
12	G2AMV	284	43	CH	G3BDQ	374	45
13	G8BEJ	281	69	SY	PA0HSW	384	150
14	G8AFA	279	42	ST	GD2HDZ	372	130
15	G8AUN	266	41	NK	G8AFA	340	40
16	G2WS	231	40	ST	G3AMW	315	72
17	G3PTM	223	44	WK	PA0CML	420	40
18	G3MAX	213	35	CH	G3PIR	316	120
19=	G5UM	210	44	LR	GD2HDZ	268	40
19=	G8BWW	210	26	LE	G3TIR	340	30
21	G8CEZ	206	53	GR	G8AUN	253	150
22	G3EHR	197	37	WK	PA0HSW	300	70
23	G3XEB	184	40	HF	GD2HDZ	390	30
24	G8BXT	179	37	SD	GC2FZC	405	12
25	G3WHL	172	24	YS	PA0CML	390	30
26	G3LTN	163	37	OX	PA0CML	385	90
27	G2BHN	162	35	ST	—	—	35
28	G3WUW	160	35	CE	GD2HDZ	380	25
29	G3NOH	158	53	HF	PA0CML	325	100
30=	G8BCH	154	35	DY	G3NEO	310	25
30=	G8ATK	154	42	SY	PA0CML	423	15
32	G8ART	145	34	HF	PA0CML	313	100
33	G3XKT	141	33	DY	G3BDQ	260	24
34	G3YRH	140	17	ND	G2JF	457	24
35	G8AWO	138	28	HF	PA0HVA	—	80
36	G3AMW	120	17	YS	G2WS	336	35
37	G8CKT	106	40	SY	PA0CML	360	15
38	G8BXJ	103	27	GR	G8CVO	234	25
39	G8BTT	97	22	LR	GD2HDZ	240	18
39	G8BZN	97	33	LR	G8BDQ	240	130
41	GW8BOQ	96	23	MH	G3NEO	215	50
42	G8CBZ	81	16	DN	G3NEO	330	25
43	G3VPR	79	20	LN	PA0CML	320	15
44	G3XAC	68	11	LE	G2JF	385	95
45	G3FWW	67	18	ST	G8BBB	244	10
46	G8BXC	60	20	EX	G3LLE	232	50
47	G8CKC	45	11	DV	G8BOR	280	9
48=	G8BVV	40	19	ST	G3PWJ	155	40
48=	G3UEY	40	24	WR	G8BSH	76	15
50	G3XKZ	32	13	WK	G8AFA	160	2
51	G2FQR	30	19	BE	G8BCH	145	12
52	G8BKR	27	17	GR	GW3MFY	67	15
53	G8BTU	24	10	LR	G3TIR	164	20
54	G3JKY	17	15	KT	G8ATK	58	10

Check logs received from G8CMB/P, PA0NAP, G3OXD/A.

October 1969 1,296 MHz Open Contest

A very good entry of 17 was received for this contest. No definite conclusions can be drawn regarding band conditions, since the comments vary from "very poor" to "very good". Congratulations are due to John Warrington, G8AKE; the Albright and Wilson ARS G3OXD/A; and Les Sharrock, G3BNL/P, as winners in Groups A, B and C, respectively. The longest distance contact was between G8AUE and G3BNL/P at 136km, the two stations using a 5ft and 4ft parabola, respectively. Many contestants were against the idea of running a 432MHz and 1,296MHz contest concurrently. Comments received included:

"I suggest that future contests on these bands (432MHz and 1,296 MHz) be timed separately."—G8AKE.

"A most enjoyable contest"—G8ADP/A.

Posn	Callsign	Score	QSOs	C'nty	Best dx	km	Aerial
Section A							
1	G8AKE	439	7	LR	G3EEZ/P	126	2ft 9in parabola
2	G8AUE	392	8	DY	G3BNL/P	136	5ft parabola
3	G2RD	367	7	SY	G3GWL	92	3ft parabola
4	G8BAV	177	6	DY	G3OXD/A	59	5ft 6in parabola
5	G8ARM	168	6	KT	G8ADC/P	60	18 ele pb
6	G8AEJ	124	5	LD	G3GDR	41	3ft parabola
7	G2FNW	89	3	LR	G8BAV	48	Indoor dipole
8	G8BGX	17	2	DY	G8AUE	14	8/8 slot
Section B							
1	G3OXD/A	603	9	WR	G3UQK	112	4ft parabola
2	G8ADP/A	301	6	GR	G3EEZ/P	102	60° trough reflector
3	G5FK	140	5	MX	G2RD	38	2ft 6in parabola
Section C							
1	G3BNL/P	796	11	GR	G8AUE	136	4ft parabola
2	G3NNG/P	524	9	BE	G3EEZ/P	114	3ft parabola
3	G3EEZ/P	504	6	SE	G8AKE	126	3ft parabola
4	G3ADC/P	408	7	BD	G8AKE	104	4ft parabola
5	G8AFA/P	208	5	WE	G3BNL/P	60	6ft parabola
6	G2WS/P	98	3	ST	G8AFA/P	58	11/11 slot

Check log received from G3SFG/P

1969 BARTG VHF RTTY Contest

This contest was run for the first time this year, so the number of stations submitting logs was rather small. However, it is hoped that this event will attract an increasing number of vhf operators in the future.

The committee of BARTG thank the readers of *Radio Communication* for their support, and feel sure they can look forward with pleaaure to their continuing participation in future rtty contests organized by the group. Ted Double, G8CDW, the BARTG contest and awards manager, looks forward to receiving readers' logs in connection with future contests.

Posn	Call-sign	Points	QSOs	Countries	Best dx(km)
70MHz band—No logs received.					
144MHz band					
1	DJ8BT	452	3	2	310
2	PA0PWG	448	7	2	310
3	ON5BV	422	2	2	210
4	DL8CX	212	2	1	125
5	G8BNW	207	3	1	75
6	PA0YZ	207	5	1	52

In addition, the following stations were active during the contest and were given points but did not submit contest logs: DK1NS, DL2QH, G6CW, G8CVO, ON5HB, PA0CRX, PA0DLC, PA0IF, PA0JHM and PA0LAN.

432MHz band—No logs received.

The Mid-Essex DF Championship Hunt, 21 September

As was expected, this hunt proved to be quite an attraction, with 12 teams from the Chelmsford, Colchester and Vange Societies taking part. Paul Selwood, G3YDY, held the fort and the frequency by acting as control station, and the hunt commenced at 2.30pm from Galleywood. There were two /P stations, and both having weak signals and the same strength puzzled some competitors. G3YCW/P was the most popular station to go for first, and all but one competitor found him at Mole Hill Common, about two miles south-west of the start. The really puzzling thing was that only four found G3OZF/P, who was sitting in a gorse bush 150 yards from the start and running a few milliwatts to a small whip.

An interesting and adventurous afternoon was had by all, and the final score was: G3PMX found both stations in 72 minutes; G3KPJ in 78 minutes; G3EDM in 110½ minutes, and G3XQA in 124 minutes.

G3FIJ found one station only, G3YCW/P, in 72 minutes; closely followed by other competitors G3VCH, G3PEV, G3BGO, G3UOG, G3VOP and G3EHZ. G3YOA nearly found G3OZF/P in the final minutes of the hunt.

Roy Martyr, G3PMP (left), receiving the Mid-Essex Trophy from Tom Carter, G3VCF, chairman of Chelmsford ARS

RSGB SLOW MORSE PRACTICE TRANSMISSIONS

These Slow Morse Practice transmissions are sponsored by the RSGB. Alterations and additions to this list should be sent to the Honorary Organizer, M. MacBrayne, G3KGU, 25 Purlieu Way Theydon Bois, Essex.

Clock Time	Call-sign	MHz	Town
Sundays			
09.30	G3TNF	1.920	Gateshead
09.30 †	G3KZZ	1·920	South Shields, Co. Durham
10.00 †	G3WNR	1·920	
09.30	G3HZL	1·940	Isleworth, Middlesex
09.45	G3USK	1·975	Mablethorpe, Lincs.
10.00	G2FXA	437·000 to North	Stockton-on-Tees
10.15	G3CGD	1·875	Cheltenham
10.30	G3SJE	28·100	Harrow, Middlx.
10.30	G2FXA	437·000 to South	Stockton-on-Tees
10.30	G3NPB	1·875	St. Ives, Cornwall
11.00	G2FXA	1·900	Stockton-on-Tees
11.00	GW3UMB	1·880	Colwyn Bay
11.30	G3KKU	1·940	Liverpool
12.00	G3HVI	1·890	Stoke-on-Trent
12.00	G3GNS	1·910	Weston-super-Mare
13.30	G3FWW	1·880	Burnham-on-Sea, Soms.
13.30	G3XDV	1·910	Canterbury, Kent
14.00	G3XGJ	1·830	Huddersfield, Yorks.
17.30	G3TNF	1·920	Gateshead
Mondays			
17.30	G3TNF	1·920	Gateshead
18.00	G3SWR	1·980	Birmingham
18·30	G3NCZ	1·920	Blackburn, Lancs.
18.30	G3RXH	1·910	Skipton, Yorks.
19.00	G3WGU	1·880	Bispham, Lancs.
19.00 †	GC4LI / GC2FMV	3·600	Jersey, C.I.
19.00	G3YJA	1·920	Coventry, Warks.
20.00	G3KAN	1·990	Northampton
20.00	G3IBJ	1·910	Southampton, Hants.
20.00 †	G3WDW / G3VTY	1·915	Leeds, Yorks.
20.15	G3YMH	1·845	Wraysbury, Middlesex
20.30	G3YEB	1·915	Harlow, Essex
20.30	G3JHM	70·050	Worthing, Sussex
† Alternately			
Tuesdays			
17·30	G3TNF	1·920	Gateshead
18.00	G3XDV	1·910	Canterbury, Kent
19.00 †	G3UFO / G3XAM	1·980	Wirral, Cheshire
19.30	G3SWP	1·850	Doncaster, Yorks.
19.30	G3WGU	433·500 to South-East	Bispham, Lancs.
20.00	G3UPA	1·850	Meriden, Warks.
20.00 †	G3FAU / G3KSS / G3OVT	1·980	Stevenage, Herts.
20.00	G3FWW	1·880	Burnham-on-Sea, Soms.
20.00	GM3UWX	144·045	Bishopton, Renfrewshire
20.00	G3WGD	1·860	Leicester
20.00	GM3PIP	3·590	Mintlaw, Aberdeen
20.30	G3UNV	1·845	Ashford, Middlx.
21.00	G4RS	1·865	Blandford, Dorset
22.00	G3HZM	1·925	Manchester

Wednesdays			
17.30	G3TNF	1·920	Gateshead
18.30	G2FXA	1·900	Stockton-on-Tees
19.30	G3WGU	433·500 to South-East	Bispham, Lancs.
19.30	G3UJD	1·825	Farnborough, Hants.
20.00	G8QU	1·970	London, N22
20.00	G3JHM	70·050	Worthing, Sussex
20.30	G3HZL	1·845	Isleworth, Middlx.
20.30	G3KGU	1·915	Theydon Bois, Essex
21.00	G3HVI	1·890	Stoke-on-Trent
21.00	G3XUS	1·970	Newhaven
† Alternately			
Thursdays			
17.30	G3TNF	1·920	Gateshead
18.00	G3SWR	1·980	Birmingham
18.30	GW3VBP	3·590	Barry, Glam.
18.30	GW3UMB	1·880	Colwyn Bay
18.30	G3NC	1·968	Swindon, Wilts.
19.00	G3WGU	1·880	Bispham, Lancs.
19.30	G3GNS	1·910	Weston-super-Mare
20.30	G3SJE	1·875	Harrow, Middlx.
20.30 †	G3ROE / G3RSF / G3YMJ / G3YFC	1·915	Harlow, Essex
21.00	G4RS	1·865	Blandford, Dorset
21.00	GW3XNI	1·930	Crosskeys, Mon.
Fridays			
17.30	G3TNF	1·920	Gateshead
18.00	G3XDV	1·910	Canterbury, Kent
18.30	G3NCZ	1·920	Blackburn, Lancs.
19.00	G3WRO	1·915	Romford, Essex
19.00	G3NPB	1·875	St Ives, Cornwall
19.30	G3PQF	1·825	Farnborough, Hants.
20.00	G3EEL	1·980	Peterborough
20.00	G3WGD	1.860	Leicester
20.00	G3KEP	1·910	Bingley, Yorks.
	G3UCZ		Pudsey, Yorks.
	G3WTF		Bradford, Yorks.
20.15	G3SAZ	1·845	Ashford, Middlesex
20.30	G3JHM	70·050	Worthing, Sussex
Saturdays			
09·30	G3UNV	1·940	Ashford, Middlesex
10.00	G3PLE	1·820	Stourbridge, Worcs.
13·00	G2FXA	1·900	Stockton-on-Tees
14.00 †	GC4LI / GC2FMV	3·600	Jersey, C.I.
17.30	G3TNF	1·880	Gateshead
19.30	G3EFS	1·913	Bromley, Kent
20.00	G3KPO	1·980	Peterborough
† Alternately			

Members might like to be reminded that the Royal Naval Amateur Radio Society using their call-sign G3BZU, transmits cw as a proficiency test at 1900 gmt on the first Tuesday of each month. Frequencies used are 1·875MHz for practice only, and 3·520 MHz for speed proficiency tests. Certificates are issued against correct copy submitted to: The Royal Naval Amateur Radio Society, HMS Mercury, Leydene, Hants. A small charge is made to cover costs.

Listeners: These slow Morse practice transmissions are promoted specifically to help you, and unless you play your part it will become increasingly difficult to keep the service going. If you benefit from any of these transmissions you owe it to the operator concerned to let him know you listen. This service is a call upon the operator's leisure time, and he is more likely to sacrifice it to help you if he knows he has an audience.

CLUB NEWS

Region 1 RR B. O'Brien, G2AMV

Merseyside Luncheon Club—Good attendances continue. First Monday in each month on HMS *Landfall*, 12.30 for 12.45pm meal. If you wish to attend please advise *G3VQT* or *G2AMV* beforehand.
Ainsdale (ARC)—10, 24 December, 7 January 8pm, "Morris Dances", Scarisbrick.
Allerton (Liverpool)—Scout Amateur Radio Society, North West Region—First and third Thursdays each month, 8pm, Liverpool County Scout Headquarters, Richmond Street, Liverpool.
Blackburn (ELARC)—4 December (AGM and discussion group), 7.30pm, Edinburgh House, Shearbank Road, Blackburn. Further details from *G4JS*.
Blackpool (B & FARS)—Mondays, 8pm, Pontins Holiday Camp, Squires Gate. Morse tuition from 7.30pm.
Bury (B & RRS)—9 December (AGM). Additionally an informal meeting is held each month, two weeks after the main meeting. All at 8pm, The George Hotel, Market Street, Bury. Club Secretary: *G3VVQ*, 411 Holcombe Road, Greenmount, Bury.
Cheshire (Mid Cheshire ARC)—Club nights every Wednesday 7pm to 9.30pm. Further details may be obtained from *G3JWK*, Technical Activities Centre, Winsford Verdin Grammar School, Winsford. Cheshire.
Chester (C & DARS)—Tuesdays, 8pm, YMCA.
Crewe and District—Local interest is being kept alive by R. Owen, BRS 26847 the local representative. He welcomes calls at his home from local enthusiasts and is searching diligently for a new meeting place. His address is 10 Circle Avenue, Willaston, Nantwich, Cheshire.
Douglas (D & DARS)—Second and fourth Wednesday each month, 7pm, 19 Rosemount, Douglas. Further information from W. T. McEvoy at same address. Tel. Douglas 6146.
Eccles (E & DRC)—Tuesdays, 8pm, Bridgewater School, Worsley, Lancs. Every Thursday, Club Top Band net 2030 hours.
Leyland Hundred Amateur Radio Group—The Thursday night net at 2000 hours gmt on 1.915MHz.
Liverpool (L & DARS)—Tuesdays, 8pm, Conservative Association Rooms, Church Road, Wavertree. Secretary: H. James, *G3MCN*. 448 East Prescot Road, Knotty Ash, Liverpool 14.
Liverpool (NLRC)—5. 19 December, 2 January at 8pm, Labour Party Headquarters, 13 Crosby Road South, Liverpool 22. Secretary: Peter Jeffs, 38 College Road North, Liverpool 23. Tel-051 924 3020.
Macclesfield (M & DRS)—2, 16, 30 December, 13 January, 8pm, The George Hotel, Jordangate.
Manchester (M & DARS)—Wednesdays, 7.30pm, 203 Droylesden Road, Newton Heath, Manchester 10. Hon. Secretary: G. Tillson, G3TJK, 95 Kelverlow Street, Oldham, Lancs.
Manchester (SMRC)—Fridays, 8pm, Conservative Association Divisional Office, 449 Palatine Road, Northenden, Manchester 22.
North West VHF Group—Meetings take place every Monday, 8pm, in the Club Caravan, Greeba, Shady Lane, Manchester 23.
Preston (PARS)—11 December, 8 January, 7.30pm, Private room, "Windsor Castle", St Paul's Square. The August Preston Amateur Radio Society mobile rally was a great success. The event was opened by Mrs F. Woolley, G3LWY, the hardworking secretary of the RAIBC. The official host was Bill Lawson, G4PF, and the talk in station was operated by Harold Woods, G2AXH. Last minute technical problems prevented the 2m station from operating. Future meetings at the "Windsor Castle" are likely to include talks on test gear, converters and transistors. Hon Secretary: George Windsor, 26 St Gregory's Road, Preston.
Salford (Dial House Radio Society)—This organization, which is confined to GPO engineers, meets every Wednesday at 6pm on the 8th floor, river end, of Dial House. Anybody interested who is a GPO engineer should write to the secretary at Dial House, Chapel Street, Salford 3.
Southport (SRS)—Wednesdays, 8pm, and Sundays, 2.30pm, The Esplanade. Secretary: S. Miller, 72 Station Road, Banks, Southport.
Southport (73 SSB Society)—Thursdays, 8pm, (All commencing with a talk on part of the RAE syllabus), 73 Avondale Road North, Southport.
Stockport (SRS)—10, 24 December, 7 January, 8pm, The Brookfield Hotel, Wellington Road South, Stockport. New members are always welcome. Further details from the Secretary, D. I. Lunn, *G3LSL*, 4 Farnham Avenue, Macclesfield. Tel 7903.
Warrington, Culcheth (CARC)—Fridays, 7.30pm, Chat Moss Hotel, Glazebury. All visitors will be welcome. Secretary: K. Bulgess, 32 Hendon Street, Leigh.
Westmorland—Fridays, 7.30pm. All meetings include a Morse practice conducted by Brian Shaw, G3CRJ. Readers will be interested to know that the Club has now obtained its own licence, G3YWR. Please note new secretary is Jim Forrester, 44 New Street, Carnforth, Lancs.
Wirral (WARS)—7.30pm, on first and third Wednesdays each month at former Civil Defence HQ, Upton Road, Bidston, Birkenhead. The Society, under its new committee, is now preparing plans for its winter programme. A new 300ft antenna has been erected at the Club's HQ and a working party is at present constructing 70cm gear to strengthen the Society's efforts in vhf contests next season. Please note new secretary is Alf Fisher, *G3WSD*, 34 Glenmore Road, Oxton, Birkenhead.
Wirral (Wirral DX Association)—Meeting on last Wednesday in each month at members' homes. Additionally the annual dinner will be held on 10 December at the River Room, Pierhead, Liverpool. The January meeting will be the AGM at QTH of G3OKA, who is secretary and from whom all details may be obtained. The association plans to participate in the local 160m phone contest on 4 January.

Region 2 RR K. Skethaway, BRS 20185

Barnsley (B & DARC)—12 December ("Technical Topics", by D. McCrum), 7.30pm, King George Hotel, Peel Street, Barnsley. *G3LRP*.
Bradford (BRS)—2 December ("Transistors and Amateur Transistor Circuits", by J. R. Hey, G3TDZ), 16 December (film show and social evening), 6 January ("Music, Hi-Fi and Electronics", by D. M. Pratt, G3KEP and R. J. Cockerham, G3WTF), 7.30pm, 10 Southbrook Terrace, Great Horton Road, Bradford 7. *G3HJP*.
Durham (DCARS)—18 December (Christmas Film show), 7pm Durham University's Elvet Riverside Arts Block, New Elvet, Durham.
Halifax (NHARS)—3 December (Members' slides), 10 December (Annual dinner), 17 December (Ragchew), 7 January (Talk and Demonstration on Hi-Fi by P. Allan, G3USH), 7.45pm, Sportsman Inn, Ogden, Near Halifax. October included the annual trip to the Exhibition; there have been some very good lectures, and the lads from the Manchester Club have been over for the annual pea and pie supper. The Club is the custodian for the W1BB Mk 2 lecture also the No 1 is still available. *G3MDW*.
Scarborough (SARS)—Thursdays, 7.30pm, c/o RAF Association, Fulbeck House, 3 Westover Road, Scarborough.
South Shields (SS & DARC)—Fridays, 8pm, Trinity House Social Centre, Laygate, South Shields. *G3SFL*.
Spen Valley (SVARS)—4 December ("Chassis Bashing", by H. Moore, G3WKD), 11 December ("Single Sideband", by A. Walmsley, G3ADG), 7.30pm, The Grammar School, High Street, Heckmondwike. *G8BSC*.
Sunderland (SARS)—First and Third Tuesdays, 7pm, Sunderland Technical College. *G3XID*.
Teeside—Second Saturday every month, social evening, 8pm, The Crown Hotel, Yarm. *G3JMO*.

Region 3 RR R. W. Fisher, G3PWJ

Birmingham (MARS)—16 December (Annual Christmas party, equipment sale), 7.45pm, Midland Institute, Margaret Street, B'ham 3.
(South)—3 December (Christmas party and surplus sale), 8pm, The Scout Hut, Pershore Road, Stirchley, B'ham 29. *G8BHE*.

Bromsgrove (B & DARC)—Second Friday of each month As from January 1970, new venue, The Royal Oak, Barley Mow Lane, Marlbrook, Bromsgrove.

Coventry (CARS)—5 December (Open meeting), 12 December (Night on the air and RAE lecture), 19 December (Annual club dinner), 26 December (No club meeting), 2 January (Open meeting), Scout HQ. 121 St Nicholas Road, Radford, Coventry.

Dudley (DARC)—2 December (Lecture on Birmingham GPO radio tower), 16 December (Talk by G8RY), 30 December, 8pm, Central Library, St James's Rd, Dudley. *G3PWJ.*

Hereford (HARS)—First and third Friday of each month, Civil Defence HQ, Goal St, Hereford. *G3RJB.*

Leamington Spa (MWARS)—1 December (Open meeting), 8 December (Calibration evening), 15 December (Open meeting), 8pm, 28 Hamilton Terrace, Leamington Spa.

Lichfield (LARS)—First Monday and third Tuesday of each month, The Swan Hotel, Lichfield. *G3NAS,*

Midland (MARS)—Details from Mr H. L. Bate, *G8AMD*, 88 Darnick Road, Sutton Coldfield, Warks.

Nuneaton (NARC)—4 December (Demonstration of home built equipment), 18 December (Operating the club transmitter on 160m), The Grange, Caldecote, Nuneaton. *G2HAO.*

Redditch (EWARG)—11 December ("Electronic Designs by Computer", talk by G3KWK), 8pm, Old Peoples Centre, Park Road, Redditch. *G3EVT.*

Shrewsbury (SARS)—4 December ("Veroboard", talk by Mr. Travers), 11 December (Coffee evening), 18 December, 7.30pm, Shrewsbury School Signals Hut. *G3WNI.*

Solihull (SARS)—16 December (Sale of surplus equipment), 8pm, The Old Manor House, 126 High Street, Solihull. *G3YOY.*

North Staffs (NSARS)—Meeting every Tuesday night, 7.30pm, The Royal Oak Hotel, Fenton, Stoke on Trent.

Stourbridge (STARS)—16 December (Christmas informal), further details from *G3HGI.* Tel Hagley 4241.

Stratford (SuARC)—12 December (Christmas party), 8pm, Mason Arms, College Lane. *G3XFV.*

Region 4 RR T. Darn, G3FGY

Derby (DADARS)—10 December (Constructor's contest for Founder Members' Trophy), 14 December (Contest for G5YY Trophy), 17 December (Annual Christmas party), 24 December (Open evening), 31 December (The year in retrospect).

Derby (NHCAARG)—5 December ("Introduction to the Oscilloscope", by G3OZ), 12 December (The year in retrospect, films and slides taken throughout the year), 19 December (Technical lecture). 25 December (Net on 160 throughout the day), 26 December (Open evening).

Melton Mowbray (MMARS)—Friday, 19 December ("Shack Visit", and slides by K. Melton, G3WKM).

Grimsby (GARS)—At the annual general meeting on 2 October the following officers were elected: Chairman, R. Robson, G8AGI; Secretary, J. H. Qurarmby, G3XDY; Treasurer, M. Knights, G3NJF; ASR M. Knights, G3NJF.

Meetings are held fortnightly, with the next one on Thursday, 11 December, 8pm, at the North Lincs Photographic Society's Clubroom, rear of 50 Welholme Rd, Grimsby.

Region 5 RR S. J. Granfield, G5BQ

Bedford (B & DARC)—Thursdays, 7.30pm. 4 December (Printed circuit boards and veroboard, G3XDU. Layout of components and printing, G3CWV), 5 December (Nosherons), 11 December (Tape lecture—W1BB Mk 2), 18 December (Tvi problems to panel), 25 December (80 metre net, 10.30-11 on, 3·690MHz), 1 January 1970. (Informal but bring your choice QSLs), The Dolphin, Broadway, Bedford. For further information apply to John Bennett, G3FWA, 47 Ibbett Close. Kempston, Bedford. Tel Kempston 2427.

Bishop's Stortford (BS & DARC)—15 December ("Oscilloscopes and their use in Amateur Radio", Tony Davies, G3VTR), The British Legion Club, Windhill, Bishop's Stortford, Hertfordshire.

Cambridge (C & DARC)—5 December (Informal), 12 December (A different tape lecture), 19 December (Mince-pies and "Night on the Air" with Peter's SB 101), 26 December (Boxing Day—no meeting), 2 January 1970 (QSL night—bring your ten most interesting cards), Fridays, 7.30pm, at Club Headquarters, Victoria Road, Cambridge.

Dunstable Downs (DDRC)—Meetings on Fridays at Chew's House, Dunstable, Bedfordshire. Particulars from *G8BWZ*, QTHR.

March (M & DARS)—Meetings on Tuesdays at Old Police Headquarters, High Street, March, Isle of Ely.

Peterborough (P & DARS)—Meets on the first Friday in the month, 7.30pm, in the Electronic Section, Peterborough Technical College, Eastfield Road. Other Fridays in the Old Windmill, London Road, Peterborough.

Shefford (S & DARS)—4 December (RAE revision and dinner review), 11 December ("The Linear", G3OLY), 18 December (No meeting), 25 December (No meeting), Church Hall, High Street, Shefford, Bedfordshire.

Region 6 RR L. W. Lewis, G8ML

Cheltenham (RSGB Group)—First Thursday, 8pm, Great Western Hotel, Clarence Street, Cheltenham.

Chiltern (ARC)—Last Thursday in every month, 8pm, The British Legion, St Mary's Street, High Wycombe. Club net on Sundays, 1200 BST, 1945kHz. *G3IQF.*

Gloucester (GRS)—Meetings second and fourth Thursdays 7.30pm, RAFA Club, 6 Spa Road, Gloucester.

North Buckinghamshire Amateur Radio Society (formerly Wolverton and District Radio Club)—Meetings fortnightly, 12 December onwards, 8pm, The Crown, Market Square, Stoney Stratford. Slow morse at 7.30pm. *G8CXT.*

Oxford University Radio Society—Weekly meetings 8.15pm, The Department of Metallurgy, Parks Road. Morse classes and RAE instruction being arranged. Contact Simon Watts, St John's College (President), or simply arrive at any meeting.

South Bucks VHF Club—2 December (film show), 8pm, Bassetbury Manor, High Wycombe.

Region 7 RR P. A. Thorogood, G4KD

The Regional Representatives Conference was a free house and all the country was represented. A list of new members promised is now being circulated, and I will send the first issue of Region 7 out now. If you require outside regions or overseas calls, I have them. Merry Christmas all.

Acton, Brentford & Chiswick (ABCRC)—16 December ? Christmas support, 7.30pm, Chiswick Trades & Social Club, 66 High Road, Chiswick.

Addiscombe (AARC)—Second and fourth Tuesdays, 7.30pm. Toc H Hall, 158 Lower Addiscombe Road.

Ashford, Echelford (ARS)—Last Thursday of month, 8 December (Natter night), 22 December ("Hi-Ball QSO", at the Links Hotel). At last month's meeting G3JGO talked on TVI, and G3AHB on receivers for swls. 7.30pm, St Martins Court, Kingston Crescent, Ashford, Middlesex.

Barking (B & DREC)—Tuesdays and Thursdays, 7.30pm, Gascoigne Recreation Centre, Gascoigne School, Morley Rd, Barking.

Bexleyheath (NKRS)—Second and fourth Thursdays, 11 December ("DX TV", by Cliff Dykes, G8CKH). Last meeting Cliff Leal G3ISX, gave an interesting talk on communications in the London Electricity Board. Problems of maintenance of countryside radio links were discussed and tape recordings were used for illustrating. 7.30pm, Congregational Church Hall, Chapel Rd, Bexleyheath.

Cheshunt (CDRC)—First Friday of month, 7.30pm, Methodist Church Hall, opp Theobalds Station, Cheshunt.

Chingford (RSGB Group)—Fridays. Telephone 01 524 0308.

Chingford (SRC)—Fridays, 8pm, Friday Hill House, Simmons Lane, Chingford, E4.

Civil Service (CSRS)—First and third Tuesdays. 16 December (Christmas dinner—no turkey, just get together? Includes red wine, about 25s a head!). Club net on Fridays, 1800 hours on 3625kHz. SWL reports are appreciated. 6.30pm, Civil Service Recreation Centre, Monck St, Westminster.

Croydon (SRCC)—Third Tuesdays, 7.30pm, Swan & Sugar loaf, South Croydon.

Crystal Palace (CP & DRC)—21 December (Christmas festivities after disposing of junk), 8pm, Emmanuel Church Hall, Barry Rd, SE22.

Dorking (DR & DRS)—Second and fourth Tuesdays. 9 December (Informal), 15 December (Annual Christmas dinner), 8pm, "Stephen Langton", Friday Street. 2nd Tuesday, "Wheatsheaf".

Ealing (E & DARS)—Tuesdays, 7.30pm, Northfields Community Centre, Northcroft Rd, W13.

East London—20 December, (AGM) and junk sale, 2.30 for 3 pm.

Edgware & Hendon (E & DRS)—8 December (Film show including RSGB news film), 22 December (Junk sale), 12 January (AGM). St Georges Hall, Flower Lane, Mill Hill, NW7.
Farnham, Bucks (Burnham Beeches RC)—Fortnightly, Mondays. Farnham Common, Village Hall, Victoria Road.
Gravesend (GRS)—Wednesdays, 8pm, Community Centre, Cedar Avenue, Kings Farm Estate, Gravesend.
Guildford (G & DRS)—Second and fourth Fridays. 12 December at Stoke Park. Enquiries still in progress about the second meeting as 26 December, Boxing Day, has lost its meeting. 17 January (Annual dinner at Wooden Bridge Hotel). Guildford Engineering Society, Stoke Park.
Hampton Court (TVARTS)—First Wednesday, 7.30pm, The Three Pigeons, Portsmouth Rd, Surbiton.
Harlow (DRS)—Tuesdays (General), Thursdays (CW practice), Fridays (Junior), 7.30pm, Mark Hall Barn, First Avenue.
Harrow (RSH)—Every Friday, 8pm, Roxeth Manor School, Eastcote Lane, Harrow.
Havering (H & DARC)—Fortnightly, 8pm, British Legion House, Western Road, Romford.
Hemel Hempstead (HH & DARS)—First and third Fridays, 7.30pm, "Addmult", Sports Club, Hemel Hempstead.
Holloway (GRS)—Mondays (RAE) 7pm, Wednesdays (Morse) 7.30pm, Fridays (Club), 7.30pm, Montem School, Hornsey Road.
Ilford—Every Thursday, 8pm, 50 Mortlake Road, (off Ilford Lane), Ilford.
Kingston (K & DARS)—Second Wednesday. 10 December (Surplus gear sale), 14 January ("Chassis construction and fabrication", by M. Diprose. Discussion on available communication rxs with an RA1 and BC342 for demonstration), 8pm, Penguin Lounge, 37 Brighton Road, Surbiton.
Leyton & Walthamstow—Tuesdays, 7.30pm, Leyton Senior Institute, Essex Rd, E10.
London (UHF Group)—First Thursday. Reunion Christmas function. For details ring G4KD, 636 1403. 7.30pm, Whitehall Hotel, Bloomsbury Sq, Holborn WC1.
Loughton—Fortnightly, Fridays. Loughton Hall, Rectory Lane, (Nr Debden Station).
Maidenhead (N & DARC)—Third Tuesday of month, 7.30pm, Victoria Hall, Cox Green, Maidenhead.
New Cross—Wednesday and Fridays, 8pm, 225 New Cross Road, SE14.
Paddington (P & DARS)—Thursdays, 7.30pm, Beauchamp Lodge, 2 Warwick Crescent, W2.
Purley (P & DRS)—First and third Fridays, 8pm, Railwaymans Hall, Side Entrance, 58 Whytecliffe Rd, Purley.
Reigate (RATS)—First Wednesday, 7.45pm, George and Dragon, Cromwell Rd, Redhill.
Romford (R & DRS)—Tuesdays, 8.15pm, RAFTA House, 18 Carlton Road.
Scouts (ARS)—Third Thursday of month, 7.30pm, Baden Powell House, Queensgate, South Kensington, SW7.
Sidcup (CVRS)—4 December ("Radio facsimile", by Anthony M. McDermott of Cable & Wireless), 18 December (Natter night), 1 January ("A visit to Bermuda", by A. O. Milne, G2MI), 8pm, Congregational Church Hall, Court Road, Eltham.
Slough (SDR Group)—First Wednesday, 7.30pm, United Services Club, Wellington Street.
Southgate (SRC)—Second Thursday of month, 7.30pm, Civil Defence Hut, Bowes Road, N11.
St Albans (Verulam ARC)—10 December (AGM and film show. Seasonal refreshments), 8pm, Town Hall, St Peter's Street, St Albans. Congratulations to two new members who now have tickets, G3YUK and G3YWA. At the last meeting 50 were present to hear G3NOH talking about vfo control on vhf and uhf transmitter design.
Sutton & Cheam (SCRS)—Third Tuesday. 16 December ("Equipment for beginners", by Tim Hughes, G3GVV). Last meeting very successful with two well-known speakers. Three exhibition tickets were raffled for HQ Building Fund and brought in 34s. Many suggestions were put forward on the Society and HQ. 8pm, The Harrow Inn, High Street, Cheam.
Welwyn (Mid-Herts ARS)—Second Tuesday of month, 8pm, Welwyn Civic Centre, Welwyn.
Wimbledon (W & DRS)—Second and last Fridays, 8pm, St John Hall, 124 Kingston Rd, South Wimbledon, SW19.
Wembley (GECARS)—Thursdays, 7pm, Sports Club, St Augustin Avenue, North Wembley. (This Club is open to non-GEC employees by invitation. Telephone ARN 1262 for details).

Region 8 RR D. N. T. Williams, G3MDO

Canterbury (EKRS)—Information of future meetings from Hon Sec, D. N. T. Williams, *G3MDO*.
Dover (SEKYMCAARS)—Thursdays, 7.30pm, YMCA Leybourne Road, Dover. Details of meetings from *G3YQR*.
Eastbourne (SARS)—Meetings held at 8pm, in the Victoria Hotel, Latimer Road, Eastbourne.
Maidstone (MYMCAARS)—Tuesdays and Fridays, 8pm, "Y" Sports Centre, Melrose Close, Loose, Maidstone.
Mid-Sussex (MSARS)—All meetings and club station at Marle Place, Leylands Road, Burgess Hill.
Thanet (TRS)—Fridays, 8pm, Hilderstone House, St Peters, Broadstairs.
Worthing (W & DARC)—2 December (Police communications), 9 December (Divertisement). A new series of Morse classes has commenced, suitable for newcomers. Meetings held every Tuesday, 8pm, at Rose Wilmot Youth Centre, Littlehampton Road, Worthing.

Region 9 RR J. Thorn, G3PQE

A very merry Christmas to all in Region 9 from your RR. Club Secs and PROs, make it a New Year resolution to get regular monthly news in before the 1st of each month to publicize your future events and venue.
Barnstaple, Bideford, North Devon Area—It is proposed to form a radio club in Barnstaple and a meeting is being held to discuss this at the home of G4CG on Tuesday 9 December at 7.30pm, "Grinnis", High Wall, Old Sticklepath Hill, Barnstaple.
Bristol (BARC)—Every Monday and Thursday, 7.30pm, Club HQ, (G3TAD), University Settlement, 41 Ducie Road, Barton Hill, Bristol 5. At their recent AGM the following new officers were appointed: Chairman, G3XTS; Vice-Chairman, G3TKF; Treasurer and Club's first President, G4UZ; Secretary, G3SXY; and three committee members. *G3SXY*.
(City & County of Bristol RSGB Group)—15 December (A special meeting of great interest to all who attend these group meetings), 7.30pm, Becket Hall, St Thomas Street, Bristol 1. 13 December (Annual group dinner), Birkdale Hotel, 11 Ashgrove Road, off Whiteladies Road. Book tickets without delay from G3WCG or G3TTZ. Arthur Milne, G2MI, paid a visit to Bristol and gave an extremely interesting illustrated talk on his visit to Canada and the USA, a big crowd welcomed him and his wife. *G3ULJ*.
(Shirehampton Radio Club)—Fridays, 7.30pm, Twyford House, Shirehampton. Morse class and RAE class are in progress, and every encouragement should be given to this new club. Secretary: Robert Jones, *G3YIQ*.
(University of Bristol Amateur Radio Society)—Meets Saturdays, 2.30pm, Department of Physics, Royal Fort, Woodland Road, Club Stations, G3KAC and G8CXH. *G8ADP*.
Burnham on Sea (BOSARS)—Contact *G3GIW*.
Cornwall (CRAC)—4 December ("SWEB Engineering", by G3OCB and G3XFL, "Tape Heads", by Martin Harvey), 7.30pm, SWEB Clubroom, Poole, Camborne. *G3UCQ*.
(VHF Group)—Third Thursday in each month, 7.30pm, The People's Palace, Pydor Street, Truro. *G3XC*.
(Falmouth Group)—9, 23 December, Laburnham Drive Mission Hall. *G3OJN*.
(Newquay Group)—10, 24 December, Treviglas School, *G3THT*.
Exeter (EARS)—2 December, YMCA, St Davids Hill, Exeter. *G3HMY*.
Plymouth (PRC)—2 December ("SSB", by Ron Daw, G3OIQ), 16 December (Club night), Club HQ (G3PRC), Virginia House, Bretonside, Plymouth. A successful annual dinner was held on 15 November. *G3YDU*.
Saltash (S & DARC)—12 December, 7.30pm, Burraton Toc H Hall, Warraton Road, Saltash. *G3XWA*.
South Dorset (SDARS)—5 December, 7.30pm, Labour Rooms, West Walk, Dorchester. *G3RZG*.
Taunton (T & DARC)—Fridays, SEVO HQ, Taunton Barracks, The Mount. At AGM recently, G3DTB was appointed chairman, with G3WPJ welcomed back as secretary. Reports were made of a successful year with an enjoyable social side. RAEN is progressing and exercises have been held. RAE classes have recommenced. *G3WPJ*
Torbay (RARS)—13 December (Christmas party with a quiz-contest between Exeter, Plymouth, and Torbay clubs), 7.30pm, Club HQ (G3NJA), Bath Lane, Rear of 94 Belgrave Road, Torquay. *G3NQD*.
Wells (WARS)—Contact *G3MQQ*.
Weston-super-Mare (WSMRS)—5 December ("The Perils of tuning SSB Txs, or how not to join the valve manufacturers benevolent society", by Vic Newport, G3CHW), 7.30pm, Westhaven School,

Ellesmere Road, Uphill, WSM. A great gathering during November heard Ken Harvey, G5KT, accompanied by Eric Gaukrodger, G6GU, give a talk on "Licences and prefixes of the very early days of radio". A full programme has been made for the next six months. *G3NGS*.
Yeovil (YARS)—Wednesdays, 7.30pm, Park Lodge, The Park, Yeovil. *G3NOF*.
Royal Air Force (RAFARS)—Club HQ (G8FC, G3RAF, G3IRS), RAF Station, Locking, Weston-super-Mare, Somerset. Membership open to serving and civilian ex-RAF.
Royal Signals—HQ (G4RS), RS ARS, Blandford Camp, Blandford Forum, Dorset. Membership open to any member of the British Army, and civilian ex-Army. *G3DPS*.

Region 10 RR C. H. Parsons, GW8NP

Blackwood (ARC)—Fridays, 7pm, Blanche Cottage, off High St, Blackwood, Mon. *G6BK*.
Barry College of Further Education (ARS)—Thursdays, 7pm, College of Further Education, Colcot Rd, Barry, Glam. *GW3VPB*.
Cardiff (RSGB Group)—Monday, 8 December, 7.30pm, Christmas Social to which all local clubs have been invited. A raffle will be held in connection with the proposal to provide memorial trophies in memory of the late Jack Wozencroft, GW3GIN, and Vic Bartlett, GW5BI. T.A. Centre, Park St, Cardiff. *GW3GHC*.
East Glamorgan Raynet Group—First Tuesday in each month, 7.30pm, Cardiff Emergency Services HQ, Womanby St, Cardiff. *GW3VNO*.
Hoover (ARC)—Mondays, 7.30pm. Hoover Social Club, Hoover Factory, Nr Merthyr. A warm welcome is extended to all visitors, and the Club station GW3RDB is active. Secretary: Mr F. E. Tribe.
Pembroke (ARC)—Last Friday of each month at the Defensible Barracks, Pembroke Dock. *GW3LXI*.
Port Talbot (ARC)—Meetings are held at the Trefelin Club and Institute, Port Talbot. Times and dates are available from the Secretary. *GW5VX*.
Pontypool (ARC)—Tuesdays, 7pm at the Educational Settlement, Rockhill Rd, Pontypool, Mon. *GW3JBH*.
Rhondda (ARS)—The address of this Society is now the Rhondda Transport Employees Club & Institute, Porth, Rhondda, Glam. A talk by Mr D. M. Thomas, GW3RWX, was given on 27 November on tvi. The talk was assisted by the use of most sophisticated equipment, and was very well received. Details of meetings from *GW3PHH*.
Sully & District Short-wave Club—Tuesdays, 7pm, Annexe Sully Bowls and Social Club, 59 South Rd, Sully, Glam. *GW3SLA*.
Swansea Telephone Area (ARS)—Tuesdays, 7.30pm. This may be changed from time to time. Meetings at the Telephone Engineering Centre, Gors Rd, Town Hill, Swansea. Further details from the Secretary, Mr M. D. E. Connor, 54 Talley Rd, Penlan, Swansea, Glam.
University College, Cardiff (ARS)—Meetings held in the Geology Department, Cathays Park. Society callsign GW3UWC, and the station is very active. Details from the Secretary, Students Union, Dumfries Place, Cardiff.
University College, Swansea (ARS)—A Christmas Social will be held in the Old Coffee Lounge, College House, on Tuesday, 9 December, at 7.30pm. All South Wales Clubs are invited, as are interested listeners and amateurs in the area. It is essential that clubs and individuals who are attending either write or telephone Rob Willcox, *GW3TSH*, Room 520 Neudd Gilbertson University College, Swansea SA2 8PS. Tel 079224947.

Region 11 RR M. Williams, GW3LCQ

Bangor (UCNWARS)—Meetings alternate Thursdays, 4 December ("Something of Mutual Interest", by Dr I. Jones), 5.30pm, Dept of Electronics.
Conway Valley (CVARC)—4 December, a very special junk sale and raffle to be held at the usual QTH, The Parade Hotel, Church Walk, Llandudno, 7.30 for 8pm. 12 December, annual Christmas Dinner at Alfredo's Restaurant, Conway. Tickets 25s each from the Secretary, Mr L. J. Marshall. Representatives of the Rhyl & District Amateur Radio Club will be present, together with those from the University College of North Wales Radio Club, Bangor.

Region 12 RR A.W. Smith, GM3AEL

Aberdeen (AARS)—Fridays, 7.45pm. 6 Blenheim Lane, Aberdeen. *GM3HGA*. Aberdeen 33838.
Lhanbryde (MFARS)—Mondays 7.30pm St Andrews School, Lhanbryde by Elgin, Morayshire, *GM3UKG*, Tel Clochan 225.
Dundee (RSGB Group)—Thursdays, 8pm, 3 Magdalen Place (off Roseangle), Dundee, *GM3KYI*.
Lerwick Radio Club (Shetland)—Tuesdays and Thursdays, Annsbrae House, Lerwick, *GM3XPQ*. Tel Bixter 249.

Region 13 RR V. W. Stewart, GM3OWU

Lothians Radio Society—11 December ("Hi-Fi" by Vic Stewart, GM3OWU), 7.30pm YMCA, St Andrew St, Edinburgh.

Region 14 RR N. G. Cox, GM3MUY

Ayrshire (Ardeer Recreation Club ARC)—2, 4, 9, 11, 16, 18, 23, 30 December, 7.30pm, Ardeer Recreation Club, Amateur Radio Section, Stevenston, Ayrshire. Details from J. F. McCreight, *GM3JDS*, 10 Auchenharvie Road, Saltcoats, Ayrshire.
Ayrshire (AARG)—14, 28 December, 7.30pm, ATC HQ, Kilmarnock.
Glasgow University (GURC)—12 December, 7.30pm, George Service House, 11 University Gardens, Glasgow W.2. Details from C. Weston, 46 Manchester Drive, Glasgow W.2. Tel 041 339 2074.
Greenock (G & DARC)—5, 12, 21, 28 December, 7.30pm, RAE classes every Tuesday, James Watt Library, Union Street, Greenock.
Mid-Lanark (RSGB Group)—19 December, 7.30pm, YMCA Brandon Street, Motherwell.

Region 16 RR W. J. Green, G3FBA

Basildon (VARS)—Vange ARS Officers: President, G3EDM; Chairman, G3RNL; Secretary, G8BPS. Thursdays, 7.30pm The Scout Hall, Fairview Road, Vange, Basildon. RAE lessons every week. Present project is a 2m tx/rx. Recent meetings have included "Moonbounce" by G3LTF, "Microwave Techniques" by Tom Kebble, and "RTTY" by G8CWL. *G3VOP*, QTHR.
Chelmsford (CARS)—First Tuesday in each month, 7.30pm, Marconi College, Arbour Lane, Chelmsford. *G3OZF*.
Colchester (CARS)—Every Wednesday, Room 41, NE Essex Technical College, Colchester. New committee—Chairman, G. Farnham, G3SJO; Dick Greenleaf, G3VAG; Secretary, T. Williams, G3YAH; Events Sec G3YAH.
Gt Yarmouth (GYRC)—The name of this club has been changed to "The Gt Yarmouth Radio and Electronics Society" and meetings are held fortnightly at 7.30pm, 98 South Market Road, Gt Yarmouth. All interested will be very welcome. *G3HPR*, Tel Gt Yarmouth 62008.
Ipswich (IRC)—31 December (film show), 7.30pm. Red Cross HQ, Gippeswyk Hall, Gippeswyk Avenue, Ipswich. *G3UJR*.
Maldon Essex (MYCRG)—Every Thursday, 7.30pm, The Friary, Chequers Lane, Maldon, Essex. *G3LRQ*.
Norwich (NARC)—1 December (What do you know?—Quiz, organized by D. Johnson, G3MPN), 8 December (informal meeting), 15 December (Optical Astronomy Visit, *to be confirmed*), 22 December (film show), no meeting 29 December. All Meetings 7.30pm, the Brickmakers Arms, Sprowston Road, Norwich. *G3PTB*
Southend (SDRS)—5 December (Southend Airport Control Tower—visit), 19 December (Ekco Weather Radar—film and talk by Ekco Electronics Ltd). All meetings 8pm, in the Canteen of Ekco Electronics Ltd. Details *G8BSB*.

Region 17 RR C. Sharpe, G2HIF

Basingstoke (BARC)—6 December ("Operating a Station"), 20 December (film show), 7pm, Chineham House, Popley Way, Basingstoke. *G3TNB*.
Chippenham (C & DARC)—Meetings every Tuesday, except 23 December, 7.30pm, Boys' High School, Hardenhuish Lane, Chippenham. The Club Christmas Dinner Party will be on 13 December, tickets from G3NJG. *G3UTO*.
N Berks (AERE, Harwell, ARC)—Meetings on the third Tuesday in each month. 16 December (AGM), 7.30pm, Social Club, AERE, Harwell, Berks. *G2HIF*.
Portsmouth (P & DRS)—Meetings each Wednesday, 7.30pm, Room 5, Community Centre, Twyford Avenue, Portsmouth. 14 January, 1970 (AGM). Old and new members welcome. *G3CNO*.
Reading (R & DARC)—2 December (AGM), 16 December (Grand wine and pickle party), 7.30pm, Victory PH, Tilehurst, Reading. It is hoped that all members will make a special effort to attend both meetings, the latter being open to non members. During the recent JOTA the Club provided a station for the Wokingham Venture Scout Group. *G3TEB*.
Southampton (RSGB Group)—Meetings on the second Saturday in each month, 7pm, Lanchester Building, Southampton University. Also each Wednesday and Friday at the clubroom, 14 Nightingale Grove, Fremantle, Southampton. *G3GOY*.
Swindon (S & DARC)—Meetings on alternate Wednesdays, RAE classes on other Wednesdays. Penhill Evening Centre, Alton Close, Penhill, Swindon. The club has renewed its callsign (G3FEC), and hopes to be active shortly. *G3SIR*.

MEMBERS' ADS

These advertisements are free to members. The number of words is limited to 32, not including your name (or call-sign) and address. All ads must be clearly written or typed on the Order Form or on a postcard. Each ad must be accompanied by a recent *Radio Communication* wrapper, the address of which must agree with the address on the ad. No trade or business ads can be accepted. The RSGB cannot accept responsibility for errors, for the quality of equipment offered, or guarantee inclusion. Ads must reach RSGB HQ during the first seven days of each month for the next month's issue. Ads which are not printed will *not* be held over, they must be resubmitted. We advise members to enclose a stamped addressed envelope when replying to ads. For further details of these ads see the current Order Form. No correspondence concerning non-appearance, etc, can be entered into.

Two AR88Ds, vry clean, S meters fitted, £35. L. Emmett, G3VKO, Boxtree Cottage, Whiteleaf, Princes Risborough, Bucks. Tel Princes Risborough 4481

50W am/cw tx, 10–80m with pp, 807 modulator and Geloso 104/5 vfo, £20. Hallicrafters S27 rx, £15 ono, buyer coll. G3WFM, QTHR.

840C, gd cond, £30. AR88LF, £25, pref buyers coll. Wanted, EC10 with mains psu. Two B5F valve bases sim to QY3-125. TU5B swtch. KW2000A case, why. G3XOD, QTHR.

Mullard 5–10 with sep 2 valve preamp, £13. Jason swtched vhf tuner, £4. Garrard SP25 stereo cartridge, £13. Matched pr Wharfedale "Denton" spkrs, £27. All carr extra. Valves, meters, etc, enqu sae. G2QY, QTHR. Tel Cheltenham 7905.

Lab type G44 oscillator 250–500MHz, £1 10s. 1000V 350mA pu compnts cheap. Cartonned 813, £1, base 5s. Htr transfmr, 7/6d, several sturdy heater transfmrs various voltages cheap, pref buyer coll. G3QC, QTHR.

HRO MX with man, psu, all gen cov coils and all bandsprds, bar 160, and 10m. No mods, one owner, vgc + Codar PR30 preselector, £26, buyer coll. G3MVD, QTHR.

Heathkit HQ12A, £55. HM15 swr bridge, £7. HS24 /M spkr, £3 10s. /M psu, h/brew, transistorized, 800V, 300/250V, —150V, £20. G3ONX, QTHR. Tel. Gloster 23329.

Creed printing reperforator no 2 (ex 7B), 160V dc motor, £18. Terminal unit AP16133 (no relay), psu 80 + 80V dc, £2. R. Mersh, 77 Grasmere Rd, Barnehurst, Bexleyheath, Kent. Tel Erith 30991.

5½ yrs comp SWM, Jan '64 to June '69, vgc, any offers plse. S. Stephenson, 82 Morris Lane, Leeds, Yorks. LS5 3EN.

Hi-power Z match, £8 10s. Diecast box 4¾in × 3¾in × 3 in, 10s ea (qty2). GM3POK, 123 Moubray Grove, S Queensferry, W Lothian.

AR88D c/w AR88 spkr and comp set spare valves. This really is a super one, hardly used, owner giving up. Will del 100 miles, £55. J. Clark, Brackenwood, 16 Desborough Dr, Tewin Wood, Welwyn Herts. Tel Tewin 219 after 6pm.

HRO, 9 coils + bs 15, 20, £22. DX40 + VF1U, £22. Command rx for top band, 12V psu, £6 10s. G3UOC, QTHR. Tel Henley in Arden 2479.

T28 exc cond. Mods—aerial attenuator, extra slow motion drive, built-in spkr, £12. R. Johnston, G3YEK, 35 Newlands Ave, Radlett, Herts. Tel Radlett 6795.

Murphy B40, comp with instruction and maintenance manual, £16, carr extra. R. Sanders, The Sconce, Badley Wood, Whitbourne, Worcs.

HA350, gd cond, 230V model, £45 ono. G3IZJ, QTHR. Tel Farnborough 48561.

Cossar 339A oscilloscope, new d/beam crt, circ and operating instructions, £10. R1392D vhf rx, oscillator mod but flty, £2. VCR97 crt with base mask and shield, 10s, carr extra. GM3VXR, 70 Leven St, Motherwell, Lanarks. Tel M'well 66597.

100W 2m com tx phone. 150W am table top 80–10. BC221 mains + mod. Signal gen, avo. TZ4O's. Stamp for lists, must be sold, best offers, G6JQ, QTHR. Tel Gaddesby 365.

Heathkit Mohican rx in gd cond inc man, best offer over £20. Del 25 miles. R. Knowles, 24 Friars Way, Tunbridge Wells, Kent.

Go RTTY. Comp setup comprising Creed 7B with silence cvr, spd strobe fork and man, AP100386 tu, CRM1 tuning ind, all psu's, mans, circ and printer paper. The lot!, £28 10s. G8AKA, QTHR. Tel Ferndown 6111 daytime.

Carter Champ gen, 230V ac 300W, little used, £25. See write-up in radcom feb '69. G3PLX, QTHR. Tel Waterlooville 51372.

Heathkit OS1 oscilloscope, £16 10s. 60 SWM.s 1960–1967, £1. G3KWK, QTHR. Tel Redditch 63817.

2000A + ac psu, serial A648, £160 + carr. Pye Ranger 2102 with control, cables, mic, full man, if xtal, wkg, unmod, £10 + carr. G3TFN, QTHR.

Grundig TK18 tape recdr with mic, leads, tape, £15 ono. G3MA, QTHR.

Joystick deluxe with type 4RF tuner, brand new and unused, £9. T. Edgar, G3BZZ, 8 Derwentwater Gardens, Whickham, Newcastle-on-Tyne.

KW2000A + ac psu. All mods, official hdbk, £160. Heathkit panoramic rx SB620, 455 kHz + mod kit other freq, hdbk, £52. Heathkit Mohican rx + hdbk, £25. All fb cond. G8BI, QTHR.

Labgear 160 twin tx, £9. G3RB, QTHR.

"Worked All Britain" and "Heard All Britain" (for swl's). Get your giant gazetteer record book for WAB/HAB, 10s, post free, from G3ABG, WAB Award Manager, 24 Walhouse St, Cannock, Staffs. Any profit to RAIBC and the RSGB QSL Bureau.

Vfo type VF1U, brand new, perf, bargain, £8. G3RUN, QTHR. Tel Deal 4276.

RA1 with internal spkr, exc cond, £28, ono. /M psu (Garex kit) has ant c/o relay, all in lektrokit case, negative earth, £5. Onkyo tx/rx, 1W on 28·5 MHz, £20. GW3UUS, QTHR. Tel 0633 65572.

Various silicon germanium transistors, gen types 2N, OC, BS ranges, mostly half price, Encyclopaedia of Space, suit Christmas present, 90s. G8CEF, QTHR. Tel Ingatestone 3667.

Heathkit Mohican rx, gd mech and elec cond, comp with man and batteries. Offers over £25. Number 46 set rx/tx's, £1 ea. Number 18 set rx/tx, £1 10s. G. Batten, Uplands, Salisbury Road, Marlborough, Wilts.

KW 72Ω swr meter, £5. Commercial Z match 160–10m with meter, £7. G3HEA, QTHR.

KW Viceroy Mk 3A tx, 6146BS in final, extra ½ lattice filt. KW77 rx, + dow-key coaxial ant changeover relay, and all interconnecting cables, recent overhaul by KW in perf cond, best offer secures. G3VIE, QTHR. Tel West Forest 4048.

AR88D, £25. T1015 vhf rx, 410–470MHz, £12. Chiltmead Invertor, £1. 2 70cm tv convtrs, aligned, 25s ea. 70cm tv conv with preamp, £5. WS62 transcvr, £10. Fsm, £2. Absorption wavemeter, £1. G8ATK, QTHR. Tel Farnham 5765.

Hammarlund HQ100A ham bandsprd rx, as new cond, reason—going transceive, £55 ono. GW3YSA, 35 Pen-y-waun, Efail Isaf Church Village, Nr Pontypridd, Glam. Tel Pontypridd 2228.

Pair of ships nav lamps, 50s, post extra. 10m tx, phone/cw, pi tank, fully metered, internal pu, cheap, callers only. G2ATD, 42 Northumberland Way, Erith, Kent.

KW2000 + ac psu, mint, £150 ono. HRO service man 30s. G6AB, 44 Preston Rd, Holland on Sea, Essex. Tel Holland on Sea 3356.

No 19 Mk 3 set in gd cond and wkg order. Fully mod and loudspkr output. Internal psu, transmtr intact and wkg, £7 10s ono. J. Perry, 137 Turf Lane, Chadderton, Oldham, Lancs.

HC6/U 36.200 MHz 3rd overtone, exch zone A. G8CCH, QTHR.

RA1 + intnl spkr, fb cond, £27 10s, or psu for R1155 with cash adjustment. S. Cole, 1 David Walk, Rogerstone, Nr Newport, Monmouthshire. NP1 9HD.

Folding contest table, 34in × 12in sloping and 12in flat. Free if coll. G3NBU, QTHR.

Panda 120 tx, £20. Eddystone 888A, £50. Labgear tx 5051, £20. Avo oscillator, £4. Wee meger, £8. Hunts cap/res, £5. 1155 wkg, £5. Various sundries—valves, capacitors, resistances, phones, ex service equip, etc. G5WR, 5 Beech Ave., Urmston, M/cr.

Trio JR60, 0·5 to 30 and 142 to 148MHz. Wanted, first class 2m rx or convtr for exceptionally bad QTH, 2m and 70cm mod walkie-talkies and mobiles. W. Jarvis, GM8APX, Head of Physics, Rannoch School, Perthshire. Tel Kinloch Rannoch 379.

English Electric Klystron with ferrite isolator, freq 8·8MHz. Any offers please write. N. Etheridge, 288 Elm Park Ave, Hornchurch, Essex.

Buckley tr switch, 30s. Mosley El Toro ant, £4. Zeiss Nettar Camera with case, £6. Revd. J. Marshall, G3RKH, 9 Colston Parade, Bristol. BS1 6RA. Tel 0272 20587.

1KW transfmr, 240V, 120V, £3, post 15s. Cossor 3339 double beam scope, spr crt and valves, £8. Hi-fi reflex cab spkr, make WB, dems given, £8. 75 valves all most useful, £3. G8APS, 177 Dower Rd, Four Oaks, Sutton Coldfield. Tel 021 308 3044.

BRT400 rx, £60 ono. Rf sig gen, needs slight attn, £7. Solartron psu, var output, £10. BCC69, perf wkg order, 2 + 4m, £15. Each ono. Various transfmrs and chokes, send sae for dtls. G3UDV, 24 St Peters Way, Montpelier Rd, Ealing, London W5.

Morse Tuition records (G3HSC) big or adv course and bks, £3 ono. K. Wickham, G3YWB, 25 Westwood Rd, Newcastle on Tyne, NE3 5NN.

209 set Mk 2 with spare set of valves and 12V 80 amp hr batt, £12. Brand new Marconi atu, £1 10s. Command set, brand new, 6–9MHz, ideal if strip for 2m covtr, £2. Trio JR500SE, ex cond, £45. S. Hesketh, 4 Hill Farm Rd, Chesham, Bucks. Tel Chesham 5557.

Heathkit OS1 scope + leads and man, gd cond, £15 ono. Buyer coll. P. Senior, G8ALV, 111 Hemper Lane, Sheffield, S8 7FB.

Eddystone 750, £35. Eddystone 840, £25. CR100, £15. 40W 80m am tx, £15. G3OGR, QTHR.

Swan 350 and ac psu, mint, £195. KW/atu, £7 10s. G4ZU 10/15m 3 ele beam, £8. The lot for £200. (going 2m/vhf). G3XEE, 28 Shaftesbury Ave, Feltham, Middx. Tel 01 890 0946.

Vhf rx R308, spare valves, circ, £21. Pref buyer coll. C. Cooper, 45 Nightingale Cres, Harmans Water, Bracknell, Berks. Tel Bracknell 4168.

Eddystone 640 with man, £17, gd cond. Trio rx JR-60, £31, vry gd cond with man. Buyer inspect and coll if poss. G3JDN, QTHR.

Pye model 1112 9 waveband radio, almost new, £30, guarantee, buyer coll. Bush Radio rx vhf 81, £31, buyer coll. A. Hill, 11 Douglas Rd, Southport, Lancs.

Crank up tower, 70ft Tristao comb with new guy wire, £75. Xtals, comp set of 120 from 5·675MHz to 8·650MHz in 25kHz steps. Weight 7lbs, £6 6s inc post. G3DRF, QTHR. Tel Malmesbury 2281.

Swan 350 + ac psu, little used, perf, £165. G3LIQ, QTHR. Tel Hull 500020.

Entire contents of shack for sale due to imminent change of QTH. Sae for list of gear and compnts. G3OUQ, QTHR.

Transistorized ham bands rx, h/b incorp electroniques front end and ssb i.f. strip, Sinclair Z12 audio amp. Eddystone dial, lrge S meter, sep psu and spker unit, prof cabs, £45 ono. C. Adams, G3YNC, Electrical Dept, Harringay Stadium, Green Lanes, London N4.

R1155 with RF26B + top band convtrs, built in psu and output stage, gd cond, offers plse. exch for 2m convtr with 28–30MHz i.f. Pref buyer coll or pp extra. I. Aicken 10 Montague Ave, Ballymena, Co. Antrim, N.I.

Rx BC1147A wkg, hdbk, auto-transf, buyer coll, sae other gear £8 10s. G2RP, QTHR.

R308 rx 20–145MHz, am fm, mains or 12V, speaker, phones, £20. Heathkit 012U oscilloscope, £18. Long wave convtr 50–600kHz, 680kHz output, £1. Fm tuner 25s. various units, rx, tx etc to clear. K. Quarman, G8CBE, 60 St Albans Road, Hemel Hempstead, Herts.

KW Valiant tx, 50W, table top, 10–80m with psu, £32. HRO rx with bandspread coils for 10–80m + psu £19. Wanted, transcvr in perf cond, also Z match. D. Wilkinson, 35 Street Lane, Leeds. Tel Leeds 664823.

HRO MX, 9gc coils, £15, psu £2. Rx, double conversion, QP166, Eddystone 898, prod dect £25, offers, carr extra. Wanted, Qoilpax GC166 or exch for QP166. C. Haddock, G3UZM, 26 Featherbed Lane, Exmouth, Devon.

Stereo/mono hdphones, 8/16 ohms, USA manufacture, chamois earmuffs £2 19s 6d. Small cabinet skr suit communications/rx 19/6d. 19 set Mk 3 with atu, achtr supply, £2 19s 6d, + carr. G3KPO, QTHR.

KW Viceroy Mk 2, add filt, property of late GW5BI, price £60. Enqu to GW8NP, 90 Maesycoed Rd, Neath, Cardiff. Tel Cardiff 68768.

KW2000A, neat hb psu, perf, hdly scratched, £145. Cons prt exch HW12A. F. Pardy, GW3DZJ, QTHR. Tel St Asaph 3333.

Hustler 4BTV 40–10m self-supporting trap vert, 1kw am, as new £15. Codar qmult RQ10 £4 10s. Dual stereo preamp TVV46 £5. G3RRF, QTHR. Tel Epsom 21224.

HW32, newly built, 20m transcvr, £60 ono. R1155, requ attention, £2 10s ono. "00" train set Hornby Royal Scot, £2 10s. Hammant/Morgan dual train contrller, i/p 200/240V o/ps 2 at 12V controlled 1 at 12V and 16V all at 2 amps £2 10s. G8CPK, QTHR.

Partially comp six band am/cw tv, 6146 pa with all pts inc cab, also control unit and 2 19in rack mounting psus set in console. Offers to G3HBZ, QTHR. Tel Sunbury on Thames 82262.

Comp stn for sale, KW2000A, ac psu, Z match, swr bridge, lpf, Shure mic, little used on hf, no ant allowed at qth, £165. G3TVN, QTHR.

Pye Ranger with remote control, 2nd if xtal, cables, mic, full manual, comp wkg not mod, £11, pp extra. G3TFN, QTHR.

Panda tuneable lpf, £2, AR88D hdbk, £2. Trio matching Is, £3, no.10 calibrator with ac psu very accurate, £4. W. Morris, 34 Birch Ave, Romiley, Cheshire. Tel 061 430 3858.

Codar AT5 tx and T28 rx, also remote control unit 12 R/C, all unused, £25 ono. H. Effemey, G5LS, 53 Stoke Road, Walton on Thames, Sry. Tel 25543.

Murphy /M hand mic, new, 7/6d, spring loaded whip ant mount, 5s, valves ECF82, EL91, E80CF, EX80, ECC85, EF91, EF92, A2521, 2s ea, KT77 GZ32, 3s ea, all post extra. Grampian DP4/L mic, offers. E. Handcocks, G5HN, 1 Conisboro Way, Caversham, Reading, Berks. Tel Reading 73650.

Not for sale. Large collection Bull, SWMag, WWorld, not all in mint cond but yours for the cost of the post. Send wants to G3RPJ, QTHR. If no reply, we have not got. I. Cobbold, 5 Avenue Rd, Stratford on Avon, Warwickshire.

Exch 4m Pye reporter, unmod, comp with mic, for 2m reporter in sim cond. G8CMU, QTHR. Tel Finedon 284.

Heathkit OS-2 scope comp with leads, manual, first class cond £17 10s. H. Manning, G3XOM, QTHR.

2m 10 el J beam, £3 10s, 4m 4 el £2, byrs coll. Pair 4CX250 bases, £5 superior type 4CX250B tubes, pair, used a little but OK, £5. Thompson, G3AMF, QTHR.

HRO with all orig coils + bs coils, psu and broad band preamp, vgc, £20. 2m ranger with remote control, transistor psu, mic, works fb, £17. Send for list of many xtals. Karl, G5AGX, QTHR. Tel 01 894 6880.

KW Vespa Mk 1, psu, mint cond, £80. BC 543 Q fiver and psu, £5. Absorption wavemeter 3·5–28MHz, 10s. Londex mains relay, 10s. Martin, G6MN, QTHR.

Psu, 240V, ip, op 500V, 200mA, 250V 100mA, 6·3 vac 8A, 4V 4A. Chassis 14 × 9in. Buyer coll, £2 10s. G3XSJ, QTHR.

EA12 as new, £130. 240V pe gen, £20. Avo multiminor in leather case, TMK500 multimeter in leather case, both £5 ea. Woden 800V 850mA transfmr, £2 10s. K. Wood, G3SME, Windrush, Hail Weston, Hunts.

KW201, Q mult, cal, £90. AR88D, man, tools, £35. Leitz microscope, 4 objectives, 5 eyepieces, mech stage, substage condenser, triple nose piece and lamp, £25. PR3OX, £6, buyer coll. Westwood, 114 Pettits Lane, Romford. Tel Romford 47577.

Heathkit SB400E ssb tx in imac cond, a gen bargain, £100, pref buyer coll, G3OJV, QTHR.

Hammarlund SP600, JX10 rx, £75, and KW77 rx, new model, £55. GW3NKZ, QTHR Tel Cardiff 753743.

EC10 as new, £40. Utility joystick and ant tuner, £2. Cheap jap rim-drive tape recorder dictaphone, £5. Everready "sky tourer" car /P radio, comp with cradle, £10. GM3LCP, QTHR. Tel 041 772 3659.

HW32 20m transcvr, £35 ono. Pye Hiband /M tx, £2. G3NYB, QTHR. Tel Stubbington 3220.

70cm 7 over 7 beam, £1 10s. 4m 4 ele J beam, £2 10s. Small 19in rack cabs 15s, £1 will del locally. G3MEH, QTHR.

HRO psu, mint, £5 10s. Labgear wb couplers, 3·5 to 29·7 MHz, unused, £2 10s. BC610 control unit, £8. TU7B others £1 ea. G3CTR, QTHR.

DX100U in gd cond comp with hdbk + cables. SB10U, mod fitted to use pa in class C or 1in, £55 ono. I. Brown, G3TVU, 47 Peak View Dr, Ashbourne, Derbys, DE6 1BR. Tel Ashbourne 3201.

Monitor scope HO-10, £22. Rf sig gen RF1-U, £15, both mint. Shure 444 mic unused, £9. G5NN, QTHR.

Hartley 13A scope comp and wkg. Heathkit RF-1U, wkg but requ cal, offers. A. Morton, 4 Mount Stuart Street, Millport, Isle of Cumbrae, Buteshire, Scotland.

Hamband rx, Electroniques transistorized front end, crystal i.f. filter, S meter, Eddystone 898 dial (uncalib), psu, output stage, Is, minus case, £30, BC221, ex cond, £15. G3PMF, QTHR.

New TT21, £1 inc post. Racal If adaptor, not wkg, offers. G3OXS, QTHR.

Eddystone 840C, fb cond, £45 ono. DX4OU, VF1U, £25, ono. Xtal cal no 10 unmod, £3. G3TZQ, QTHR. Tel Horndean 3833.

Wobbulator 5–220MHz, orig £200, hdbk, wkg order, must be worth £8. Two spkr cabs with 4 units and crossovers, qual sound, exc on stereo, £20. G73 wavemeter, £1. G3MOU, QTHR. Tel 01 570 6181.

DX100, VF1U, Reslo dyn/mic, class D w/meter, £40 + carr. G3DBU, QTHR.

KW Valiant tx, KW76, rx, both with psu, £30 with control unit + loudspkr. 1147A rx, £14. Ex the late G6KK, buyer coll. G3GEE, QTHR, Tel Blackpool 42754.

R107 gd cond, R1475 with psu type 360, must be sold, every off cons. P. Hyde, 8 Highgate Dr, Walsall, Staffs. Tel 22745.

Eddystone EA12 rx new, £175 ono. Panda PR120V tx, exc cond, 150W am/cw, new — valves + psu and mod, £55. Heathkit oscilloscope 10-12U, 5in, built & wkg, 2 mnths old £27. Rotary gen, 12V 12A in, 250V out £5. Two 1·4MHz xtal filts USB/LSB, plug in, £5 ea. C. Attwell, 21 Keevil Drive, Beaumont Rd, Wim, SW19.

Heathkit RA1 with xtal cal, imac, £32 ono. Kronquist, Trees, Rogate Road, Hill Brow, Liss, Hants.

Nombrex bridge as new, £6 ono. Avo c/r bridge, £6. 70cm Nuvistor convtr, 14–16 MHz i.f., £9 ono. 2m Nuvistor convtr 28–30MHz i.f. (TW), £8. BC221 (needs calib), £8. Rf pow/swm (Eagle), as new, £7. G3VGH, QTHR. Tel York 69245 after 9pm.

TW 2m convtr with 6CW4 preamp, £5. BC348R with Qmult, £13. Wanted, FT241A xtals, chans 43–47 and 324–328. HRO GC coils. GW3GHC, QTHR. Tel Castleton Mon. 481.

Creed 75 teleprinter, 45/50 bauds, silence cover, fluorescent lit, 230V ac, fitted perforator, £60. Auto tx Creed 6S5, 230V, £20. G8BMQ, 2A Convent Hill, Upper Norwood, London SE19. Tel 01 653 8489 evenings.

All comps for G3MVZ ssb exciter inc filt, front panel, dial etc, offers to G3YGM, 9 Albertus Gardens, Hayle, Cornwall.

Rtty tu ZA39384, power unit, transit cases, £7. Creed 75 teleprinter reperforator, 6S6 auto tx, mans, £35. Another 6S6, £10. Lafayette TE18 gdo, unmkd, boxed, man, £7. EMI oscilloscope, £5. Coll pse. G3LUY, 8 Alexander Road, London Colney, Herts. Tel Bowmansgreen 2201.

Test set 253, 25–93MHz, £7. Pair brand new tele 'L's, £4. Rotary trannies mainly 12V dc input from 5s ea. AR88 coils, ganged condenser, wants and offers sae. R. A. Norrington, G3IUD, QTHR.

Xerox 3600 copies of AR88D hdbk, circ inc, 11/6d ea, pp inc. GM3OWZ, QTHR. Tel 041 884 3822.

HRO psu, rough, 8 coils, best offer. G3TLC, QTHR.

DX100U, 150W, cw/am tx with man, £45. CT53 sig gen, 8·9–300MHz, 1mV–100mV, with man and graphs, £19 10s, both items as new. 813 21s, 5B/251M new 20s ea, 5B/252M new 20s ea. G8BGQ, 25 Church Lane, Sarratt, Rickmansworth, Herts.

Eddystone 680x gen cov rx, fb cond, £60 ono. Teleton R8000 stereo radio comp with MPX decoder and sep spkrs, £35 ono. I. Gower, 10 Homethorpe, Orchard Pk Est, Kingston on Hull, Yorks.

KW Vespa Mk 1 and psu, £70. G3SHQ QTHR.

KW2000 + ac psu, KW600 lin, dual imp Jap mic, imac cond, hdbks, £220. HK1B elec keyer, £10. G3HSC records, beginners advanced 2 lp wit hbks, £3, all coll or carr extra, inspctn evenings. G3PDW, QTHR.

Lafayette SR40 rx, 560kHz–30MHz, bfo, anl, bandspread, 4 swtched bands, as new, bargain at £25 ono. L. Pye, 17 Cleveland Rd, Manchester. M86GS.

Swan 350, £185 ono. B. Shaal, 43 Hamilton Rd, London NW11. Tel 01 455 2677.

Codar CR45, fact built, 5 coils, £7. Codar mini-clipper with 2 transistor amp, 3 coils, £2 10s. Beulah D50 Mk 2 transistor c/circ tv cam, 405/625 line, f1·9 lens works into dom tv, £59. M. East, 41 Avenue Close, Avenue Rd, London NW8. Tel Primrose 7040.

UNR-30 rx, gen cov, 550kHz–30MHz, ex cond, £10 ono. I. Ray, 110 The Avenue, Greenacres, Aylesford, Nr Maidstone, Kent. Tel Maidstone 77904.

Ssb package (see ARRL hdbk), 90% kit of comps inc filt and mixer xtals, tubes etc, less psu, £10. Woden transfmrs, 1250–1000–0–1000–1250 300mA, £3. 650–0–650 250mA, £2 5s. G3AIZ, QTHR. Tel 554 0984.

National NC/60 special, limited circ but ideal for swl, 500kHz–30MHz, £10. GW8BOX, 15 St Margarets Drive, Llanelli, Carms.

HRO T5, psu, 9 coils and spkr, perf, reasonable offers. J. Gates, 16 Summerhill Cres, Liverton, Newton Abbot, Devon.

Panda cub with ant relay, £20. Minimitter 75W mod, £4 10s. Geloso 4/102 vfo, £5. Pye reporter 12V, rx tunable 4m band EF183 front end, £5. Buyer coll or carr extra. G3NFT, QTHR.

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Valves, QQV06/40A, £1. 7360, QQV03/10, 573, 10s. 6CB6, 6BA6, 6AKS, 12AT7, 6U8, ECC84, ECC88, E88CC, 2s. Xtal filts 10·7MHz, bw 30kHz (2), 15kHz (1), shape factors 2 : 1, ultimate atten >80dB, small size, £4 ea. G3URX, 10 Mill Close, Tiptree, Essex. Tel Tiptree 6533.

HA350, 10–160m, vgc, £50. Sphinx tx, £45. Vanguard tx, 160–10m, gd cond, £25. AR77 rx, goes well, £15 ono. G3SUK, QTHR Tel Rattlesden (Suffolk) 352.

BC221, charts, powerpack, £20. TE149 wavemeter, man, spares, transit case, £6. Jap bug key, £3. Valve voltmeter CT54, £10. Pref buyer coll. G3FNV, QTHR.

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Urgently wanted, quartz xtal in frequ ranges 115MHz to 117MHz (7th overtone) or 57MHz to 59MHz, your price paid. G8BXM, QTHR.

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AR88D case wanted, or scrap value set. Cradduck, G3PIE, Grasscroft South Road, Alresford, Hampshire. Tel Alresford 2521.

Cct and info for Lavoie labs microwave freq meter 105SM, and circ for TR1986. G3TTV, QTHR.

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Alignment gen, minimitter MR44, BC454. Want CR100, BC348, why. I will pay post on alignment gen, will coll rx lancs area. G2DCF, 16 Himley Rd, Clayton Estate, Manchester, M11 4JF.

April 1966 bull please. G3GRA, QTHR.

SSB transceiver KW2000A, exchange Kraft KP6B radio control system, perfect (cost £260) or sell £120 ono. G2ALH, 8 Watling St, Radlett, Herts. Tel Radlett 5136.

Pye Radio telephone, AM10D or B, high band, any cond. G3ISQ, QTHR.

Swop for KW2000 or best ssb offer. Cannon 518 zoom Super 8 cine camera with accessories, value £135. G3PWV, 10 Boultbee Rd, Sutton Coldfield. Tel 021 373 2956.

Wireless World 1915–1922, any vols 3 to 10. G3IDG, QTHR.

Info plse, Simon ex Gov tape recdr espec record erase, osc valve, loan or purchase of dtls. A. Bawden, 232 Exwick Rd, Exeter, Devon.

SX117 or sim ssb rx, must be mint cond and untouched, reasonable price for cash. G3APH, QTHR.

Codar equip, AT5, T28, PR30, /M and mains psu, control box, or CSE tx rx. Exch camera petriflex SLR F2 lens or body only. G3EMW, QTHR.

25 and 25·6MHz HC6/U xtals. S. Hindmarsh, 4 Rydal Mt, Castletown, Sunderland.

Teleprinter pic tapes for duplicating and returning asap, costs refunded. G3XYT, QTHR.

Need Jan, Feb, and Mar '69 issues of radcom in gd cond, any reasonable price accept. R. Fenn, W0LXQ, 1315 S Main Ave., Sioux Falls, S.D. 57105, USA.

Manuals for BCC vhf rx 201G, Air Min rx type R1147B, J. Kozminski, Rutherford College, The University, Canterbury, Kent.

Help! R216 fm, ok, am weak, 120kc gd, 30kc weak, assistance in pinpointing fault(s) much appreciated. How does sim set comp? Have hdbks. H. Thornton, 26 Stagbury Ave, Chipstead, CR3 3PD,

Beam ant such as TA31, TA32, TA33, all band rx, command rx 28–30 MHz, 4–6 MHz, spch comprsr, Q mult, transistor GDO, Heathkit HW30 2m tx/rx. G3IDW, 6 Church Way, Lower Stratton, Swindon.

BC348 with integral mains psu. G2HR, QTHR. Tel 01 529 2932.

Twin feeder, 75Ω, heavy duty grey oval bicc type with ·044 conductors also aerial switching unit for balanced twin feeder. G3TJY, QTHR.

Tx, top band Codar AT5, also hf bands DX40U, reasonable. C. Minns, G3YSZ, 41 Rangemore Dr, Eastbourne, Sussex.

Collins 516F–1 psu, offers pse. Foulkes, G3UFZ, 21 Pishiobury Drive, Sawbridgeworth, Herts. Tel Sawbridgeworth 3088.

BC221 with charts and prof absorption wavemeter covering 2m band, must be in gd cond. P. Price, 87 Victoria Rd, Formby, Lancs. Tel Formby 75958.

Manual for xtal calibrator No 10. A. St-Amour, 43 Malvern Rd, Luton, Bedfordshire.

Elec and radio notes for wireless ops, price and cond to R.Woodman, 3 Gladstone Cotts, Wimborne Ave, Norwood Green, Southall, Middx.

Valves type QQV03-20A + QQV06-40A, 250kHz xtal, 620-0-620V + 5V mains transfmr, dtls and price to G3NPF, QTHR. Tel Southend on Sea 544096.

FT243 types for 7·0, 9·0, 12·5, 19·5, 26·5, 33·5, 34·0, 34·5, 35·0MHz, can multiply subs. G3APV, QTHR.

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1000kHz octal base xtal, have 100kHz for disposal. Thorburn, G3WBT, 27 Banklands, Workington.

Line output transfmr for Murphy V250 or V250A for oap's tv, price plse to G3OCC, QTHR.

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Rx for /M use in private car. R. Pyatt, 23 Arundel Drive, Orpington, Kent. Tel Orpington 20281.

Transcvr for 20 and/or 80m. G3YEP, QTHR. Tel Portishead 2312.

Drake RV3 or RV4, also MS4. Back issues (any) 73 mag. G3VBL, QTHR.

Man for R1475 rx, by or borrow but plse write first. For sale, 52 set rx, no psu, £2 10s ono. D. Harding, G3YHG, c/o 168 Wilton Road, Shirley, Southampton.

Wkg 2m convtr. Max if 17·5MHz. G8BLI, 53 Tankerville Rd, London SW16.

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High price paid for the tuning condenser gears for R216 rx. J. Tye, G8BYV, Inter-nos, Swanton Morley, Dereham, Norfolk.

Oscilloscope with long persistance tube, comp with psu, time base not essential. GM3CEA, QTHR.

Copies QST issued before Oct 1927. G5LY, QTHR. Tel Cooden 3758.

Eddystone S750 rx. G3THX, QTHR.

Admiralty AP56152 filt unit, h/f. G3PVA, 10 Holne Chase, Morden Sy.

Rtty teleprinter, Creed 7B or 7ERP, 240V overlap cam type with reperforator, and also 6S5/6. Shf rx range up to 3MHz, state cond. R. Bliss, G3JGC, QTHR.

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KW160 tx. G3WTA, QTHR.

Vibroplex semi-automatic bug key, must be gen Vibroplex make. Full detls to V. Lear, G3TKN, 49 Cliff Rd, Wallasey, Ches. L44 3AX.

Student requ Kokusai MF455K mech filt. Urgent. G3YMH, QTHR. Tel Staines 53765.

Man for DX40, buy or loan. GM3VEY, 25 Elmwood Rd, Dundee. Tel Dundee 66241.

xtals FT243, 8003 to 8010kHz, 7100kHz. SCR522 mod driver transfmr cons chassis to strip. A. Shrewsbury, G3KAN, 75 Delapre St, Farcotton, Northampton.

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Drake RV3 or RV4. Also back issues of 73 mag. C. Pedder, G3VBL, 107 Broad Oak Lane, Penwortham, Preston, PR1 OXA.

Vintage xtal or valve rx 1923 to 1929 period. Also wireless journals of this period. Gd home provided and fair price offered. Will coll by arrangement. Write or phone. F. Neale, 11 Pine Drive, Wokingham, Berks. Tel Eversley 2626.

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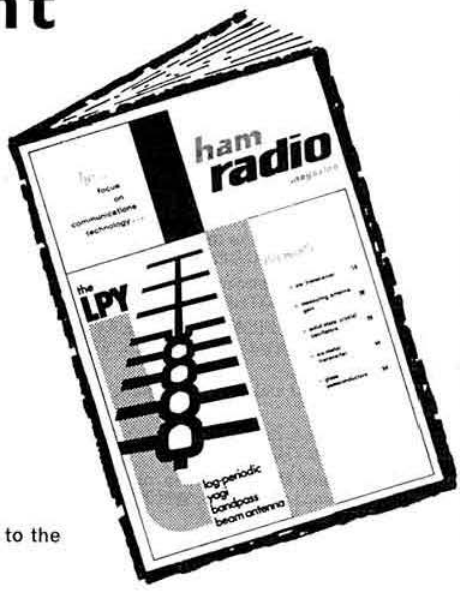

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Editors: Robert E. Lentz DL3WR
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Publisher: UKW-BERICHTE
D-8520 Erlangen Gleiwitzstr. 45
Federal Republic of Germany.
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D. T. Hayter, G3JHM,
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CQ — CQ — CQ de G3VQM/KW

So it will soon be Christmas again then. The time for the exchanging of presents ahd getting plastered! Well, anyway, it's a good excuse for the odd noggin and the exchange of greetings and messages of goodwill around the world.

I always find it difficult to think of what to give people for Christmas but this year it seems much easier. I'm giving my wife a K.W.2000B with AC psu (only £240), my eldest daughter, she's 5, is getting a K.W. E-Z Match (£12.10), the littlest one will receive a low pass filter and SWR bridge (totalling £14.5.) fitted with SO239 sockets of course, and I'm giving the dog a DC psu positive to chassis (£44). I'm sure they will be very pleased.

I hear from unreliable sources that Santa Claus is running a KW Atlanta /M this year. His sleigh is fitted out with the G-Whip Multi-Mobile (it only cost him £15.10.0 plus £8 for 80 and 160). The G-Whip Tribander is a good one too at £9.9.0 plus coils for all other bands at £4 apiece.

Santa has several of these mobiles on his sleigh but he would like your lists early so he doesn't disappoint you. The pixies and fairies (mostly fairies!) are working hard at it making all the KW toys so I'll leave them to it.

Happy Christmas, best 73 es gd DX.

Mike.

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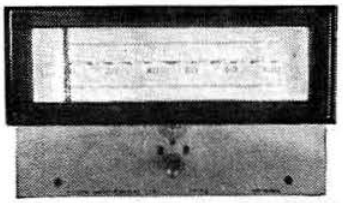

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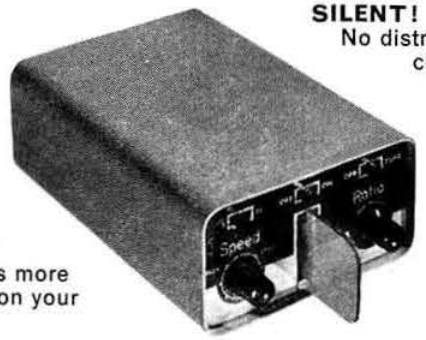

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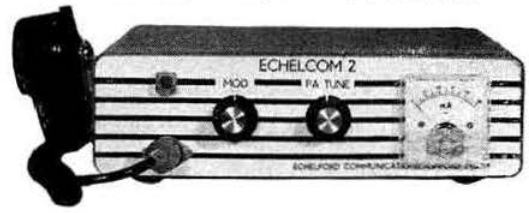

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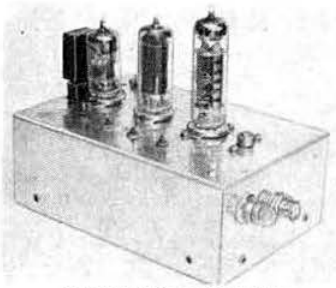

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Radio Society of Great Britain

FOUNDED 1913
INCORPORATED 1926

PATRON H.R.H. THE PRINCE PHILIP,
DUKE OF EDINBURGH, KG

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01-837 8688

* I hereby apply for election as a Corporate Member of the Society and enclose a remittance for £2/10/- being the amount of my first annual subscription.

* Being under 21 years of age and not holding a current Amateur Radio Transmitting Licence I hereby apply for election as a Non-Corporate (Associate) Member of the Society and enclose herewith a remittance of £1/5/- being the amount of my first annual subscription.

I, the undersigned, agree that in the event of my election to Membership of the Radio Society of Great Britain, I will be governed by the Memorandum and Articles of Association of the Society and the rules and regulations thereof as they now are or as they may hereafter be altered; and that I will advance the objects of the Society as far as may be in my power; providing that whenever I shall signify in writing to the Society addressed to the Secretary that I am desirous of withdrawing from the Society I shall at the end of one year thereafter after the payment of any arrears which may be due by me at that period to be free from my undertaking to contribute to the assets of the Society in accordance with Clause 8 of the Memorandum of Association of the Society.

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