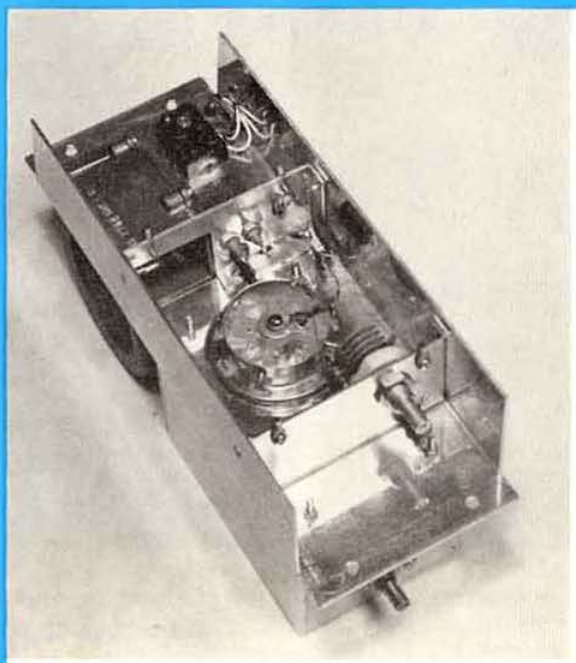
radio communication

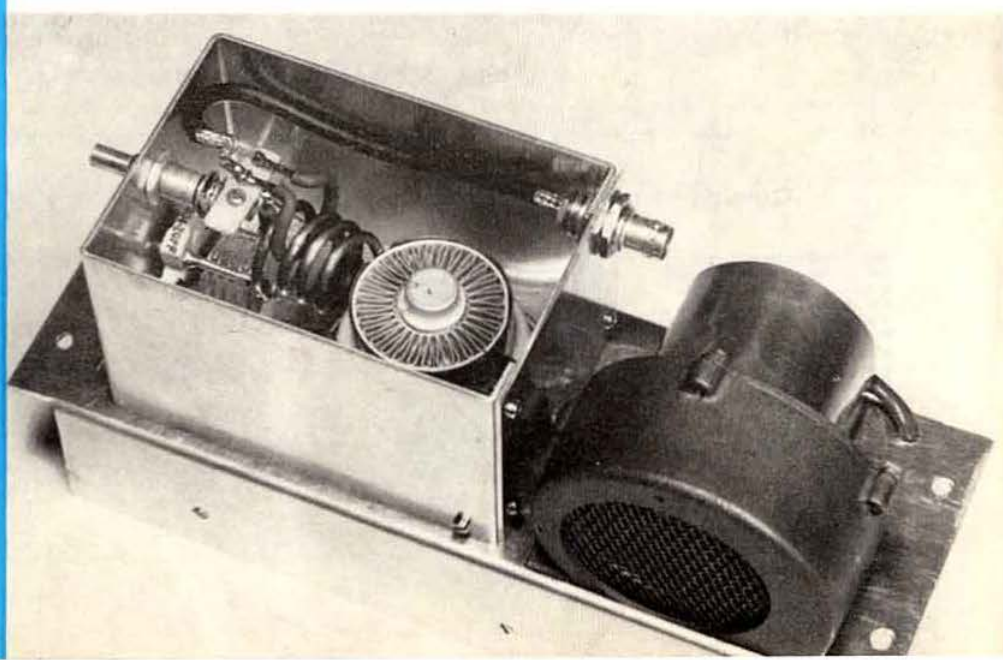
November 1970

Journal of the Radio Society of Great Britain



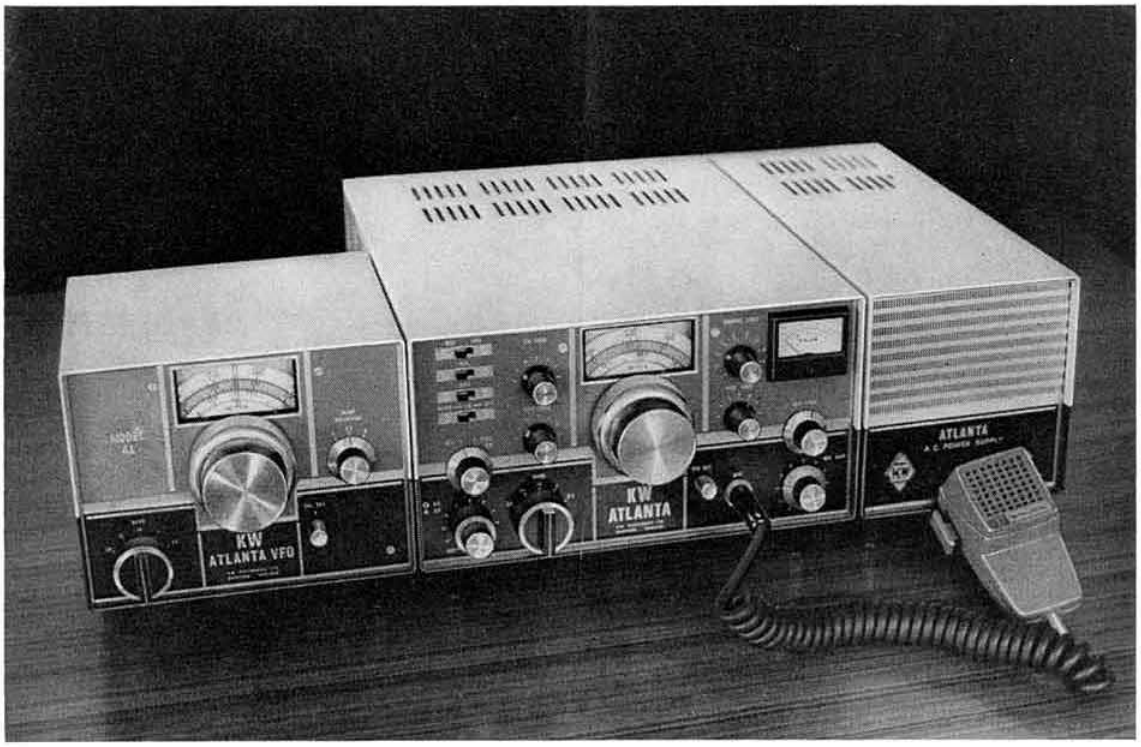
G6JP's 150W AMPLIFIER FOR 144MHz

page 751



THE KW ATLANTA

NOW RETAILS FOR £198



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November 1970

radio communication

Volume 46 No 11 Price 4s

CONTENTS

FRONT COVER
G6JP's 150W amplifier. Top: underside view with grid circuit cover removed. Bottom: top view

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

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

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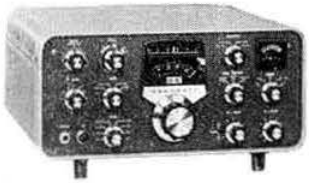
MODEL SB-102 TRANSCEIVER KIT



New transistorised L.M.O.—retains features of SB 101—180 watts PEP SSB—170 watts CW input—80-10 metres—Requires external PSU (HP-23A or HP-13A).

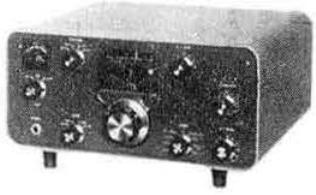
Price £185. Carr. 14/-.

SB-200 LINEAR AMPLIFIER KIT

80-10 metres—1200 watts PEP SSB input—1000 watts CW output—pre-tuned input—internal PSU, 120/240 VAC.

Price £115. Carr. 16/-.

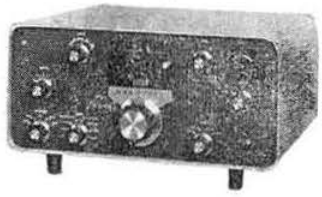
SB-301 AMATEUR BANDS RECEIVER KIT



80-10 metres—Stability less than 100Hz per hour—Visual dial accuracy less than 200Hz—Sensitivity 0·3μV for 10dB S+N—N LSB, USB, CW, RTTY. 120/240 VAC.

Price £140. Carr. 14/-.

SB-401 AMATEUR BAND TRANSMITTER KIT



Full coverage 80-10m—Input 170 watts CW, 180 watts PEP SSB—Full transceiver or split with SB-301—With any other RX using xtal pack SB-401-1-110/240 VAC.

Price £175. Carr. 16/-.

HW-100 5 BAND SSB-CW TRANSCEIVER KIT

High performance, minimum cost—80-10 metres—170 watts C.W., 180 watts PEP—Solid state L.M.O.—Less than 100Hz drift—Requires PSU (HP-23A-HP-13A).

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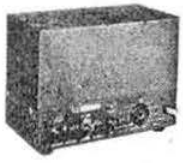
HW series Single Band Transceivers New Styling—Upper or lower side-band—200 watts PEP input—Choice of HW-12A (80m), HW-22A (40m) or HW-32A (20m)—requires external PSU (HP-23A or HP-13A).

HW-12A £59-10.

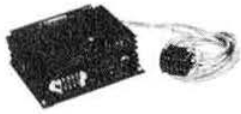
Price HW-22A & 32A £62-10. Carr. 10/-.

HP-23A AC PSU KIT (800VDC-300VDC 12.6VAC-130V BIAS)



110/240 VAC

Price £25 Carr. 12/-.



HP-13A MOBILE PSU

12-16 volts DC in 800 & 300 VDC plus—130v bias.

NEW Price £36. Carr. 8/-.

STATION SPEAKER SB-600 KIT

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8 ohms impedance 6" × 9" speaker—housed in case to match SB series equipment.

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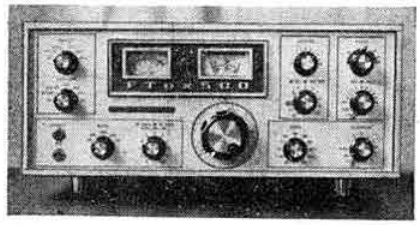
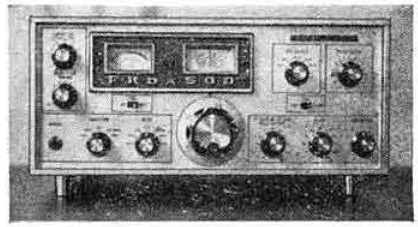
Sim GM3SAN 19 Ellismuir Road, Baillieston, Nr. Glasgow. 041-771-0364

FT 500



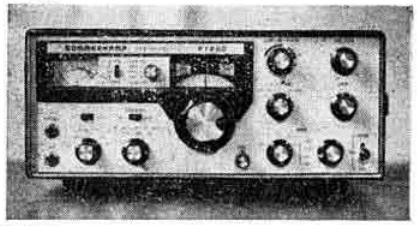
509W PEP
VOX, PTT, MOX. 100 and 25kHz marker RIT, Metered ALC. All the usual optional extras fitted as standard, £250. With extra 6 xtal CW filter £270.

FR 500



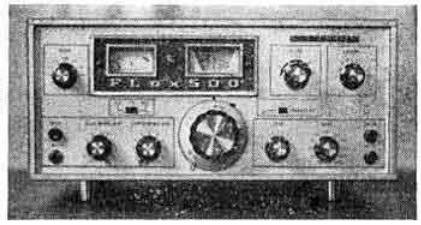
Top band to 2m.
The no compromise AM, FM, SSB and CW receiver for the man who wants the best. £160.

FT 220



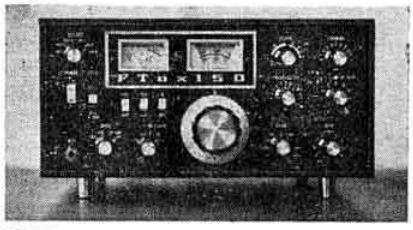
240W PEP
VOX, PTT, MOX. 100kHz marker. RIT Metered ALC. Again, usual extras are standard. £160. psu £45.

FL 500



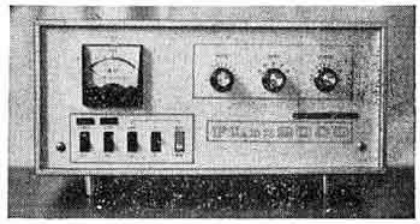
240W PEP
Companion to the FR-500 for transceive or split frequency. Matching it in quality and performance. £145.

FT 150



120W PEP
All transistor except driver and PA. Both AC and DC power supplies built-in. Specially designed for mobile. VOX, PTT, MOX, 100kHz marker, RIT. £215.

FL 2000



To complete the station, there is the FL-2000 linear. 1200W PEP. input. Comfortable legal limit output. Built-in SWR meter, etc. £110.

Hear them—any band, any part of the world, any time.

Try them—at Matlock, or any of the Agents.

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MEMBER SOCIETY INTERNATIONAL
AMATEUR RADIO UNION

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Current Comment

AS foreshadowed in a previous issue of *Radio Communication*, the Council of the Society has fixed the new subscription rates for corporate members at £4, and for associates at £2. The new rates are effective from 1 January 1971, and members who pay by Banker's Order are asked to complete the new Order form as soon as received and to return it immediately to Society headquarters in the reply-paid envelope provided.

The full benefit of the new rates will not be apparent by the end of the present financial year, since many members will still be "using up" their subscriptions at the old rate. Meanwhile postal and other charges are expected to rise in the near future, but Council is of the opinion that a reasonable working surplus will be achieved in about a year.

At the beginning of 1972 it should also be possible to introduce new membership categories such as "family membership" which should help to ease the burden of the increased basic rates. These developments require amendments to the Society's Articles of Association which are still under discussion with the Board of Trade. Council wishes to avoid the expense of yet another Extraordinary General Meeting, so that the updating of the Articles is expected to be introduced at the 1971 AGM. Many of the amendments are of a purely legal nature, such as incorporation of the title of the latest Companies Act in the Articles, but they have to be ratified by the members in general meeting. Details of the amendments proposed will be circulated in good time for full consideration.

Meanwhile it should be noted that Council has the power to reduce or waive the subscription of members who suffer from blindness or from any other disability which leads to financial hardship. Sympathetic consideration is also given to old age pensioners whose income is substantially reduced at a time when they are at last able to derive full enjoyment from the hobby.

How can we hold the subscription rates at the new level? Council and headquarters staff are pledged to "do their bit", but *you* can help vitally by encouraging as many as possible—especially licensed amateurs—to join the Society. By this means the unit cost of our journal and our services can be kept to a minimum.

* * *

Elsewhere in this issue appears a letter from our General Manager, Ron Vaughan, G3FRV, who finds it necessary to give up his post to return to industry.

Council would like to record its appreciation of the hard work put in by Mr Vaughan in dealing with the considerable burden of work at Society headquarters and the loyalty with which he has served the membership during his term of office. We wish him every success in his new sphere of activity.

Pending the appointment of a new General Manager, members are asked to keep correspondence with headquarters to a minimum, and the staff will do their best to maintain the essential work of the Society.

QTC AMATEUR RADIO NEWS

RSGB certificates: RTTY endorsement

As a result of an agreement between the Society and the British Amateur Radio Teleprinter Group, RSGB certificates are now available with rtty endorsement.

Claims for such certificates should follow the normal procedure, with the exception that QSL cards will require to be endorsed clearly to show that they verify two-way rtty contacts.

All claims for RSGB hf awards with rtty endorsements should be sent to the RSGB certificates manager, Charles Emary, G5GH.

Customs documentation for mobile installations

Further to the note published in the September issue, we have now been advised that the Royal Automobile Club also issues Customs documentation for mobile installations. Information can be obtained from the Foreign Touring Department at RAC Headquarters, RAC House, Lansdowne Road, Croydon, or from any of the RAC county offices.

You are reminded that the RAC will not be in a position to answer technical enquiries concerning mobile installations or reciprocal licensing.

Emigrating to Australia?

The RSGB frequently receives enquiries concerning the import of radio equipment into Australia when emigrating from this country. The following information has recently been made available by Alan Gibbs, VK6PG/G3PHG:

Radio transmitting and receiving apparatus may be imported by licensed radio amateurs provided the equipment was purchased at least 12 months prior to departure from the UK. A receipt must be produced to the Australian customs authorities on demand, clearly showing the date of purchase. Provided the equipment is for use by the owner, and is not sold within 12 months of arrival in Australia, no duty is payable. This also applies to ancillary equipment, such as wavemeters etc. Home-built equipment is not subject to any restrictions. In cases of difficulty, production of a current amateur transmitting licence will confirm the position.

VK6PG mentions that he will be pleased to assist any British licensee intending to emigrate to Australia with advice etc. His address is: Alan J. Gibbs, VK6PG, 12 Munyard Way, Morley, W. Australia 6062.

Explosions risk

Mercury wetted reed relays used in some telegraph and other equipment have a metal jacket over a pressurised glass capsule.

The jacket protects against injury in the event of the capsule breaking.

Do not be tempted to remove this outer jacket. Two men recently had lucky escapes in trying—the capsules exploded.

Reprinted by permission *Post Office) Engineering Safety*, Spring 1968.

To: The President and Council.

From R. G. B. Vaughan, G3FRV, General Manager.

Gentlemen,

It is with great regret that I have to submit my resignation as general manager, to take effect from 1 December 1970.

You will be aware that I joined the Society at a difficult time, and that as a result it has been necessary to work excessive hours, both at home and at headquarters, to maintain the administrative services of the Society.

Unfortunately some completely unexpected changes in my personal circumstances have now arisen, and these combined with recent increases in the cost and difficulties of commuting now make it impossible for me to continue as a fulltime employee of the Society.

I am returning to the electronics field, and I hope that it will be possible for me to help the RSGB in various voluntary capacities, as in the past.

I would like to take this opportunity of thanking my many friends and the headquarters staff for their support during a difficult period.

R. G. B. Vaughan

"An automatic rotator"

In connection with this article in the October issue of *Radio Communication*, Mr R. G. Brown advises that the following amendment is necessary:

In Fig 2, the supply to RLC3, LP1 and associated switches ST, RLB1 and RLA1 should be taken from contacts RLC2 and RLC3.

Falkirk & D RSGB Group

This club is active once again. Meetings are held on the last Friday of each month in the Temperance Café, Lint Riggs, Falkirk. Chairman is Alan Cameron, GM3OGJ, and the secretary is Brian Mulleady of 9 Elizabeth Crescent, Camelon, Falkirk (tel Falkirk 26437).

Lecture expenses

Members responsible for affiliated clubs' and societies' lecture programmes are reminded that it is courteous to offer expenses to lecturers coming from considerable distances. We recommend that programme organizers should state whether they are prepared to pay reasonable expenses when writing to prospective lecturers.

IEE lecture

There was an excellent attendance at the IEE when D. J. Collins, G2FLB; R. G. Shears, G8KW, and Sqd Ldr F. W. Church produced a joint lecture on the British Trans-Arctic Expedition 1968/9. The speakers dealt with the background of the expedition in addition to its human and technical aspects. A number of colour slides taken by Sqn Ldr Church provided visual support, but lack of time unfortunately prevented more material being shown. A vote of thanks to the speakers was proposed by R. J. Hughes, G3GVV.

"Ham Radio Magazine"

A large response has been received to the special offer leaflet for *Ham Radio Magazine* enclosed with the October issue of *Radio Communication*. May we remind new subscribers that all copies of *Ham Radio Magazine* are posted from the USA by surface mail, and that they should receive the first copy some six weeks after placing their subscription.

"Free Radio" circulars

It has come to our notice that a large number of licensed amateurs have received circulars from the Free Radio Association. The addresses were almost certainly obtained from the RSGB Call Book but we would like to make it clear that the Society does not wish to associate itself with the circular in any way.

Can you help?

Ken Vickery, G3CLK, is anxious to trace an old friend, J. A. Hunt, who was previously licensed as G2FSR and VS4JH. G3CLK would be pleased to hear from anyone who has information as to John Hunt's present whereabouts.

Mr F. H. Hatt, 23 Ravens Close, Enfield, Middx, would like information on a unit type 57 believed to be a preselector made by Radiocraft, 25 Beardall Street, SE19.

Sr Gianfranco Salsi, Via Tassoni 77, Modena, Italy, has a piece of "surplus" equipment which he describes as "Indicator CRT 26 A.M. Ref No 20Q/16058 Serial 1211" and would like a circuit diagram and any information on how it works.

Electroniques coils

It is now the policy of Electroniques not to despatch goods to overseas destinations. Further, a number of the ranges of coils have been discontinued, including some which are featured in designs appearing in RSGB publications. It is hoped that in due course replacements for at least some of the unavailable coils will be produced by other manufacturers.

Digital counters

Have you an interest in designing and constructing a digital frequency control unit intended for use with the oscillator of receiving equipment? If so, J. Gardner of Stable Cottage, Meonstoke, Southampton SO3 1NT, is anxious to compare notes on such a project.

Morse proficiency transmissions

Morse proficiency transmissions at 20, 25, 30, 35 and 40wpm will be transmitted from G3BZU at 1900gmt on the first Tuesday of each month on 3,520kHz.

Only 100 per cent copies of entries sent in for marking will be awarded a certificate for 20wpm and endorsement stickers at all other speeds.

A charge is made of 10 new pence or two IRCs for the basic certificate, and 2½ new pence or one irc for each endorsement sticker claimed.

All entries should be sent to the "QRQ Manager", HMS *Mercury*, Leydene, Petersfield, Hants.

Lost property

A doorkey and a ring were found after the Peterborough Mobile Rally and to date are still unclaimed. Owner please contact the honorary secretary—G3KPO, QTHR.

VACANCIES AT RSGB HQ

GENERAL MANAGER

Applications are invited for the position of general manager of the Society.

Applicants should be licensed radio amateurs, have a sound knowledge of the Society's activities, and have experience of office administration.

A salary commensurate with age, qualifications and experience is offered, together with appropriate additional benefits.

ADMINISTRATIVE ASSISTANT

There is also a vacancy for an administrative assistant to assist the general manager in dealing with queries from members and with other routine duties.

The successful applicant is most likely to be a licensed amateur with experience in various aspects of office routine.

A salary commensurate with age, qualifications and experience is offered, together with appropriate additional benefits.

Applications, in writing, should be addressed to:
Mr J. W. Swinnerton, G2YS,
Chairman, RSGB Finance & Staff Committee,
29 Beacon Way,
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"Educational Electronic Experiments"

A new book published by the Mullard Educational Service contains 20 electronic experiments that have formed the subjects of pamphlets issued over the past 10 years. The experiments have been designed to familiarize students with electronic theory and practice while building useful equipment. For example, the first experiment describes the construction of a double-beam simulator for producing two independent beams on a simple oscilloscope; and the next a one-megohm-per-volt dc voltmeter. Power supply units, oscillators (af, rf and microwave) and an oscilloscope are made in other experiments. The critical potentials in gases, Hall effect, and logic gates are subjects that are also dealt with.

Although Mullard does not supply kits of parts for the experiments, the names and addresses of distributors who do are given.

Intended for the use of apprentices and students of electronics, it could also help home constructors to build their own test equipment—power supply units, voltmeters and oscilloscopes—as well as various control circuits.

Educational Electronic Experiments costs 10s post free (cash with order) and can be obtained from Mullard Educational Service, Mullard Ltd, Mullard House, Torrington Place, London WC1E 7HD.

Camera tube test chart

The English Electric Valve Company, Chelmsford, Essex, has just produced a camera tube test chart specially for use with cctv systems. Copies of the chart and a leaflet describing its use are freely available to anyone using cctv in return for information about the types of cameras they are using.

Parasitic oscillations in vhf power amplifiers

Reproduced from *Mullard Technical Publications* **by courtesy of the editor**

by G. S. M. TEALE, formerly of Mullard Limited

IN a variety of circuits, using transistors as vhf power amplifiers for the ultimate or penultimate stages of a transmitter, the common emitter configuration is only conditionally stable. Some amplifiers with transistors operating in this mode are prone to oscillate; the most troublesome oscillations take place at less than the signal frequency and appear at the output as amplitude modulation of the rf output, or as modulation of the mean rf level.

The cause of the instability can be traced in the first instance to feedback via the collector base capacitance from the output to the input. Under certain circuit conditions the eedback may be positive.

A theory to explain some types of instability is suggested and practical methods of stabilizing a wideband amplifier are discussed.

Introduction

Instability has appeared in a number of differently designed amplifiers. In the past it has been found possible to suppress the oscillation by changing one or two components, but in some circuits, particularly wideband amplifiers, this may still not be satisfactory and a more systematic approach may be required. Such an approach is described in this article.

Theoretical fundamentals

Consider the circuit of Fig 1(a), the equivalent circuit of Fig 1(b) and the current and voltage phasor diagram of Fig 1(c).

The values of the voltages and currents at key points are written on the equivalent circuit and repeated on the phasor diagram. It can be seen that with a phase shift of 180° due to transistor action, 90° due to the load inductance and 90° due to the collector base capacitance, the feedback current is in phase with the input current. Consequently, if the loop gain exceeds unity, the amplifier will oscillate.

It is assumed here that the base resistance $r_{bb'}$ is small and that the reactance of c_c is very much greater than the base to emitter resistance $r_{b'e}$. For the purpose of the above illustration the depletion capacitance of the base-emitter junction is ignored. The load L is assumed to be a pure inductance.

The general case

Consider the circuit of Fig 2(a) and the equivalent circuit of Fig 2(b), and consider an initial current I at a given frequency. If the current gain at this frequency is β and the feedback current to the input is I_{FB}, the voltage V_L appearing across the load is given by

$$V_L = Z_L(-\beta I - I_{FB}). \qquad \ldots [1]$$

Let Z_X be the total input impedance, that is Z_i in parallel with the transistor impedance.

Then

$$I_{FB} = Z_X + Z_2 = V_L$$
$$= Z_L(-\beta I - I_{FB}).$$

Therefore

$$I_{FB} = \frac{-\beta I Z_L}{Z_X + Z_2 + Z_L}.$$

Generally, Z_X is small compared with $Z_2 + Z_L$. Typical

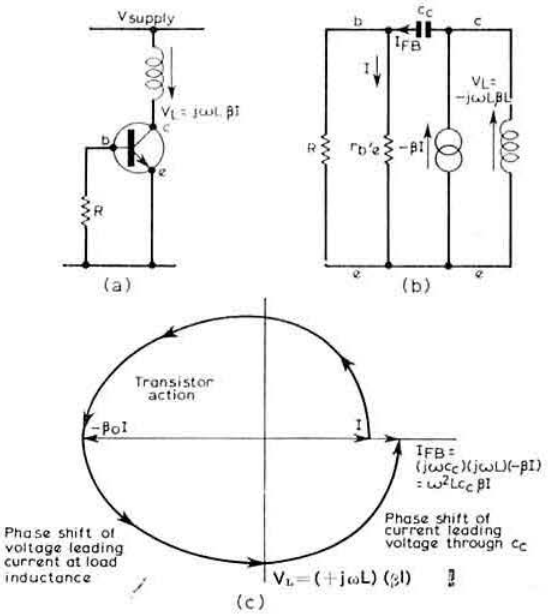

Fig 1. Circuit under consideration, together with the equivalent circuit and phasor diagram

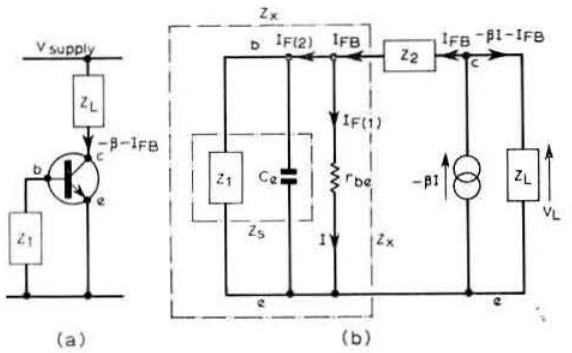

Fig 2. Circuit under consideration and its equivalent circuit

values for the components of Fig 2(b) are $Z_2 < 20pF$, $c_e = 150pF$ in the off condition, $c_e \gg 150pF$ in the on condition, and $r_{b'e} \simeq 10\Omega$ for $I_E = 200mA$. Therefore we may write,

$$I_{FB} = \frac{-\beta I Z_L}{Z_2+Z_L}. \quad \ldots [2]$$

Let Z_S be the impedance of the parallel combination Fig 2(b) of Z_1 and c_e. Then

$$I_{F(2)}Z_S = r_{b'e}I_{F(1)},$$

whence

$$\frac{I_{F(1)}}{I_{F(2)}} = \frac{Z_S}{r_{b'e}}$$

$$\frac{I_{F(1)}}{I_{F(1)}+I_{F(2)}} = \frac{Z_S}{r_{b'e}+Z_S}.$$

But

$$I_{F(1)}+I_{F(2)} = I_{FB}.$$

Therefore

$$I_{F(1)} = I_{FB}.\frac{Z_S}{r_{b'e}+Z_S}. \quad \ldots [3]$$

Substitution in Eq. 2 gives

$$\frac{I_{F(1)}}{I} = \left[\frac{Z_S}{r_{b'e}+Z_S}\right] \times \left[-\beta\right] \times \left[\frac{Z_L}{Z_2+Z_L}\right]. \quad \ldots [4]$$

Conversion to modulus and angle gives

$$\frac{I_{F(1)}}{I} = [\text{A angle } \theta] \times [\beta \text{ angle } 180] \times [\text{C angle } \phi]. \quad \ldots [5]$$

For oscillation, $I_{F(1)}$ must be in phase with I, and $(I_{F(1)}/I)$ must exceed unity.

Phase angle

For oscillation, $\text{angle}\frac{I_{F(1)}}{I} = 2n\pi$ where n is an integer.

That is,

$$\theta+180^\circ+\phi = 2\pi$$
$$\theta+\phi = 180^\circ. \quad \ldots [6]$$

Example 1

Assume that the load is purely inductive (Fig 3(a)). From Eq. 4, we may write

$$\phi = \text{angle}\ \frac{j\omega L}{-\frac{j}{\omega c_e}+j\omega L} \quad \ldots [7]$$

$$\phi = 0^\circ \text{ if and only if } j\omega L > \frac{j}{\omega c_e} \quad \ldots [8]$$

$$\phi = 180^\circ \text{ if and only if } \frac{j}{\omega c_e} > j\omega L. \quad \ldots [9]$$

Substitution in Eq. 6 gives

$$\text{For oscillation } \theta+0 = 180^\circ \quad \ldots [10]$$

or

$$\text{For oscillation } \theta+180^\circ = 180^\circ. \quad \ldots [11]$$

Eq. 10 gives

$$\theta = 180^\circ, \quad \ldots [12]$$

which, from Eq. 4, is not possible. Thus we must take the solution from Eq. 11, that is

$$\theta = 0. \quad \ldots [13]$$

We may then write

$$\text{angle}\frac{Z_S}{r_{b'e}+Z_S} = 0.$$

This is true when Z_S is purely real, that is when the parallel combination of the external circuit and c_e is purely resistive. (This confirms the assumption made earlier in the discussion of Fig 1, illustrating the principle that oscillation can occur if the load is purely inductive and the input resistive). However, oscillation in this mode is only possible if Eq. 8 is satisfied. That is,

$$\frac{1}{\omega c_e} > \omega L$$

whence

$$1 > \omega^2 L c_e$$

$$\omega < \frac{1}{\sqrt{(Lc_e)}}. \quad \ldots [14]$$

The oscillation frequency is below the resonance frequency of the load inductance and c_e. For a typical case, $L = 500nH$, and $c_e = 20pF$, for which $f < 50MHz$.

Example 2

Assume the load is purely resistive (Fig 3(b)) and has a value "a"Ω. From Eq. 4

$$\phi = \text{angle}\ \frac{a}{-\frac{j}{\omega c_e}+a}$$

$$= \text{angle}\ \frac{a\omega c_e}{a\omega c_e - j}$$

$$= \text{angle}\ \frac{a\omega c_e(a\omega c_e+j)}{a^2\omega^2 c_e^2+1}$$

$$= \text{angle}\ (a\omega c_e+j)$$

$$= \tan^{-1}\frac{1}{a\omega c_e} = \tan^{-1}\frac{X_{ee}}{a},$$

where X_{ee} is the reactance of the collector base capacitance.

The value of ϕ tends to 90° as X_{cc} becomes very much greater than "a". Substitution in Eq. 6 gives

$$\theta + 90 = 180°,$$

that is

$$\theta = 90°.$$

In the limit, when ϕ has tended to 90°, it is possible for the circuit to oscillate if the output is resistive and the input is purely inductive and if the loop gain is greater than 1. See Fig 3(b).

Example 3

It is also possible that oscillation can occur with intermediate phase angles in the input and output (Fig 3(c)).

Loop gain

For oscillation to occur, we may write from Eq. 5.

$$A\beta C > 1,$$

that is

$$\left|\frac{Z_s}{r_{b'e}+Z_s}\right| \times \left|\beta\right| \times \left|\frac{Z_L}{-\frac{j}{\omega c_c}+Z_L}\right| > 1.$$

If $r_{b'e}$ is very much less than Z_s, which is the normal condition, then

$$\frac{Z_s}{r_{b'e}+Z_s} \text{ tends to } 1.$$

This represents the worst case condition when all the feedback current passes into the base of the transistor.

$$\text{Loop gain} = \beta\left|\frac{Z_L}{-\frac{j}{\omega C_C}+Z_L}\right|.$$

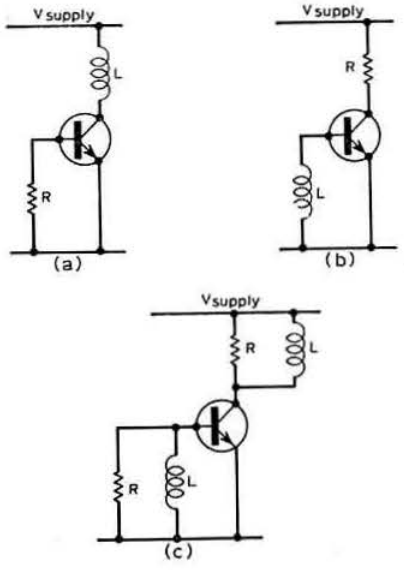

Fig 3. Possible oscillating circuit configurations

If $Z_L = a + j\omega L$, then, for oscillation to occur,

$$\beta\left|\frac{a+j\omega L}{-\frac{j}{\omega c_c}+a+j\omega L}\right| > 1.$$

From the phase angle calculation, and from Eq. 8, oscillation can only occur if $1/\omega c_c > \omega L$.

Assume that $1/\omega c_c \gg \omega L$. Then, for oscillation to occur,

$$\beta^2\left[\frac{(a^2+\omega^2L^2)}{a^2+\frac{1}{\omega^2c_c^2}}\right] > 1,$$

that is

$$\frac{\beta^2\omega^2c_c^2(a^2+\omega^2L^2)}{1+a^2\omega^2c_c^2} > 1. \qquad \ldots [15]$$

When $a = 0$,

$$\frac{\beta^2\omega^2c_c^2\omega^2L^2}{1} > 1$$

$$\beta\omega^2Lc_c > 1$$

$$\omega^2 > \frac{1}{\beta}\cdot\frac{1}{Lc_c}$$

$$\omega > \frac{1}{\sqrt{\beta}}\cdot\frac{1}{\sqrt{Lc_c}}.$$

This gives the lowest frequency of oscillation, and indicates that the assumption that $1/\omega c_c \gg \omega L$ is justified except for large values of collector load inductance.

Thus, if $L = 30\mu H$, and if $c_c = 20pF$, and if $\beta = 100$, then $f > 600kHz$.

Design with chokes

Consider Figs 4(a) and 4(b) which show a transistor with collector and base bias chokes only. Following the general theory outlined above, and assuming that the feedback current is small compared with the load current, then

$$V_L \simeq -j\omega L_c\beta i,$$

and the feedback current is given by

$$i_{FB} \simeq -j\omega L_c\beta i(j\omega c_c)$$

or

$$i_{FB} \simeq \omega^2 L_c c_c \beta i.$$

For oscillation to occur,

$$i_{FB} > i$$

or

$$\omega^2 L_c c_c \beta > 1. \qquad \ldots [16]$$

Oscillation cannot take place above the resonant frequency of the base choke and the emitter depletion capacitance since the total phase shift would then be less than 360°. However, at frequencies only slightly below the resonance, $\omega = 1/\sqrt{(L_b c_e)}$, the impedance of the reactive parts will be at a maximum, and almost all of the feedback current will flow into $r_{b'e}$.

Substitution into Eq. 16 gives, for oscillation to occur

$$\frac{L_c c_c \beta}{L_b c_e} > 1. \qquad \ldots [17]$$

From this equation it can be seen that greater stability will be achieved if the collector choke is smaller than the base choke.

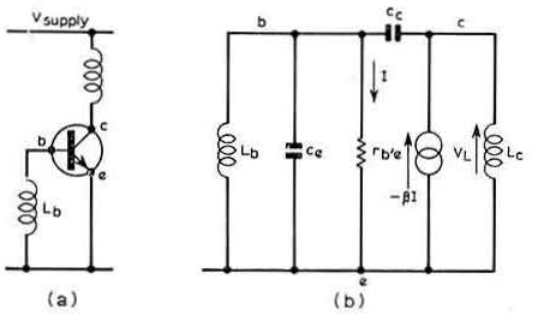

Fig 4. Circuit diagram of amplifier with inductive input and output, together with the equivalent circuit

Theory and practice of possible cures

Various practical methods of avoiding oscillation are now discussed under separate headings.

Supply decoupling

Difficulties have been encountered, in practice, with resonances between the supply decoupling capacitors and inductances both in the circuit and in the supply lines. Resonances have also been noticed between undamped capacitors in parallel. A "preferred" circuit was designed and has proved very satisfactory in use (Fig 5). At frequencies above 100kHz the impedance is less than $(5-5j)\Omega$.

It has been found that a great number of parasitic oscillation problems can be traced to inadequate or unsatisfactory supply decoupling.

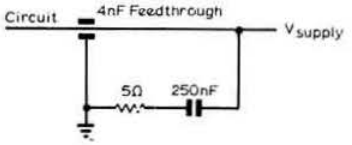

Fig 5. Preferred decoupling circuit

Design with chokes

From the above discussion concerning chokes (and in particular from Eq. 17), it can be seen that stability can be improved by making the base choke larger than the collector choke. Little can be done with β, c_c and c_e as these factors are primarily dependent on device geometry and manufacturing processes. This explains why some types are more prone to instability than others.

Additional circuitry

The simple picture of a choke in the collector circuit is complicated by additional circuitry if there is a capacitor in the output circuit which can resonate with the choke. At frequencies near resonance the impedance of the combination is considerably greater than that of its component parts. If the impedance is still on the inductive side of resonance (as it must be for oscillation to occur) this is equivalent to a choke of a considerably higher value than that in situ, and oscillation may occur as described previously. The impedance which may be seen at the collector is dependent on the Q of the circuit. Under fault conditions the Q may be very high and it has sometimes been found helpful to limit the Q by including a fixed resistor across the output. This does not affect the performance significantly if it is at least 15 times higher than the matched impedance.

On the input side a low value of inductance connected to ground may shunt the base choke entirely and oscillation may occur by Eq. 17 if the effective L_b is low enough.

From Eq. 4 it can be seen that it would be advantageous to decrease the value of $Z_s/(r_{b'e}+Z_s)$ where Z_s is the impedance of the input circuitry with c_e. This may be done satisfactorily by a low value resistor connected between base and ground. However, power will be lost in this resistor and its effectiveness depends on the relative magnitudes of $r_{b'e}$ and Z_s.

Phase control method

Because of radiation, resistance, small losses in components, etc, the phase shift in either the input or output circuits singly can never quite reach 90°. If now one side (either the input or output) is prevented from becoming inductive, or is always slightly capacitive, the phase shift round the loop will never quite reach 360°. Consequently, oscillation cannot occur, as Eq. 6 indicates.

If oscillation is troublesome in the output stage, phase control must be applied to the input circuit since under fault conditions, with an aerial attached, the output impedance may take any value, capacitive or inductive. This solution limits circuit design considerably and it can be very difficult in practice to make a circuit capacitive at all frequencies, because of imperfections in components at high frequencies. Thus, capacitors may look inductive and inductances may look capacitive.

An example of the use of this method is shown in Fig 6, which shows a wideband output circuit of a small transmitter using a high gain transistor in the output stage.

In practice, a selection of filters was necessary in the output, and under fault conditions the possible values of impedances at the collector could take on any value. The coupling circuit between the transistor stages was designed to give a satisfactory gain as well as to remain capacitive at all frequencies. One difficult compromise had to be

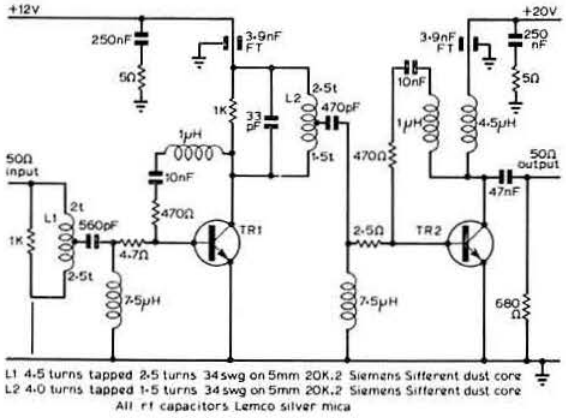

Fig 6. Wideband test amplifier for use with high gain transistors, using the phase control method to suppress oscillation

made between the collector choke of the first stage and the base choke of the second stage. For stability of the first stage the collector choke had to be as small as possible, but for the stability of the second stage the base choke had to be as large as possible. They were coupled with 1nF and it was only by adjustment of this coupling capacitor, and by the choice of the base-to-emitter resistor-capacitor combination, that satisfactory stability was achieved.

Resistor feedback method

A second method of stabilization of a development circuit was the use of a feedback resistor connected between the collector and base of each oscillating transistor. This has the effect of "swamping" the collector base capacitance and prevents the phase shift from reaching 360°.

The calculation of the value of the resistance required is shown below. From Eq. 4,

$$\frac{I_{F(1)}}{I} = \left[\frac{Z_S}{r_{b'e}+Z_S}\right] \times \left[-\beta\right] \times \left[\frac{Z_L}{Z_2+Z_L}\right].$$

Assume, under worst case conditions, that all the feedback current returns to the transistor base. Then

$$\frac{Z_S}{r_{b'e}+Z_S} = 1, \qquad \ldots [18]$$

and

$$\frac{I_{F(1)}}{I} = -\beta.\frac{Z_L}{Z_2+Z_L}. \qquad \ldots [19]$$

With a resistor connected from collector to base, then Z_2 (from Fig 2(b)) has the value of R in parallel with c_c. That is,

$$\frac{1}{Z_2} = j\omega c_c + \frac{1}{R}$$

$$Z_2 = \frac{R}{1+j\omega c_c R}$$

$$= \frac{R(1-j\omega c_c R)}{1+\omega^2 c_c^2 R^2}.$$

Substitution in Eq. 19 gives

$$\frac{I_{F(1)}}{I} = \frac{-\beta Z_L(1+\omega^2 c_c^2 R^2)}{R(1-j\omega c_c R)+Z_L(1+\omega^2 c_c^2 R^2)}.$$

Let $Z_L = j\omega L$, which is the most likely condition for oscillation. Then

$$\frac{I_{F(1)}}{I} = \frac{-j\beta\omega L(1+\omega^2 c_c^2 R^2)}{R+j(\omega L+\omega^3 L c_c^2 R^2-\omega c_c R^2)}.$$

Therefore

$$\frac{I_{F(1)}}{I} = \frac{[-j\beta\omega L(1+\omega^2 c_c^2 R^2)][R-j(\omega L+\omega^3 L c_c^2 R^2-\omega c_c R^2)]}{R+j(\omega L+\omega^3 L c_c^2 R^2-\omega c_c R^2)}.$$

For simplicity, say

$$\frac{I_{F(1)}}{I} = A+jB.$$

For complete stability A should ideally be negative. That is,

$$\beta\omega L(1+\omega^2 c_c^2 R^2)(\omega L+\omega^3 L c_c^2 R^2-\omega c_c R^2) > 0$$

or

$$L+\omega^2 L c_c^2 R^2 > c_c R^2.$$

Therefore

$$R^2(c_c-\omega^2 L c_c^2) < L$$

$$R^2 < \frac{L}{c_c-\omega^2 L c_c^2}.$$

The minimum value of R occurs when ω tends to 0, that is, when $R^2 < L/c_c$.

Hence, the maximum resistance allowed for complete stability is $\sqrt{(L/c_c)}$.

Example 4

Assuming a minimum collector inductance of 5μH and c_c of 20pF,

$$R < \sqrt{\left(\frac{5\times10^{-6}}{20\times10^{-12}}\right)}$$

$$R < \tfrac{1}{2}\times10^3$$

$$R < 500\Omega.$$

Two obvious disadvantages of this system are dc current shunting and loss of gain. By judicious choice of values a capacitor may be included in series with the resistor to block the dc current with no detrimental effect, provided that its value is chosen so that the combination is not significantly capacitive at the lowest troublesome frequency.

If the oscillation frequency is different from the drive frequency then it is possible to include a choke in series with the combination. This reduces the loss at the operating frequency but has little effect at the lower frequency. Restraint should be exercised in using this solution, however, since it is possible to have oscillation with capacitive input, capacitive output and inductive feedback. Fig 7 shows an example of a circuit using the technique of resistive feedback.

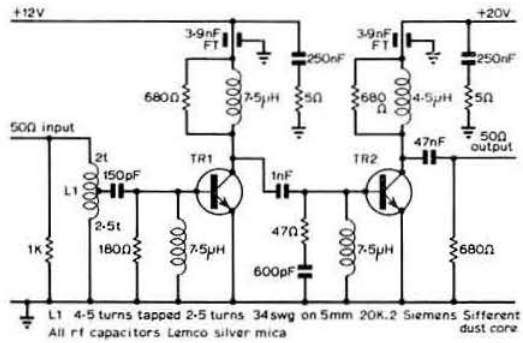

Fig 7. Wideband test amplifier for use with high gain transistors, using the resistive feedback method to suppress oscillation

Symptoms and diagnosis of oscillations

Oscillations which occur under various circuit conditions are discussed under separate headings below. Cures for the oscillation are suggested in each case.

Oscillation with dc supply only (Class B stages)

Oscillations may be observed with an oscilloscope connected

between earth and the circuit side of the resistor in the preferred decoupling circuit (Fig 5). However, it is more satisfactory to connect the probe to the collector pin. If any oscillation is observed, the frequency should be noted and the loop gain calculated. Steps can then be taken either by altering component values or by applying solutions discussed in the previous section.

Oscillation with forward bias on the base

The gain of forward biased transistors is relatively greater than that of the transistors in Class B or Class C stages, and oscillations may occur which did not appear under the previous heading. The application of forward bias also changes the values of c_e and $r_{b'e}$, and an oscillation may start when, in contrast, in an undriven Class B stage, the V_{be} (which is approximately 0·7V) would normally prevent oscillation. Cures for this form of oscillation may be attempted by applying the solutions discussed previously.

Oscillation with rf input

Parasitic frequency unchanged with change of drive frequency

Since the rf drive effectively sweeps the dc characteristic, any form of oscillation not cured under the two previous headings will show up in the form of amplitude modulation of the rf output, or modulation of the mean dc level. It is possible that oscillations will show up in this test which did not appear in the preceding test. If the oscillation loop gain is not quite unity, the circuit may behave like a super-regenerative receiver. This can occur at the drive frequency, at a harmonic or at a sub-harmonic.

Frequency of oscillation changes with change of drive frequency

If a circuit is oscillating at one frequency and the drive is at a different frequency, mixing will occur between the two and an oscillation will appear at the difference frequency. Small changes in the drive frequency thus cause a fairly large change in the difference frequency. This type of oscillation has been called "parametric oscillation" and it occurs more readily in amplifiers where the signal frequency is relatively high, for example 175MHz.

A cure must be effected by stopping the oscillation at the "local oscillator" rather than trying to cure the oscillation at the difference frequency. Because the oscillation frequency may be near the signal frequency, it can be difficult to apply some of the cures previously discussed without a loss of gain.

Other forms of oscillation

The preceding is not a complete coverage of parasitic oscillations. One additional fairly commonly observed form occurs when the transistor is driven hard with a particular fault condition on the output, and the collector-base junction becomes forward biased preventing the transistor operating correctly over the next few cycles. This has been called "the skip-effect". Varactor multiplication is not discussed because it is a completely different form of oscillation.

An rf indicator for the blind

by R. C. RAY, BSc, ARIC, ARCS, G2TA*

Introduction

One of the handicaps of being a sightless amateur is how do you tune for dip, or "peak" the aerial current without some visible indication? Through the good offices of the RAIBC, a RNIB audio rf indicator is obtainable, but although this is better than nothing, it indicates rf in the shack rather than current in the aerial. Nonetheless it provides the basic idea, namely an instrument which would generate audible tone dependent on the amount of rf available.

Design

To provide an audible tone which could be varied over a fairly wide range by a relatively small change in current or voltage a transistor multivibrator circuit was chosen. This seemed to be a sure-fire oscillator which could be built into the minimum of space and which would require no expensive transformers. Application of a variable current into the base of one of the transistors would change the frequency, and if this variable current could be obtained by rectifying part of the rf current in the feeder an audio rf ammeter should result.

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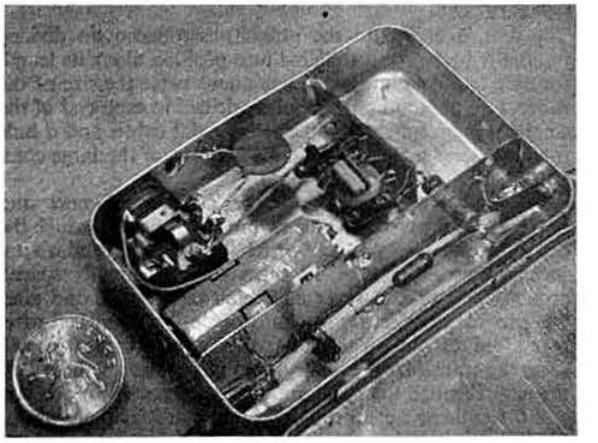

The indicator layout

Previous experience with the RNIB design showed that such simple oscillators were very prone to odd and misleading effects caused by rf picked up on phone leads, etc, so it was decided to isolate the oscillator as far as possible. This was done by building the "Detector" in a separate screened compartment and by decoupling the phone leads where they entered the box. In addition, the output from the multivibrator was passed through a common collector amplifier to the earphones. This makes the unit fairly independent of output impedance, and low- or high-resistance phones, or

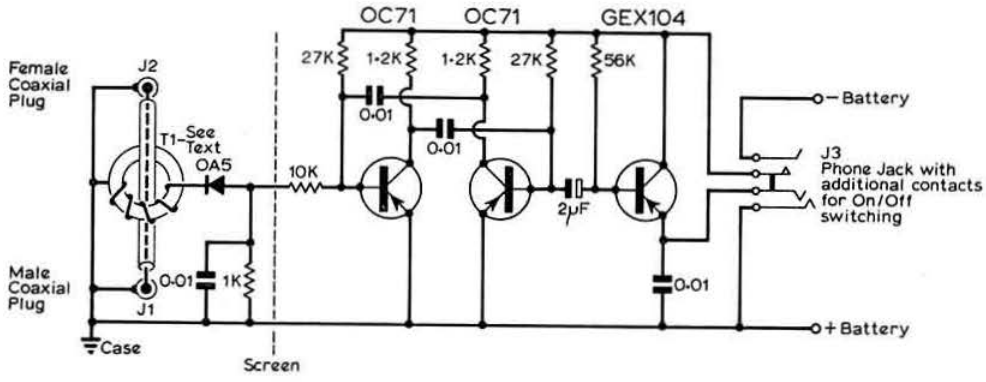

Fig 1. Circuit diagram

alternatively a small speaker about 100Ω, can be used. Finally, to avoid prematurely run-down batteries the phone jack is made to operate the battery on-off switch.

Circuit

The electrical circuit is shown in Fig 1. The transistors were junk box items and there seems no reason why similar ones should not be equally satisfactory. The rf transformer was constructed from a dust iron pot core of unknown origin, but which was apparently of the type commonly used in i.f. transformers where the coil is completely enclosed by the pot. A small ferrite ring suitable for the frequencies in use would no doubt be equally satisfactory.

Construction

The unit is built into the ubiquitous tobacco tin divided internally by a screen soldered into position along its length forming two compartments, one about twice the size of the other, (see photograph). A hole is drilled in each end of the smaller compartment to take the coaxial cable, and a hole for the phone socket is made in the front of the large compartment.

The rf transformer should be constructed next and threaded on the coaxial cable before this is fitted through the box. Take the dust pot core or ferrite ring and wind on it a secondary consisting of 12 turns of wire equally spaced around the circle. A layer of Scotch tape before and after will provide satisfactory insulation even for enamelled wire. Next, feed the ring on about a yard of coaxial cable (this will form the transformer primary) and insert into the box. Pull the ends through the holes and fit a male socket to one end and a female socket to the other—this will facilitate inserting the unit is series with any existing coaxial cable system. Now draw the coaxial cable up into a loop from within the box so that it can be worked on and strip off about two inches of the outer insulation. Cut the outer braid at the centre, being careful not to damage the insulation on the centre conductor.

Form each braid into a pigtail and "tin" ready to solder into the box. Now slide the "transformer" along on the inner conductor, leaving a braid pigtail on either side, and pull the cable tight through the box. Solder the two pigtails to the inside of the screened compartment, leaving the centre conductor through the pot core transformer. Connect one side of the secondary to the chassis and wire up the rectifier together with its load resistance and smoothing capacitor as in Fig 1. Make sure that the rectifier is connected so as to give a *negative-going* voltage—it would be wise to check this part of the circuit before proceeding. An rf current of 1A in the coaxial cable should give about 2V dc across the diode load.

Having made sure that the detector is functioning correctly, the oscillator and amplifier can be wired up on a small piece of Veroboard and a check made for oscillation. The tone will depend to some extent on the characteristics of the transistors and may be adjusted to taste by changing one or both of the capacitors in the multivibrator circuit—larger capacitors, lower frequency.

Finally, install the Veroboard, the battery and the phone jack in the larger compartment. The frequency change of the oscillator can be confirmed by connecting the 10kΩ resistor to a separate source of dc from a battery, via a potentiometer, when it will be found that a just-noticeable change of tone can be obtained by about 25μA change in the base current, equivalent to about ¼V at the detector.

Having confirmed that both the detector and multivibrator are working satisfactorily, connect the 10kΩ resistor between the detector and oscillator and complete the screening of the unit by soldering a tin cover over the smaller compartment.

Testing and use

Plug the unit in series with the station aerial system and insert the earphones or speaker into the output socket. An audio tone rich in harmonics should be heard. Now adjust the transmitter to feed a small amount of rf energy into the aerial, when the audio tone should be heard to rise in frequency. The necessary tuning adjustments can now be carried out to give the highest pitch of note corresponding to maximum current in the feeder.

The minimum current which can be detected is about 100-200mA rf, but if too large a current is passed the audio tone may become "sour" and will not necessarily peak in frequency at the point of maximum current. If this is the case all tuning adjustments should be carried out at reduced power and the indications ignored when full power is resumed. The performance of the unit may vary from band to band, as the efficiency of the rf transformer will change with frequency, and for this reason it is only possible to use it for indication of relative current rather than absolute measurement.

A compact 150W amplifier for 144MHz

by G. R. JESSOP, CEng, MIERE, G6JP*

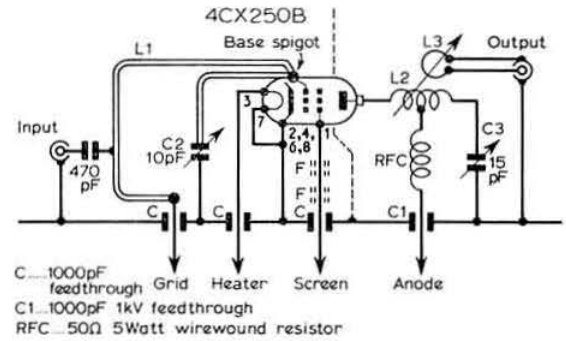

Fig 1. Circuit diagram

THIS amplifier, which was displayed at the recent RSGB Show, attracted many requests for details. Originally it was intended to describe a complete transmitter in which this amplifier forms part. However, since there was a demand for the information and the rest of the transmitter is conventional, it is being described as a unit.

The amplifier, anode and grid circuits are simple and very compact. The anode circuit is naturally somewhat less efficient than a tuned line would be, but in terms of output power it is doubtful if, for most purposes, increased efficiency really justifies the larger cabinet space needed.

The valve used is a 4CX250B and a suitable blower is included in the unit. It should be noted that the amplifier is intended to operate at the full licence power of 150W input and that for this power the small blower is quite adequate. If for any reason the full power capability of the valve is required, then a larger blower would be needed. In order to get the needed airflow through the anode cooler, it is necessary to enclose fully the input (base) circuit and the valve socket and to use the appropriate ceramic chimney, otherwise the airflow will largely pass around the outside of the anode cooler.

The circuit is quite conventional and based on the use of the standard valve socket in which the screen bypass capacitor is built-in, although a home-made arrangement as described in "A self-contained linear amplifier for 144MHz", (*Radio Communication*, February 1970), may be used as a cheaper alternative. Some care is needed to ensure that the grid circuit is very similar to that used in the prototype so as to tune within the band. The anode circuit is less critical, except that the ceramic chimney should be in position when checking frequency with gdo, because its dielectric makes a significant difference to the apparent valve output capacitance.

Construction may be of any form suitable to the individual; in the prototype it was required to fit into an existing transmitter.

The form, as can be seen from the photographs, consists of a "U" chassis with an enclosure under the valve. This should be reasonably airtight to ensure that the forced air from the blower which enters the enclosure at one end and at right-angles to the valve socket will pass through the anode cooler. If height is not restricted the blower could be

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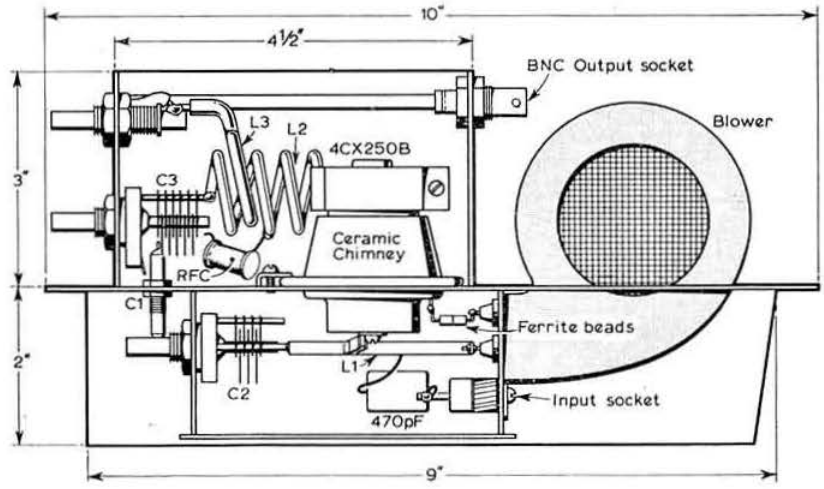

Fig 2. General lay-out (side view)

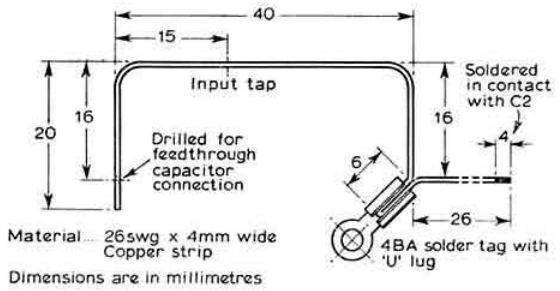

Fig 3. Detail of grid inductor L1

mounted so that the air inlet is directly under the valve socket; such an arrangement would provide a more straightforward air flow, but would restrict the access to the grid circuit.

The valve and its tuning circuit is mounted in an open top enclosure above the chassis, with the blower fixed to chassis with a cut-out through which the blower output protrudes to connect into the grid circuit box.

The grid circuit, which as mentioned earlier should closely resemble that of the prototype, is made of 4mm wide 26swg copper strip and is formed as shown in Fig 3. Note that the lead to the grid tuning capacitor is of the same material.

The anode circuit inductor consists of 3½ turns of ¼in diameter copper spaced approximately one diameter and wound on a ¾in diameter former. The rf choke, a 50Ω 5W wire-wound resistor is connected to the centre point, and the connection to the valve anode is made of ¼in wide 26swg to form a clip around the anode cooler. See Fig 2.

The output is a single turn of well-insulated thick wire, 16 or 14swg, which is arranged so that variable coupling is provided. This coil is meshed into the anode coil in the turn nearest to the anode tuning capacitor; to allow this, the turns spacing is increased to suit. Coupling of this type is felt to be a more satisfactory method of variable loading than the usual coil and capacitor arrangement.

The input tap point as given is suitable for 50Ω; for 75Ω this should be moved towards the grid end of the grid inductor.

DC isolation of the grid bias is provided by the feed-through capacitor at the earthy end of the inductor, thus allowing the copper strip to provide some cooling of the grid connection.

Incidentally, the grid circuit used in this amplifier may be used as an alternative to that used in the linear amplifier described in the February 1970 *Radio Communication*, when a tuned circuit is needed instead of the passive circuit.

Performance

The amplifier was required to operate at a ht voltage of 750–800V. Although there is obviously no reason why it should not be higher, it will be limited by the feed-through capacitor rating. With a higher voltage some improvement in efficiency will be obtained, and this may be as much as about 10 per cent, due to the increased anode voltage swing then available.

	Anode Voltage 750V	Anode Voltage 800V
Anode current	200mA	200mA
Screen voltage	250V	250V
Screen current	5mA	8mA
Grid voltage	−100V	−100V
Grid current	6·6mA	8mA
Power (drive)	2·6W	3·0W
Power (output in load)	90W	100W
Anode, rf/dc efficiency	60 per cent	62·5 per cent

As with all valves of this class, the screen must be supplied from a suitable source of substantially fixed voltage to cater for the possibility of negative screen current.

Components list

C	1,000pF feed-through
C1	1,000pF 1kV feed-through
C2	10pF C804 Jackson
C3	15pF C804 Jackson
F	Ferrite bead
RFC	50Ω 5W wire-wound
L1	see detail drawing
L2	3½ turns ¾in inside diameter ¼in diameter copper spaced approximately 1d
L3	1 turn ¾in inside diameter, well insulated
Valve socket	VH548/801 AEI
Blower	Plannair type 2PL 321-284C Mk 3

A simple 3cm polaplexer

by A. Wakeman, G3EEZ*

THE polaplexer principle is fairly well known and a brief resumé of operation is as follows.

If two stations use a common i.f. frequency for reception, say 30MHz, and one station transmits, say, on 10,020MHz, and the other on 10,050MHz, then each station accepts the other's frequency on reception since they are both spaced by 30MHz, one LO working below signal frequency and the other above signal frequency. This allows duplex working and allows for very simple transmitter/receivers. One way of providing separation of transmit/receive signals is by using a polarization difference of 90° for transmit and receive signals, one station transmitting with horizontal polarization while the other station transmits with vertical polarization, and each then receives the other's signal by virtue of the 90° polarization difference built into the polaplexer. The attached drawings show a 3cm polaplexer developed at the author's QTH and capable of excellent results.

The main cavity/waveguide is made from 1in bore copper tube blanked off at one end, and the drawings show relevant dimensions for drilling etc. If the bore of the tubing is departed from, the drawing dimensions no longer hold good as they are calculated for a waveguide diameter of 1in.

2K25 or 723A/B klystrons can be used, or any 3cm klystron with probe output.

Supplies can be fairly simple. Requirements are +300V for the klystron shell and −150V for the repeller; this can usually be supplied by a couple of 90V dry batteries in series

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across a variable potentiometer to set for maximum output from the klystron. Three or four points on the adjustment of the potentiometer will be found to produce output—choose the one which gives the greatest diode current.

Alignment is simple and straightforward, consisting of applying voltages to the klystron and adjusting repeller voltage for maximum output (as shown on a meter connected across the mixer diode). The injection screw is adjusted to give a crystal current of 0·2–0·5mA.

Mount the polaplexer in front of a parabolic dish at the necessary feed point. The supply cables and i.f. feed cable can be any reasonable length, the i.f. cable being fed to a broad band i.f. strip/receiver conveniently located.

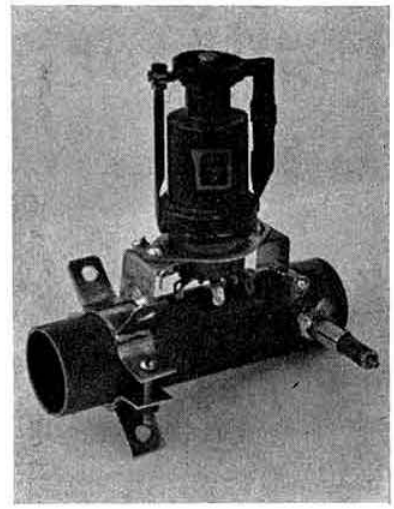
The 2K25/723A/B klystrons are normally set to a maximum frequency of 9375MHz. To adjust these klystrons to suit the amateur band, the weld on the adjusting nuts on the strut of the device must first be filed or ground away—this leaves the nuts free to turn. The top lock-nut should be released and the bottom nut turned approximately ¾ turn further out and the lock-nut tightened. A check with a wavemeter will then confirm the frequency. Coarse adjustment of frequency is achieved by turning the square end nut on the klystron; the closer the two strips on this nut adjustment, the higher the frequency.

Fine adjustment can be achieved by variation of the repeller voltage. A swing of approximately 20MHz can be realized between the extremes of this control before the output falls to zero on either side.

Modulation can be achieved with a simple two-stage transistor audio pre-amp by feeding this output through 0·1μF capacitor to the repeller feed, thereby producing fm.

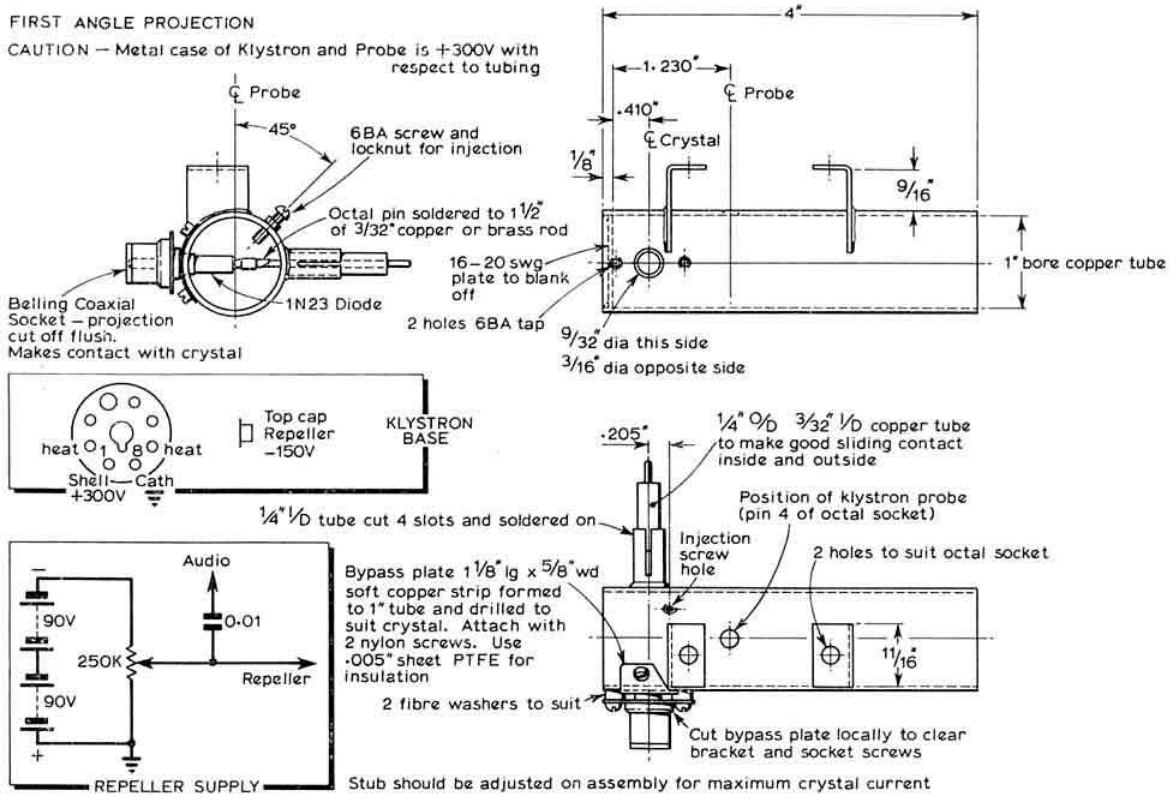
With the extreme simplicity of the gear for this band it is not without the bounds of possibility that we shall be calling "CQ 3cm" very shortly!

Right, the completed polaplexer



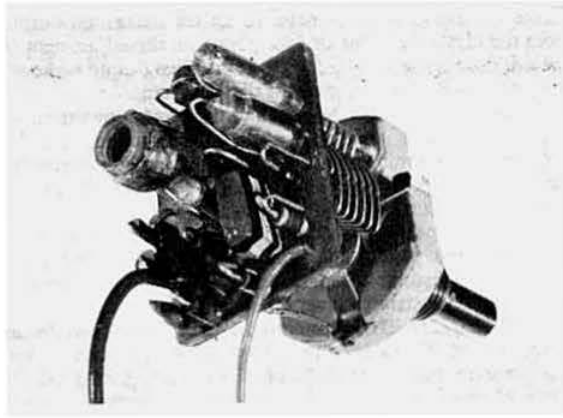
Below, constructional details

Note..... Reference dimensions given in decimals — A reasonably accurate marking off with a rule will usually suffice



The G3XGP Vackar oscillator

by W. H. BOND, FRCS, G3XGP*



FOR the last two years various 'XGP top-band transistor transmitters have been fired by a small vfo of simple design and very considerable stability. The circuit employed is a fet Vackar and, with appropriate changes in inductance and capacitance values, has been employed as a stable signal source in a 455kHz carrier oscillator for ssb or nbfm, a 5-5·5MHz vfo for an ssb transceiver and a 9MHz source in the same unit. The circuit has undergone various stages of development to a double biased mosfet, but there is little difference in performance—the simplest being as stable and drift-free as the most complex. All the units can be relied on to give a p/p output approaching the supply voltage at about 1kΩ impedance, the current through the active unit being 0·5 to 2mA so that thermal effects are minimal. Furthermore, being basically a constant current circuit the frequency of oscillation is almost independent of supply voltage, the top band vfo changes frequency by only 200Hz with a 7 to 17V change in supply voltage: Zener stabilization is desirable but not essential. The designs to be outlined are all in use, but this being a back-of-a-cigarette-packet-calculation article they are intended for the serious amateur where adjustment and further development can be undertaken with 'scope and wavemeter.

Development of the Vackar circuit

Fig 1 is a simple oscillatory circuit, points X and Y being at opposite potential during oscillation. The frequency of oscillation is f (in MHz) = $\sqrt{25330/LC}$ where L = μH and C is in pF. In Fig 2 the additional capacitors 2, 3 and 4 do not alter the equation and oscillation will occur at a frequency dependent on the parallel and series values. Note, however, that C3 and C4 form a potential divider and the polarity of Z is opposite to Y. To maintain oscillation, power must be introduced in the correct phase at the right moment, and in Fig 3 an inverting amplifier has been added taking a little of the power from the left-hand side of the circuit and introducing it in opposite phase into the right. A true Vackar can be constructed using bipolar transistors, but a fet with its very high input impedance and low capacitance carries many advantages. A practical circuit appears in Fig 4, and within broad limits calculation of LC values by simple reduction of the circuit to a single capacitor and inductance gives a frequency of oscillation very near the required values.

The objection to this circuit is that the average current through the fet is the result of self-limiting action, and the sine wave is non-linear for this reason. The waveform and stability are both improved by adding a diode (Fig 5). The diode linearizes operation, clamps the gate below ground at all times and reduces the current flow. The fet may be replaced by a mosfet, with the advantage that another control element—the substrate—becomes available. If part of the output voltage is rectified and fed to the substrate not only does the current fall even further but, more important, negative feedback occurs to stabilize the output and further improve the waveform. With this circuit stable, operation continues down to a fraction of a milliamp, and even less current will flow if a dual-gate mosfet is used and the feedback taken to the second gate. The latter technique does provide the most stable oscillator but is more expensive. In all these circuits the value of L1 is about 3kΩ impedance at the oscillatory frequency, but the value is not critical.

Signal extraction

(1) The signal may be taken inductively from a link winding on the coil.
(2) Synchronously by driving another fet from the gate of the first.
(3) Resistively by about 20Ω in the source lead through a

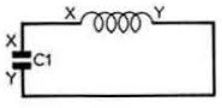


Fig 1

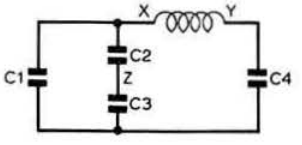


Fig 2

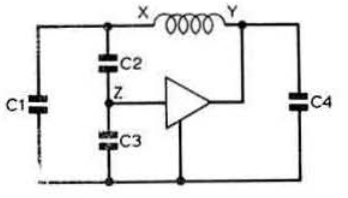


Fig 3

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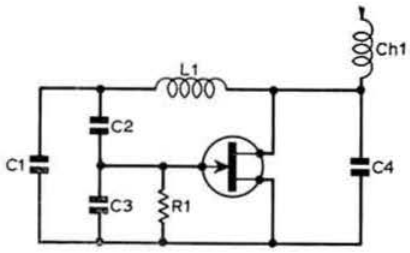


Fig 4

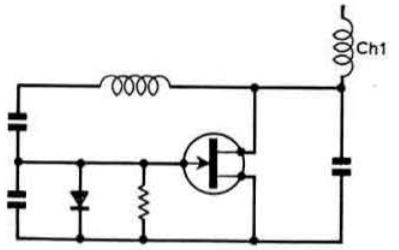


Fig 5

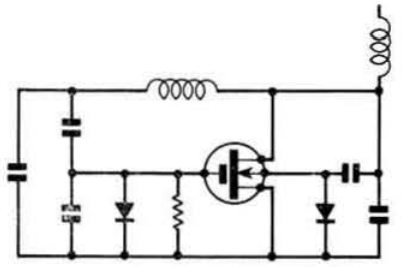


Fig 6

capacitor to the buffer stage, or direct source coupling to another fet.

(4) Capacitatively from below the choke, and this has been the method usually employed.

The output of these units is so high that extremely loose coupling can be used at all times, and 10pF is quite sufficient in (4) on top band.

Tuning

Depending on the application, C2 and C3 alone may control the frequency, using the coil slug for final adjustment in fixed frequency working, or a variable capacitance may be added in parallel. Fig 8 illustrates this and also shows tuning by varicap diode using a BA111, OA200 or other suitable diode for which the best reference is Pat Hawker, *Amateur Radio Techniques* 2nd ed, p36. (3rd ed. p39).

Buffer stages

After stability and a pure sine wave, the next most important factor is buffer isolation of a linear type. A variety of buffer stages has been employed, Fig 9 illustrates seven of these, and all have been adjusted to give a 2 to 4V p/p sine wave of very clean appearance, with virtual isolation of the oscillator from changes in output impedance. The most satisfying, though the most difficult to set up, is (a) because of the spread in characteristics of cheap FETS. (b) is simpler and easier and while not giving quite the isolation as (a) can provide 30mW of rf. (c) provides excellent isolation and can be designed on paper with predictable results; like (a) voltage isolation is provided by the emitter follower and current isolation by the common emitter. Circuit (d) is simple but the load must reflect into the oscillator because of the changes in input impedance with change in load. Circuit (e) is excellent where the output load is reasonably constant as in ssb. Component values are not offered, save that on a 9·1V Zener supply the base of the second transistor is set at 5V, giving 4·3mA through the collector, except in (b) where 20mA are run. Circuits (f) and (g) also provide excellent isolation through the grounded base output and because of the mismatch between emitter and collector impedances.

Choice of components

Circuits have been made up using 2N3819, MPF103/5, 40468, 3N141 as the unipolars, and 2N2926, 2N706, BC108, 2N4288, 2N4125, 2N4286 as the bipolars. The coils have been taken from the Osmor series and run where possible without a slug. Cheap polyester capacitors have been used from choice, for though the long term stability may not be good they are very much less temperature sensitive than

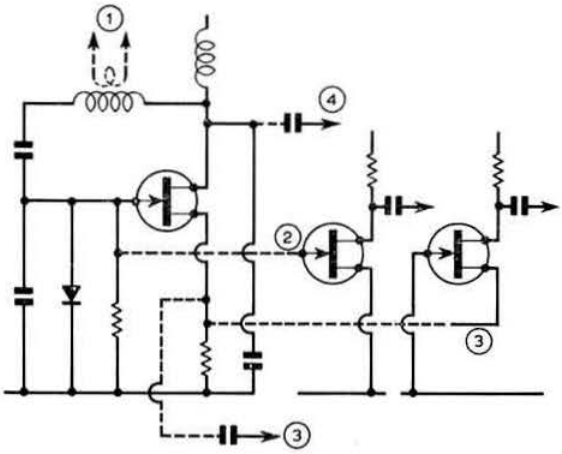


Fig 7

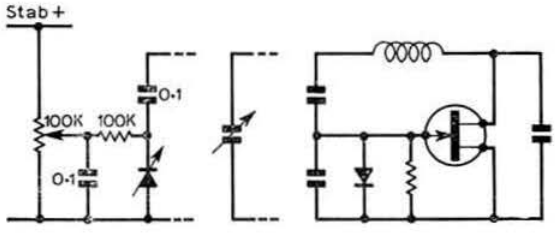


Fig 8

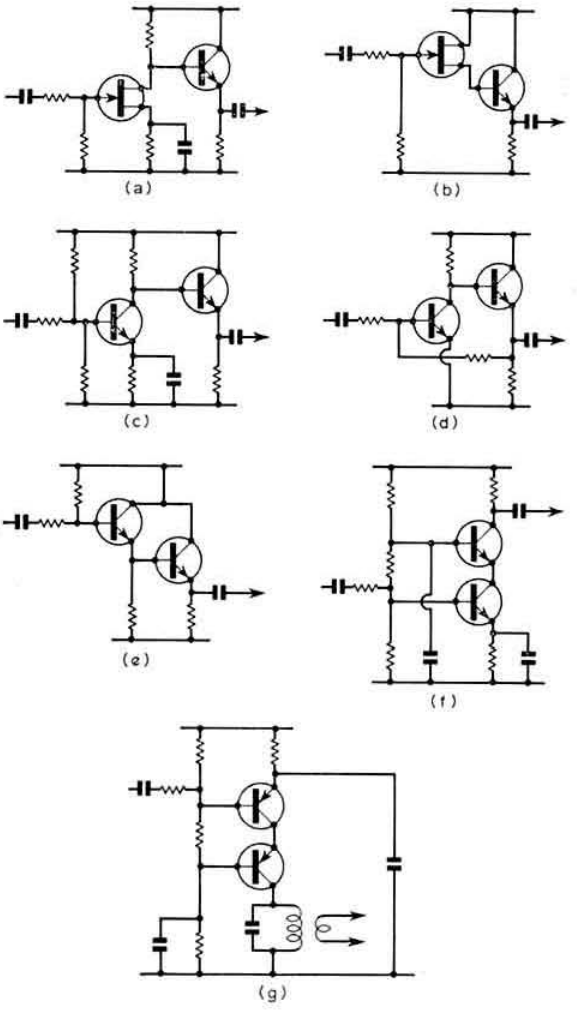


Fig 9

mica. The diodes are OA200. Generally Jacksons C804 series capacitors have been used but they are not entirely satisfactory, being temperature sensitive, and for optimum results a double bearing capacitor with a good weight of metal should be employed. NTC capacitors have not been recognized as necessary but they could with advantage be included across C1.

Construction

A fetish for miniaturization has resulted in the VFOs being constructed on the lines illustrated, a small etched circuit board carrying all the components, including the buffer and Zener stabilization stages, being attached directly to the legs of the tuning capacitor. The boards measure 1in by 1¾in, and if care is taken to keep the coil ¼in or more away from metal, the vfo, buffer, rf amplifier and driver stage for the top-band transmitter can all be accommodated in the smallest Eddystone diecast box of 4¾in by 2¼in by 1¾in.

Component values

Table 1 gives component values which have been used in the various oscillators, but memory dims and notes get lost so that no promise is made that duplicates will behave in an identical manner. However, if the figures are regarded as a starting point for the amateur who is prepared to settle down with test gear, the end result should be a high-output stable oscillator, fully up to ssb standards or better than the average valve with very little harmonic content and a very flat output. To repeat, though written by one this is not an article for the tyro, but is a report intended to encourage those with more electronic knowledge to sample a very stable and versatile oscillator.

Table 1

fMHz	C1	C2	C3	C4	Osmor
0·455	10pF trimmer	470	820	1000	QO9
1·8—2·0	75pF variable	110	680	820	QO5
2·2—2·455	50pF variable + 200pF	150	300	680	QO5
5·0—5·5	50pF variable	100	470	470	QO4 series connected
9·0	10pF trimmer	50	150	150	QO4 single winding

R_1 is 47kΩ and may need to be increased with the higher frequencies.

The RSGB News Bulletin Service

The RSGB News Bulletin, callsign GB2RS, is broadcast every Sunday morning. This bulletin can be received on either vhf or hf, which gives almost complete coverage of the British Isles. It keeps radio amateurs up-to-date about happenings in the world of amateur radio and gives information on coming events, supplementing and bridging the gap between successive issues of *Radio Communication*.

SCHEDULE

Time (bst)	Frequency (MHz)	Location of station
0930	3·6	SE England
1000	3·6	Severn area
	145·1	SE England (Farnham, Surrey, beaming NW)
	145·8	Aberdeen (beaming W)
1015	3·6	Belfast
	145·8	Belfast
	145·8	Belfast (beaming S)
1030	3·6	N Midlands
	145·1	SE England (Farnham, Surrey, beaming SW)
	145·93	NE England (Bishop Auckland, beaming N)
	145·8	Aberdeen (beaming SW)
	145·3	Birmingham area (beaming NW)
1045	145·93	NE England (Bishop Auckland, beaming E)
1100	3·6	NW England
	145·3	Birmingham area (beaming SW)
1130	3·6	SW Scotland
	145·5	Leeds (beaming N)
1200	3·6	NE Scotland
	145·5	Leeds (beaming E)

Exhibitions—Beacons—Conventions—Contests—Local events Rallies—Scientific projects—Meetings—Licensing—Clubs Propagation reports—Lectures—Field days—Expeditions

A portable cw transceiver for 3·5MHz

by J. E. HODGKINS, G3EJF*

DURING 1969 the writer constructed a direct-conversion receiver based on the design of W7ZOL and W7WKR (*Technical Topics*, February 1969). Used from a very poor location in mountainous country with only a short length of wire as an aerial, the results were surprisingly good. Modifications which gave improved sensitivity and selectivity were incorporated, and the receiver forms part of the transceiver to be described. Attempts to build a transistorized transmitter made little progress, so a hybrid arrangement was used in order to complete the transceiver for use during the summer of 1970.

The semiconductors used are all inexpensive, readily obtainable devices. Any npn silicon rf transistors may be used for the oscillator, phase splitter and sidetone oscillator. The transistors in the receiver af stages must be high beta, low noise types. All the diodes were the unmarked untested switching diodes which are available in large quantities at very low cost. Use germanium for the double balanced mixer and silicon for the tuning diode.

Transmitter section

The oscillator, which is common to both transmitter and receiver, uses the familiar W3JHK "Synthetic Rock" circuit and has proved extremely stable. It incorporates incremental receiver tuning which will be described later. Following the oscillator, a phase splitter provides outputs to the transmitter and receiver sections.

The valve stages of the transmitter follow normal practice and call for little comment. Since the transceiver was only designed to cover 3,500 to 3,600kHz, the tuned circuit in the anode of the pentode section of the ECF82 was peaked at 3,550kHz and gave reasonably constant drive over the whole frequency range. The pa grid current as measured between the test point and chassis was approximately 1mA.

It should be pointed out at this stage that it is essential that the valve heaters be supplied with dc. The use of ac on the heaters results in a loud hum in the receiver due to the high gain of its af stages and renders it unusable.

Receiver section

It is not intended to repeat the information given in *Technical Topics* (February 1969) but to confine the description of this section to the points by which it differs from it.

The addition of a grounded gate rf stage using a 2N3819 fet added greatly to the sensitivity of the receiver without degrading its cross-modulation performance. As some form of gain control was required, it was decided to use the crude aerial attenuator formed by RV1. This rough and ready arrangement proved in no way inferior to a properly matched switched attenuator copied from a famous receiver.

One of the disadvantages of a 3·5MHz direct conversion receiver is the tendency for the oscillator second harmonic to beat with strong broadcast signals on 7MHz, and to reject this form of interference a wide-band coupler T1 resonant at 3·55MHz was used between the rf stage and the mixer, low impedance output being obtained by use of the two capacitors across the secondary winding. The wide-band coupler used by the writer was an i.f. transformer removed from a B44 and designed for 2·625MHz, the existing capacitors being replaced by 47pF silvered mica types. An alternative design is given in the diagram.

The diodes used in the double balanced mixer were matched for forward and reverse resistance by means of a multimeter. Since no balancing adjustment was fitted, this matching plus a symmetrical layout is of importance. The toroids T2 and T3 were made from surplus ferrite pot cores

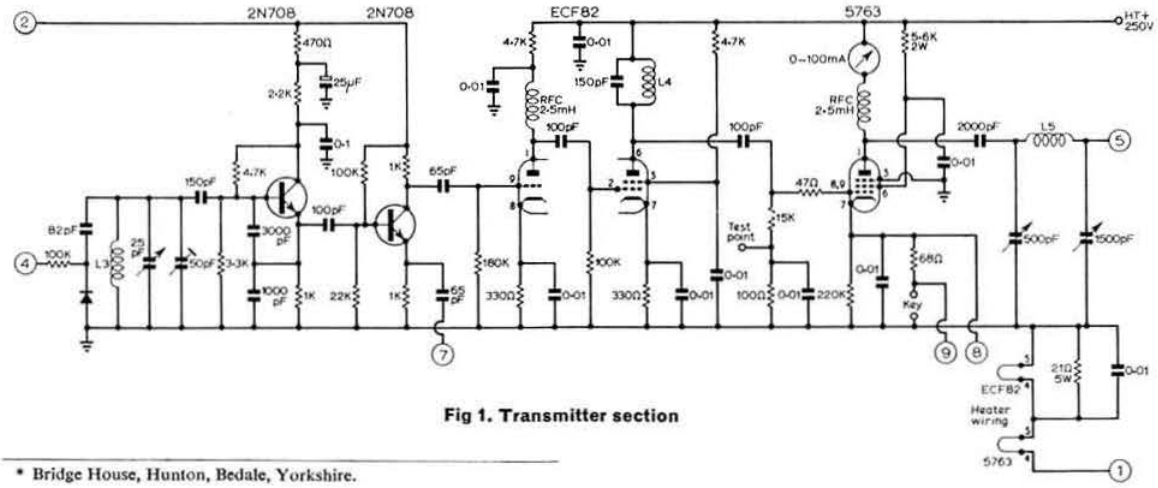


Fig 1. Transmitter section

* Bridge House, Hunton, Bedale, Yorkshire.

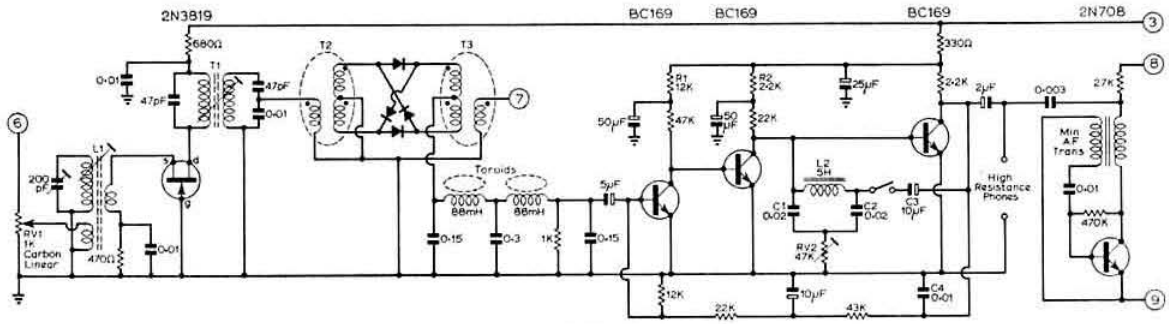


Fig 2. Receiver section

bought at 2s 6d per dozen. They measured $\frac{5}{8}$in outside diameter, $\frac{7}{16}$in inside diameter and $\frac{1}{2}$in long and were cut into $\frac{1}{8}$in lengths. The method of cutting was to wrap paper round a pencil until it was a snug fit into the bore and then scribe with a three-cornered file. The cut rings were wrapped with masking tape to avoid scratching the enamel coating of the wire.

To wind, take three lengths of 28swg enamelled wire and wind 15 turns trifilarly equally spaced round the ring. Identify each end of the wires with the multimeter; winding "A" is the low impedance winding, join the start of "B" to the end of "C" to form the centre tap. The start of each winding is indicated on the circuit diagram by a dot.

The low-pass filter on which the receiver selectivity depends was designed for a cut-off frequency of 2kHz and an impedance of 600Ω. The measured response was 6dB down at 2·1kHz and 60dB down at 5kHz. The 88mH toroids were obtained from Spacemark of Manchester. The use of toroids is strongly recommended as the normal type of choke will pick up 50Hz from any nearby mains wiring, giving a loud hum in the headphones. The af stages are similar to those in the original *Technical Topics* article, C4 being added to prevent oscillation at supersonic frequencies. The regenerative af filter comprising L2, C1, C2, C3 and RV2 gave good results. If RV2 was short-circuited, the output transistor would be a Colpitts oscillator and its value must be adjusted until oscillation just ceases. During experiments with this filter it was found possible to obtain a bandwidth so narrow that while 10wpm morse could be read, 20wpm was completely garbled. If the af stages prove unstable, try increasing R1 and R2.

The receiver is switched off on "Transmit" and a sidetone oscillator is powered by the voltage dropped across the cathode resistor of the pa valve. Note that this oscillator is NOT earthed until the key contacts are closed.

Incremental receiver tuning is accomplished by means of another unmarked, untested diode and a *linear* potentiometer RV3. On switching to "Transmit", the diode is connected to a preset potentiometer RV4 which ensures that the transmitted frequency coincides with the centre frequency of the incremental tuning control. The frequency coverage of the incremental tuning control may be varied by changing the value of R3 to increase or decrease the voltage across RV3.

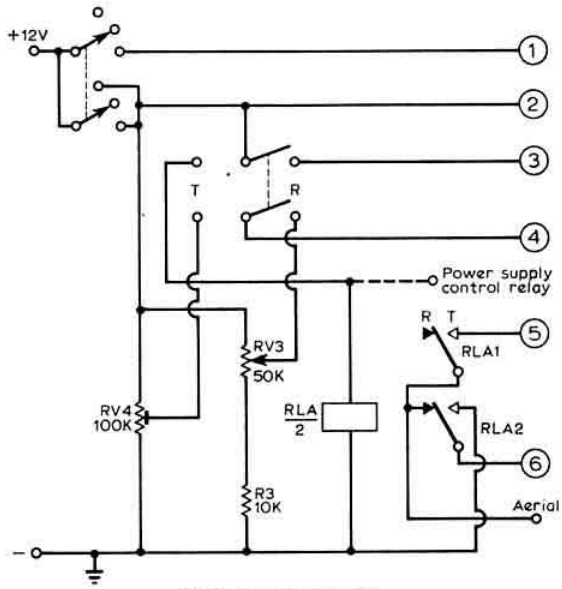


Fig 3. Control circuits

Control circuits

The main power switch is of the centre-off toggle type, up is RECEIVE ONLY, down is RECEIVE AND VALVE HEATERS. The transmit/receive switch is a standard dpdt toggle switch. One half switches the 12V dc supply from the receiver rf and af stages to the relays, while the other half transfers the tuning diode from the incremental tuning control to the transmitter reference voltage potentiometer RV4.

The aerial changeover relay is also of the dpdt type, enabling the input to the fet rf stage to be earthed on "Transmit". Another relay of the make and break type applies 12V dc to the power supply when energized.

The power supply is a surplus transistorized dc converter giving 250V; its measured efficiency when supplying 80mA is over 80 per cent. The drain on the car battery, which has negative earthed, is 10mA on RECEIVE, 760mA on RECEIVE AND VALVE HEATERS, and just under 3A on TRANSMIT.

Construction

The transceiver was built on a 8in by 6in chassis $1\frac{1}{2}$in deep. The oscillator and phase splitter were built into a small metal box, actually a wall-box for a flush-mounting 13A

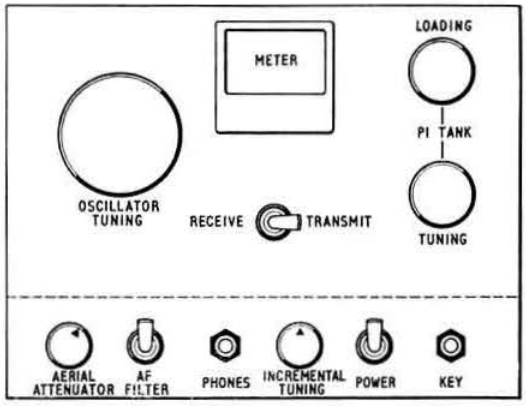
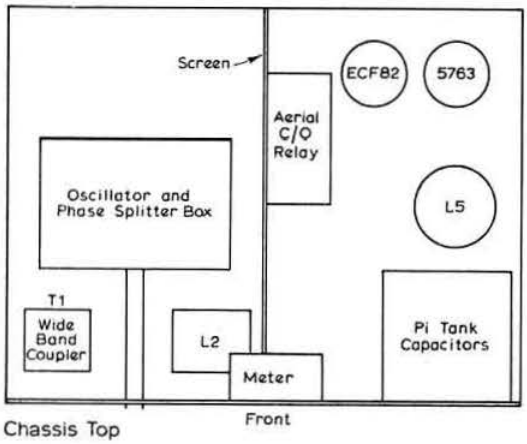


Fig 4. Front panel layout



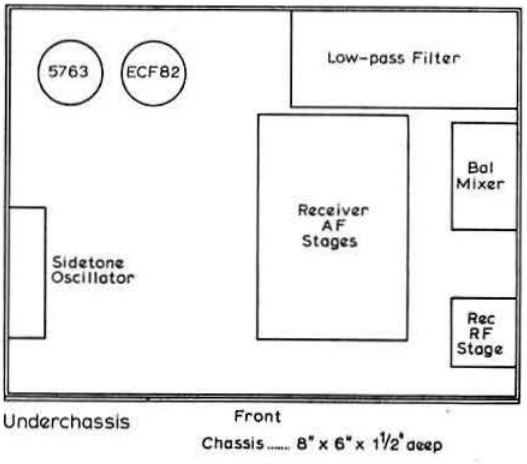


Fig 5. Above chassis and below chassis layouts

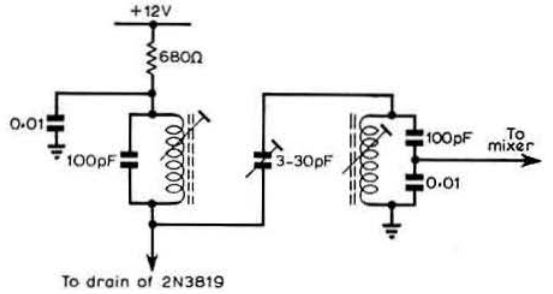


Fig 6. Alternative wide-band coupler. The coils each consist of 20 turns of 28swg enamelled wire on ¼in formers with adjustable cores

mains socket, the usual precautions being taken to ensure mechanical stability. The receiver rf amplifier, mixer, af stages and sidetone oscillator were assembled on small pieces of Veroboard and mounted below the chassis together with the low-pass filter. Above chassis were the oscillator box, the wideband coupler, the choke of the af filter, the two valves and the pi-tank components. The valves, being sources of heat, were mounted as far from the oscillator as possible and a screen was placed from front to rear which also supported the aerial changeover relay. The layout is illustrated in the accompanying diagrams.

Results

The transceiver has been used with a 27ft loaded vertical aerial on the Worked All Britain CW net from "rare" areas in the northern Pennines, as well as from the home station using an end-fed Zepp. The transmitter will do all that any 10W transmitter will do and is reported to be stable. The receiver's sensitivity is such as to make a 1μV signal quite readable, and its bandwidth is 4·2kHz at —6dB and 10kHz at —60dB. To quote the *Radio Communication Handbook*, this order of shape factor represents a "moderately good communications receiver". Switching the regenerative filter on gives a very sharp response. The author would liken the performance to that of receivers of the R107 or BC348 class. The audio image, which is always present with simple direct conversion receivers, has not been found to be a serious handicap. Contacts have been made with stations in all parts of the UK during daylight hours, and it will be interesting to see how it performs during the long winter evenings.

The techniques used in this receiver could be applied to turn any low-power transmitter into a transceiver. Just run the valve heaters from dc, keep the oscillator running all the time, and take a small portion of its output (about 100mV rms) to the balanced mixer of a direct conversion receiver built as an add-on unit.

Coil details

L1 45 turns of 28swg enamelled wire on ⅜in former with iron dust core with two 5-turn links.
L2 5H choke
L3 20 turns of 24swg enamelled wire on ⅜in former (no core)
L4 to resonate to 3·5MHz with 150pF
L5 36 turns of 18swg enamelled wire on 1½in former

TECHNICAL TOPICS

A monthly feature by PAT HAWKER, G3VA

RECENTLY, in the course of a few days, three most informative and detailed letters, all on the subject of direct-conversion receivers, came through my letter box: all, interestingly enough, included virtually the same message. This can be paraphrased as the plea: "do not write off the direct-conversion technique as being suitable only for simple gimmick receivers."

High-performance direct-conversion receivers

One of the letters came from K. Spaargaren, PA0KSB, whose simple transistorized receiver (*Electron*, January 1967, *TT*, March 1967 and *ART*) really started off the whole of the present interest in this subject: he has built several more direct-conversion models including an advanced model which he hopes to describe soon in *Electron*. Another was from P. I. Rhodes, G3XJP, who is concerned (fortunately not entirely justified) that "nobody, that I am aware of, has tried to implement the principles of direct-conversion to achieve *top performance* at *reasonable cost*." The third came from Tich Ryan, G3VJN, who has been concentrating on overcoming two of the drawbacks found in the simpler direct-conversion models—audio image and lack of agc.

All these three amateurs provide information on direct-conversion receivers and transceivers either built or planned. There is space only for a little of this information this month, but it is worth emphasizing that all these reports are enthusiastic about direct-conversion not just for the novelty attraction of a simple low-cost receiver but also for more ambitious designs.

Historically this approach is supported by some often-overlooked work in this field by John P. Costas, W2CRR,—and, it might be added, by some past suggestions in both *TT* and *QST* on the possibility of high grade direct-conversion receivers. Inescapably, in surveying the history of direct-conversion, one comes up against the AN/FRR-48 (XW1) synchronous receiver briefly mentioned (along possibly with what was the first published use of the term *direct-conversion receiver*) in the important paper on synchronous communications by Costas in the famous ssb issue of *Proc IRE* (December 1956). It was this paper that listed a number of advantages of direct-conversion and included the basic outline in diagrammatic form of what has become the simple form of direct-conversion receiver. But Costas also showed how a "two-phase synchronous receiver", using phase quadrature techniques, could eliminate one sideband.

Admittedly, Costas, at least in that paper, was thinking in terms of a fully synchronized detector for double-sideband suppressed carrier reception rather than the more tolerant frequency stability which can cope successfully with ssb and cw product detection. The AN/FRR-48, illustrated in his paper, was evidently a pretty complex two-phase synchronous receiver with elaborate frequency synthesizer and phase-lock loop demodulator. It would be interesting to know more about the performance of this 1956 receiver—in the rush to ssb I imagine that it never progressed beyond the prototype stage.

Perhaps even more remarkable (in view of the little notice taken of it) was the suggestion made in the course of the correspondence which followed the publication of Tucker's classic articles on synchrodyne receivers (*Electronic Engineering*, 1947-8, still a useful source of ideas on direct-conversion receivers), that one could improve selectivity still further by phasing out one of the two sets of sidebands.

So, basically the idea of a high-performance direct-conversion receiver is not a new one—it just happens that by a series of quirks very few people have ever taken it seriously and so there is still much experimental work which could and should be done.

G3XJP is one of several readers who are a little concerned at the indiscriminate use of so many different terms (and I plead guilty to this) for this type of receiver: synchrodyne, homodyne, direct-conversion etc. Perhaps it would be better if we dropped homodyne altogether, and used *synchrodyne* only when there is a locked synchronous oscillator, using instead *direct-conversion* for models in which the oscillator is free-running (ie those intended for ssb/cw reception only), and *two-phase direct-conversion* (or G3XJP's suggestion of "direct-conversion phasing transceiver") for the more advanced units where the audio image is phased out.

Some readers may feel that I am overselling the two-phase direct-conversion receiver, since one is unlikely to obtain the degree of rejection of the unwanted audio image that can today be achieved with a really good hf crystal filter or mf mechanical filter in a conventional superhet. This is probably true, though even 30 to 40dB of sideband selection is not to be disregarded. But remember the potential advantages of direct-conversion include the virtual

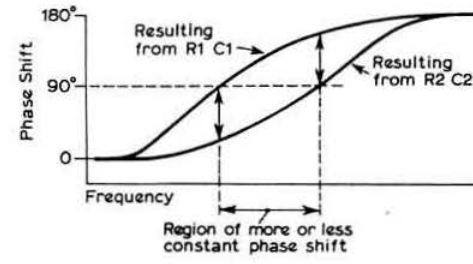


Fig 1. Basic principle of phase shift networks used by PA0KSB

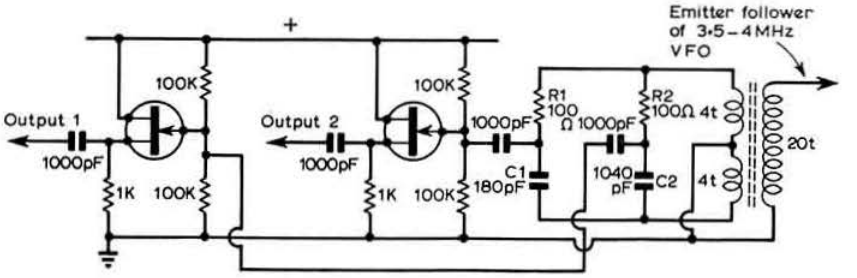


Fig 2. How the two oscillator injection frequencies are obtained. C2 is 820pF and 220pF in parallel

elimination of almost all forms of spurious responses and birdies, and the possibility (see for example G3PDM's audio filter in *Radio Communication*, July 1970) of extremely good selectivity characteristics (and the flexibility possible by using several low-cost af filters): the absence of all mixers (other than in the detector stage) making it possible to design for good cross-modulation and intermodulation characteristics. Altogether these advantages—even if some are potential rather than immediately achievable—add up to a pretty formidable list. Furthermore, direct-conversion, even in the more complex two-phase version, should eliminate many of the constructional problems which we have come to associate with single- and multi-conversion superhet receivers of high-grade performance. And if later it proves possible to develop direct-conversion receivers with fully synchronous detection, then they will become extremely flexible in being suitable for all transmission modes including ssb, cw, am, nbfm, dsb, fsk, etc.

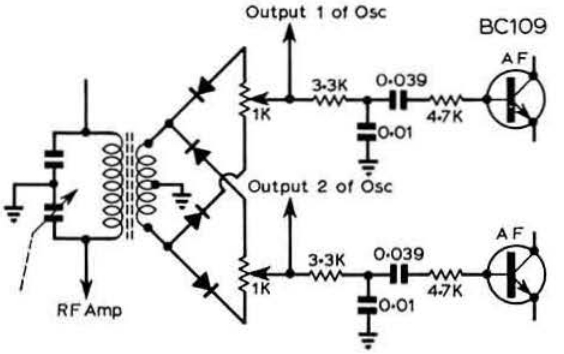


Fig 3. Phasing type balanced detectors

PA0KSB's two-phase d-c receiver

Since K. Spaargaren, PA0KSB, described his pioneering all-transistor direct-conversion receiver, he has continued experiments in this field. One of his latest experimental models—which he considers indicates that it is possible to make a relatively good receiver using direct-conversion—is a two-phase unit, providing true ssb reception and including audio-derived agc. Basically it is a 3·5MHz receiver (he has an fet converter foi 7, 14, 21 and 28MHz) using some 16 bipolar transistors, nine FETs and a fair number of diodes and zeners.

A cascode agc-controlled fet rf stage (two devices) is followed by his twin balanced diode detectors with the vfo output passed through phase-shift networks to obtain the phase quadrature injection. The af outputs, after preliminary af amplification, pass through active 90° phase networks, and then combine and go through a five-section active low-pass filter (2·2kHz) to the main af amplifier and to the agc amplifier. The agc controls not only the rf stage, but, by means of a transistor employed as a variable resistor, also the first af amplifier. He notes that conventional OA85 diodes in the balanced detectors have been found superior to FETs and MOSFETs, and with little difference to using Schottky or silicon diodes. In practice, the sensitivity of a 3·5MHz direct-conversion receiver is largely determined by the noise of the first af amplifiers immediately following the detectors: PA0KSB uses BC109 transistors in this position.

Of particular interest is the technique he uses for the 90° phase shifts; this is based on an old technique brought up to date by using FETs. Despite the use of mainly 10% tolerance (but stable) components he obtains about 40dB of sideband suppression at 3,700kHz. When his hf phase network is adjusted for this frequency there is an error of only about 1° at 3,600 and 3,800kHz. For af networks he uses the same basic arrangement but the usable frequency spread is increased to about 1:10 by having two networks cascaded. Bipolars are used as phase splitters while the second stages of the networks contain FETs. P3 and P4 adjust the phase shift to 90° at the upper and lower ends of the frequency range. The possibility exists of using three sections in each leg of the network with smaller ratios of time constants.

The prototype receiver uses a 24V supply line, and PA0KSB is in process of modifying some of the details to permit the use of 12V; he is also checking that the design is reproducible with other transistors.

For those who wish to paddle before plunging in the deep end, PA0KSB provides a further "simple" receiver for 3·5 MHz ssb/cw reception: Fig 5.

An integrated circuit linear

As mentioned earlier, Tich Ryan, G3VJN, has been busy developing direct-conversion receivers and has developed an agc system based on the combination of a lamp and light dependent resistor. We hope to refer to this in *TT* shortly, but feel that we must turn to another topic or we shall be accused of having a bias against superhets!

Meanwhile, it seems well worth passing on his suggestion that the CA3020 and the slightly more powerful CA302A integrated circuit amplifiers, usually regarded as intended

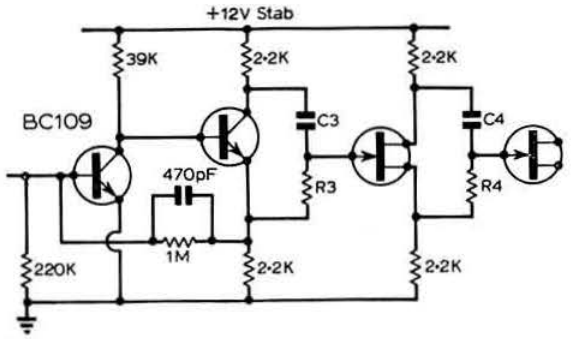


Fig 4. Outline of audio phase shift networks. Two of these arrangements are used with similar values except that for one C3 is 4,700pF, R3 is 220kΩ, C4 4,700pF, R4 is 18kΩ. In other network C3 is 1,000pF, R3 is 800kΩ variable, C4 1,000pF, R4 20kΩ variable

for audio and similar low frequency applications, can also make a useful hf linear amplifier for driving such valves as the 12BY7 in portable and field day rigs. Both these integrated circuit amplifiers will provide sufficient output to drive a low-power final even on 21MHz. Up to about 8 or 10MHz the output is roughly within the device specification for af applications (about 550mW for the CA3020 or 1,200mW for the CA3020A). G3VJN is hoping to write an article soon on an all-integrated circuit 3·5MHz ssb transceiver providing an output of about 2W p.e.p. (this uses a conventional superhet receiver) in a cabinet 9in wide by 3½in high by 9½in deep. He considers that an amateur can often adapt some of these newer devices for applications very different from those intended by the manufacturers. In one of his tests, with a different tank circuit to that shown, he obtained from one of these ic linears enough output at 30MHz to light a 1·2W bulb. He points out that it is most important to keep the output circuit circulating currents away from the input circulating currents, and that all output earth and decoupling points should be earthed at "one point", as should all input earth and decoupling points—ie there should be no common input/output earth paths.

HF power FETs

A few years ago we referred in *TT* to several hf power FETs seen at various exhibitions or announced by manufacturers, capable of providing up to about 10 to 15W p.e.p. on 30MHz. However, little more has been heard of these devices; Mullard, for example, one of the firms concerned, are now concentrating more on bipolar planar rf transistors of up to around the 25W region, though they say that they retain their interest in the development of power FETs.

To my mind the higher impedances of the FETs and the promise of lower intermodulation products, greater docility etc, more than outweigh the problem of the fairly high internal capacitances which make power FETs rather akin to early triode valves. But, unless there is a reasonable commercial market for such devices, they are hardly likely to appear at "amateur" prices,

Some indication that there is still work going on in this area is provided by a letter, stemming from the US Army Electronics Command at Fort Monmouth, in *Proc IEEE*

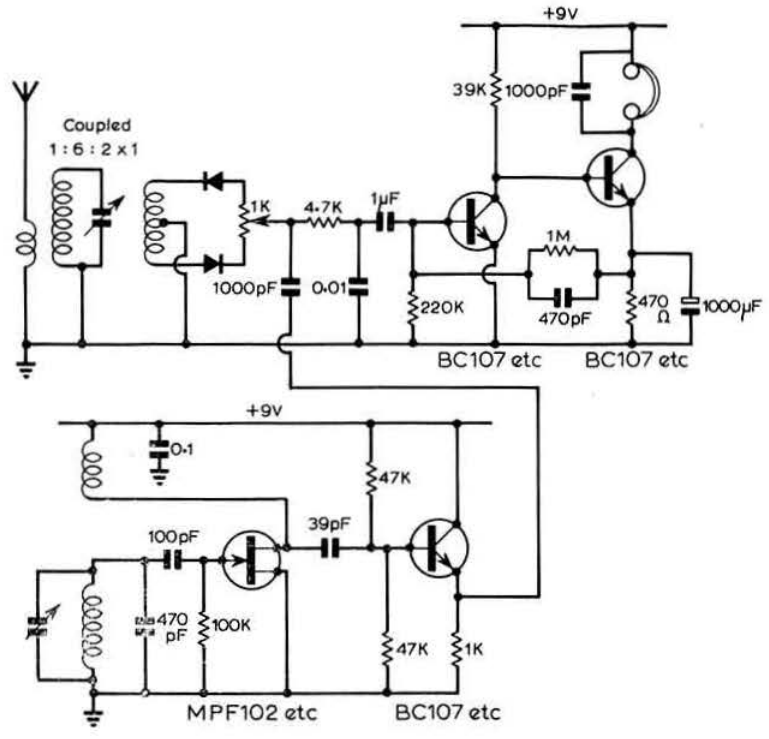


Fig 5. A simple direct-conversion 3·5MHz receiver by PA0KSB

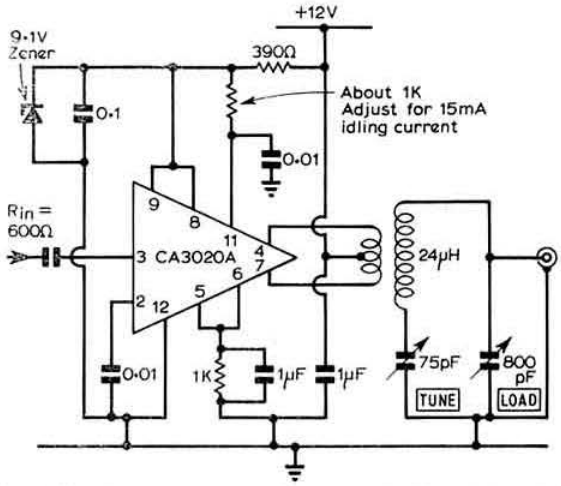


Fig 6. Practical linear amplifier using CA3020A integrated circuit. Tank circuit constants for 3·5MHz. 55mV rms input gives 1,200mV rms output into 50Ω. Tank coil 36 turns on 1⅜ in diameter former, collector winding 6 turns centre tapped

(May 1970) reporting the use of junction-gate power FETs to obtain outputs of more than 30W cw at 30MHz. Using common-source and common-gate circuits, power gains of over 10dB have been achieved. In practice, the common-gate configuration is reported as the most promising; typically such circuits can provide 20W stable cw output with a power gain of 13dB, and 55 per cent drain efficiency. It is also claimed that such power amplifiers can survive lengthy periods of instability, mismatched loads and other conditions which usually result in sudden death for bipolar rf power transistors. Indeed the reports indicate that if and when such power FETs become readily available they may well prove free of the vices which still make the development of all-transistor transmitters a rather risky business.

Low-noise af amplification

In a recent *TT* (August 1970), we included an Australian suggestion for a low-noise af amplifier using an fet/bipolar

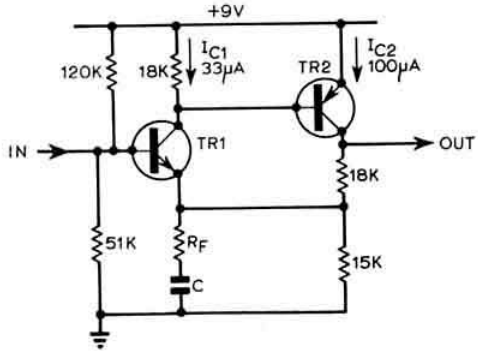


Fig 7. AF amplifier optimized for low noise

approach, with possible applications to direct-conversion receivers or to meet any other requirements for coping with weak af signals. Another article dealing with this subject appears in *Electronics* (28 September 1970) by two writers from University College of Swansea. This provides full information on how, by designing bipolar transistor amplifiers having low collector currents, it is possible to optimize the noise figure to a value well below that normally suggested in manufacturers' data sheets for the device concerned. It is not intended here to delve into the detailed design procedures but simply to reproduce two of the recommended amplifier arrangements. Fig 7 shows a basic low noise amplifier designed on the principle that collector current can be optimized for minimum noise. In this example, the amplifier's open-loop gain is over 60dB (with $R_F = 0$) and its noise figure is less than 1·5dB. Increasing R_F to 2kΩ drops the gain to 20dB but leaves the noise figure unchanged. Fig 8 shows a further development of this circuit using bootstrapping in the input stage to raise the input impedance of the amplifier to several megohms, while TR3 (an emitter follower stage) lowers the output impedance of the amplifier without affecting the dc stability.

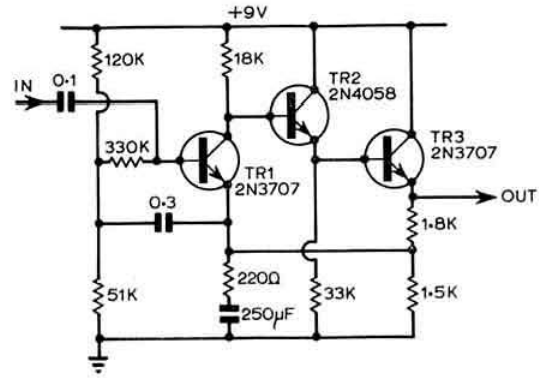


Fig 8. Low-noise amplifier with high input impedance

Interference from thyristor controls

Attention has been drawn several times in *TT* to the likely rise in interference to weak-signal radio reception by inadequately suppressed thyristor control devices. Various suppression circuits were given (*TT*, June 1968 and *ART3*). More recently we have been reading a report by G. A. Jackson of the Electrical Research Association ("Radio interference from thyristor control circuits", ERA69-93). This confirms the problem of providing suppression but also makes some useful comments on the main features of this form of spectrum pollution. Almost all common forms of thyristor controls, unless fitted with suppression devices, can radiate significant interference. However, this interference is most serious at the lower frequencies, falling off as the frequency rises to about 10MHz, beyond which the problem is less significant. The highest frequency to which interference extends depends largely on the rise time of the device; the better quality thyristors, with rise times of a few nanoseconds, can cause interference up to above 10MHz, whereas if a low-quality device with a rise time of more than 1μs could be developed for this application, little or no

suppression would usually be needed n the hf range. It is pointed out that control circuits built into portable tools and the like are usually less of a problem than where the control is physically separated from the load. Thyristors are not specifically covered in current interference regulations, but are likely to be covered in pending revisions to BS800. Unfortunately almost all the legal limits to interference tend to be above the figures which would be needed to render domestic appliances entirely innocuous to weak signals. The report makes various suggestions on thyristor suppression circuits, including the use of twin-wound 1mH chokes in series opposition on ferrite U cores.

Improved dc/dc converter

The use of transistorized dc/dc converters has long become established practice in mobile operation, and it seems quite a long time since any novel ideas have come forward in this area. However, a note by Roy Hartkopf in *Electronics* (14 September 1970) provides information on a new technique for preventing burnout of the power transistors and at the same time reducing power loss. In effect, by using two silicon power diodes to protect the main transistors in the converter it becomes possible to use low-cost power transistors with low BVEBO ratings. The use of zener diodes for this purpose is described in *Radio Communication Handbook*.

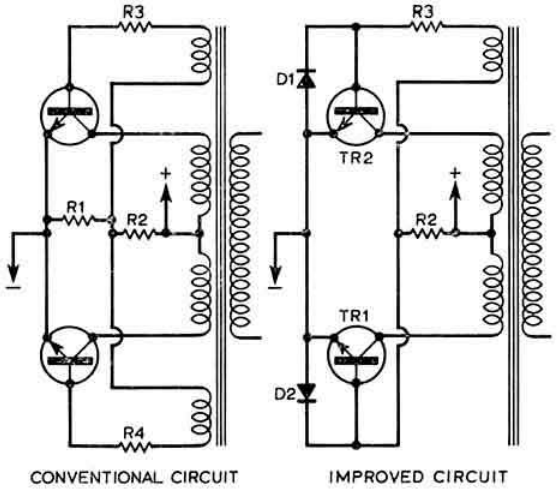


Fig 9. Use of protection diodes in dc/dc converters

It is pointed out that in the conventional converter circuit, reverse voltages develop across the base-emitter junction of whichever transistor is in the cut-off condition. In the improved arrangement (Fig 9b) diodes D1 and D2 limit the reverse bias across the cut-off transistor to about 1V, while the use of a single bias winding means that no transients are developed; the need for R1 (which in the normal arrangement should be large for good starting yet small to minimize voltage drop) is eliminated. It is claimed that the circuit starts easier and wastes little power, only a few milliamps of bias current need flow to the transistors; the value of the resistors can be adjusted to increase power output and efficiency.

Coaxial reed relays

John Bluff, G3SJE, has sent along details of some prototype coaxial aerial changeover relays that he has developed for use on 28 and 144MHz, using reed relays. While G3SJE has clearly developed his units as an "original" idea, there have in fact been several articles published on the use of reed relays for this purpose, though using rather different construction. For example, E. Berberich, DL8ZX, described some units in *VHF Communications*, May 1969, and this idea has also appeared, based on the DL8ZX technique, more recently in *Radio-REF*. Both these articles showed two reeds fitted into a brass tube to form a change-over switch.

The G3SJE relay differs from this, though the basic principle is still the same: an interesting example of how a known requirement can produce independent yet similar solutions.

The G3SJE relay is shown in Fig 10. This is based on a reed switch to provide the inner conductor, with the outer conductor comprising a conductive sleeve fitting closely over the glass envelope of the reed. But instead of brass tubing he uses the outer braiding of a suitably sized piece of coaxial cable, selecting good quality cable with closely woven braiding. The operating coil for the reed switch is mounted over the outside of the outer sleeve, using a coil former originally intended as a close fit on the glass envelope by drilling this out just sufficiently to accommodate the outer sleeve.

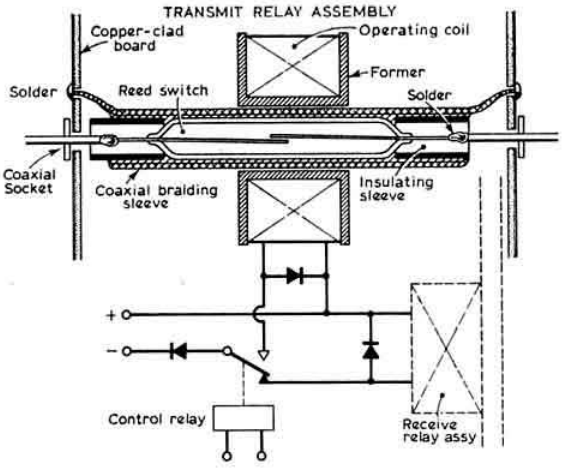


Fig 10. G3SJE's reed coaxial switch arrangements

The reed switch contacts are soldered directly on to the respective coaxial sockets, with a piece of insulating sleeve (the insulation can come from the same piece of coaxial cable) slid over each of the exposed contacts to isolate them from the overlapping outer sleeve, and taking care to use only the minimum of heat while soldering in order to avoid undue melting of the sleeve. Braiding tails from the ends of the outer conductive sleeve are connected to the outer of each coaxial socket by soldering or otherwise. In his prototype unit, the two coaxial sockets are soldered to pieces of copper-clad board; the two pieces of board are then butt-soldered on to a third piece of copper-clad board to

provide a base. To form a changeover relay, a second assembly was mounted at right angles to the first, extending from one of the coaxial sockets. The relay is sufficiently fast in action to allow high-speed break-in cw operation. Preferably the first assembly, providing a straight-through path, is used as the transmitter relay.

It has been found that the braiding sleeve does not screen the magnetic field generated by the operating coil significantly but does provide excellent rf screening. The type of reed relay is not known, but it appears to be rated at 1A 250V dc, and the straight-through relay assembly handles 70W rf energy at 28MHz without problems, and has been tested on lower power (10W) on 144MHz, and the whole unit is based on 50Ω impedance cable. G3SJE suggests other impedances could be used by selecting reeds of appropriate size.

He avoids any possibility of connecting the receiver directly to the transmitter (which could result from energizing both coils together) by using a changeover control relay (Siemens high speed) as shown in the diagram. With this circuit, continuous energization of one or other operating coil is required as the reed switch contacts are normally open. G3SJE suggests that possibly a permanent magnet could be used to bias the receive relay so that it is normally closed, the operating coil providing a magnetic field opposing that of the magnet in order to open the relay. A normally reversed bias diode is connected across each coil to suppress voltage spike when the coil current is broken, and which could otherwise result in clicks in the receiver.

Here and there

Bell Telephone Laboratories have reported the first cw oscillation of silicon TRAPATT diodes to obtain up to 3W output between 2,500 and 4,000MHz with efficiencies up to 20 per cent; this seems an appreciable increase on the usual figures quoted for the earlier Gunn-effect and Impatt modes, and could bode well for the new *1000MHz and up* column.

In looking round the recent Mullard Golden Jubilee exhibition, it was fascinating to have memories recalled by the valves and components of the 'twenties and early 'thirties. But I admit to a shock at seeing in the collection a familiar looking slow-motion dial, since I still find use for one of these. This set me thinking about the longevity of some of the early equipment: around the shack is a usable morse key dated 1914, and the transmitter includes a modified Peto Scott neutralizing capacitor which must date from the neutrodyne circuits of the early 'twenties. It makes one wonder just who can claim to have the oldest component still in current amateur operation?

It seems a pity that several of the reports in the technical press of "Radicom 70" drew the conclusion from the limited showing this year of amateur-built gear that home-construction is a vanishing art. My own impression, from correspondence and conversations, is that while undoubtedly a lot of factory equipment is being used, the extent of home construction, particularly of ancilliary equipment, has not diminished greatly during the past few years: if anything, the reverse is the case.

FOUR METRES AND DOWN

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

"Carefully tuning . . ."

The big tropo openings of the early autumn exposed lots of dx which was exciting while it lasted. They exposed something else which was not so exciting: certain limitations in current UK operating practices.

A large proportion of Continental vhf operators now use co-channel "looking on my own frequency" techniques. We in these islands by and large do not (except on the 145·41MHz sideband channel). Almost every a.m. station to be heard during the openings announced that he was ". . . carefully tuning high to low" (or low to high). It was with almost a shock of surprise that one heard the solitary operator (again outside 145·41) announce that he proposed to listen on his own frequency after a CQ. Those who did worked more of the dx than the random searchers; noting current Continental procedures, the British habit of "carefully tuning" is beginning to sound anachronistic. "Laboriously tuning" is nearer the truth.

It is unrealistic to expect the British vhf community to equip itself with VFOs overnight. Many operators are content enough to use commercial (or ex-commercial) rigs rock-bound on one frequency and to work the dx as it comes—and nothing wrong with that: there are *n* different ways of enjoying your amateur radio. But in just the same way that random searching has virtually disappeared from the hf bands, so it will in time at vhf—and the process of change will be stimulated when definitive articles about VFOs for vhf which are now in course of preparation for this journal find their way into print.

Meanwhile, until the VFO is installed, there is still much to be done to improve current operational techniques on "Two." Equipping oneself with a flock of crystals working through a vxo imparts a fair degree of freedom to move and even to net on to the wanted station (one of our local G8E- - Ernests sensibly put in half a dozen crystals within Zone C before he went on the air).

Something else which may be rated as an operating advance—and widely practised by UK stations for quite some years now—is to note the wanted station's stated tuning direction and, by dropping in the appropriate crystal, to catch him before he has tuned very far. This is a perfectly legitimate procedure which need not give rise to any guilt complex about moving outside one's zone: the British Isles bandplan is an elastic one capable of being moulded to meet immediate operational requirements but ready to spring back to its normal shape afterwards.

Catching the high-to-low tuner by inserting a high-end crystal is one method of utilizing the elastic bandplan to good effect (moving back to the home zone as soon as possible afterwards). Another is to use telegraphy on 145·41 to catch the sideband men, who anyway will be tuning with BFOs on and will be in a position to accept A1 as readily as ssb. But what is *not* acceptable is to use A3 in the sideband area: there is plenty of room for it outside. One Class B licensee, whose operating experience should have told him better, applied amplitude modulation to 145·41MHz to call the exotic Continental dx, and succeeded only in incurring the wrath of sidebanders trying to do the same. As an exercise it was a waste of time, for a.m. cannot compete with ssb in carrying power.

Apart from such lapses from grace—and using phone in the cw segment is another—inter-mode contacts enhance the enjoyment of operating in the metre wavebands, and (this is where we came in) greater use of the VFO will help to promote them.

Whereabouts

Something else made plain during the autumn openings was the now universal use by our Continental friends of the QRA Locator as the sole means of indicating their whereabouts. This trend, gathering momentum these last two or three years, has now reached the stage where a PA or DJ, for instance, will state his actual geographical position only upon request.

It must have been borne in upon many UK operators new to vhf that while enjoying the several openings which 1970 has provided they would have enjoyed them still more if a good QRA Locator map had been available in the radio room. Even during "non-openings" it has been significant how often people are in doubt about their own locators and seek the advice of others to put them right, notwithstanding the admirable explanatory article on the subject by G3JKY on page 178 last year. (The VHF Contests Committee can tell a few amusing stories about locators returned on contest forms which placed entrants in the middle of The Wash or Cardigan Bay.)

The QRA Locator map advertised on the inside back cover of each issue of *Radio Communication* makes a useful adjunct to the radio room furniture. Kilometre and mileage scales are included. Have one installed before the next opening!

The plan on "Seventy"

Quite often when conditions are normal the need to observe the band plan on 70cm does seem to be an over-riding one. Plenty of room for all, and each familiar voice popping up on the frequency which it has occupied probably for many years is part of the pattern of activity in a frequency spectrum known for its friendly ambience and complete absence of racing rats.

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But there *is* a bandplan, and there *is* a need to adhere to it as increasing numbers of stations appear on "Seventy". Bigger and better aerials and increased power levels (14–over–14 plus 100W to the final are common) mean that ranges are extended well beyond the "cosy local" characteristic of "Seventy" in the past. Additionally, converters are today far better than they were in the pre-transistor era.

All this adds up to more people being heard more of the time at increasing distances. Some of the signals will be quite weak at maximum range, and the man who is trying to work them will not thank a local for coming plonk on top of them at the critical moment.

Let G3UBX, Peter Burden of Wolverhampton, add a thought or two in context: "This evening I have heard on 433·15MHz two stations in Staffordshire and one in Lancashire, plus another in Cheshire, all on that channel. All very economical of frequency space but frustrating to those trying to make medium and long-distance contacts."

The odd-man-in was the one in Lancashire. The other three should have been in Zone 6: the reasons why they were not probably stemmed either from the fact that they were using the common, all pervading 8,021kHz crystals, one-time "five bob in any market place", or that they could hear nobody else around (or both).

432·0–432·1MHz	CW only.
432·1–432·2MHz	**Zone 1.** (Berks, Cornwall, Devon, Dorset, Hants, Somerset, Wilts, Channel Is.)
432·2–432·3MHz	**Zone 2.** (Brecon, Cardigan, Carmarthen, Glamorgan, Gloucester, Hereford, Monmouth, Pembroke, Radnor, Worcester.)
432·3–432·5MHz	**Zone 3.** (Kent, Surrey, Sussex).
432·5–432·7MHz	**Zone 4.** (Beds, Bucks, Essex, Herts, London, Middlesex.)
432·7–432·9MHz	**Zone 5.** (Cambs, Hunts, Leicester, Norfolk, Northants, Oxford, Rutland, Suffolk, Warwickshire.)
432·9–433·1MHz	**Zone 6.** (Anglesey, Caernarvon, Cheshire, Denbigh, Flints, Merioneth, Montgomery, Shropshire, Stafford.)
433·1–433·3MHz	**Zone 7.** (Derby, Lancs, Lincs, Notts, Yorks.)
433·3–433·45MHz	**Zone 8.** (all Scotland, Northern Ireland, Isle of Man, Cumberland, Durham, Northumberland, Westmorland.)
433·45–433·5MHz	Beacons.
433·5–434MHz	Television sound.
434 to top of band	Video.

Your bandplan ready reckoner. If you find it difficult to remember which 70cm frequency segments go with what geographical areas it will tell you at a glance. On the reverse the 2m bandplan is mapped Zones A to D and the frequencies used in them. Measuring 7½ by 9½in, and printed on stiff card, this useful adjunct to the vhf man's radio room comes for only 1s 7d from RSGB. Thought for club secretaries: buy in a dozen for your metre-wave members

G3UBX goes on to add that the recent openings showed him that stations in Dorset and London shared his Zone 6 channel of 433·05MHz.

Our remarks above about positioning oneself in the band to catch a wanted station at the moment he begins tuning apply as much to 70cm as to 2m. Even so, it is time that for the daily run-of-the-mill operation between 432 and 433·45 MHz people should begin to think about putting themselves in their right zones to achieve on 70 cm the general sense of orderliness that prevails on "Two."

Our man in Zomergem

Having recovered from that mild exercise in self laceration about British operating habits let us now bask in the aura of some kind words sent in to *FMD* by Henri van Gastel of Zomergem in Belgium. He is ON4HN, as if any "Seventy Centimentalist" needed telling.

Commenting on our VHF National Field Day he observes: "It seems that the contest procedure in G-land is super FB. On the Continent a contact lasts 10 to 12 minutes. I was able to work G and GW for about 4½ to 5 minutes for each contact. When making it short you increase your chances."

On the equipment side ON4HN has a word or two of advice for the listeners who seek out his signal during the famous schedule which he has been keeping for so long with G8AKE: "Congratulations about your aerials and converters, but make your tuned rf stages more selective with sub miniature variable condensers. Signal strengths will increase and noise will drop. Please increase your power, as G8BBY and G8BBB. If I run 15W out instead of 75W out you won't hear me so often . . . 50W out seems to be reasonable."

Our man in Zomergem provides a clue to the absence of 70cm signals from the Low Countries, except for those from ON4HN, and it is simply that inadequate equipment is used. Enough scorn has been poured on British operators who attempt to get going with television front ends to persuade them to have another think. It seems that the same treatment is needed in Holland and Belgium where, according to ON4HN, ". . . more than 50 per cent of the stations are working with mini power, co-ax of poor tv quality and converter a uhf television tuner! It's very glorious when they work one or two G stations when propagation is fine. They forget they are working with stations with serious equipment. That's the reason the band seems to be empty, because with normal propagation they are only heard within a very restricted range."

Wise words that could well be heeded on this side of the North Sea.

Looking to the future, ON4HN plans activity on 23cm with a 4ft parabola at the end of Aerialite 363 72Ω feeder. The converter with two BFY90s in the rf stages is already complete, but ". . . the tx is the problem. I need at least 50-60W out. I should like to have information about power varactors able to 'swallow' 130W of rf from the 70cm transmitter and gently triple at the best rates, and also about the cavity and circuitry for the varactor."

Those who can assist—and they might well be rewarded with a 1296MHz contact with ON4HN in the future—may care to write to him. Henri van Gastel, Zomergem, Belgium, will find him.

Behind the Jura

British stations who have patiently waited in the queue for a 2m dx station to become available may think their situation

peculiar to living in this offshore way-out-west country of ours. It is not by any means. Says HB9RO, Bernard Zweifel of Cheseaux (". . . a member of RSGB for 17 years"):

"On the afternoon of Sunday 20 September pressure had a growing tendency, and suddenly in the usual Sunday afternoon of portable and mobile operation came F9TL/P in Finisterre, YI51H, operating very well for dx work. After one and a half hours calling the QSO resulted—a nice path of 823km."

Three days earlier, hearing HB9LN working the British in droves, HB9RO lay in wait with satisfying results: seven south-eastern G stations contacted at great strength, with G3PNA, G8CFZ and G3HIL as gotaways.

The enormous signal from HB9LN comes from the top of the Jura at about 4,000ft. The site at HB9RO is about 30km behind that mountain in relation to the British Isles, and is 1,000ft up. The 2m transmitter delivers 50W to a 10-element Yagi.

Check "Four" Wednesdays

It was to be expected, with the dx roaring in on "Two" during the recent period of anomalous propagation, that the greater weight of vhf activity should have been concentrated there rather than on "Four". But if 2m is wide open, almost certainly 4m will be, too. "It seems a pity not to make the most of this glorious band while conditions are good, and even more so when they return to normal." This comment made to us over the air by a well-known 4m *aficionado* was echoed in similar terms by many others.

This trend of thought has now given rise to suggestions that there should be 70MHz Activity Nights and perhaps even a 70MHz Cumulative Contest on the lines of the popular and successful 432MHz Cumulatives of recent winters. The VHF Contests Committee will have the second of these suggestions before them. As for the first, the VHF Committee took a hard look at it when it met on 30 September, and opted for Wednesday as the most promising night for a 70MHz activity period. It is clear of the intense Monday night activity on 2m and 70cm and does not run into contest preoccupations at the back end of the week.

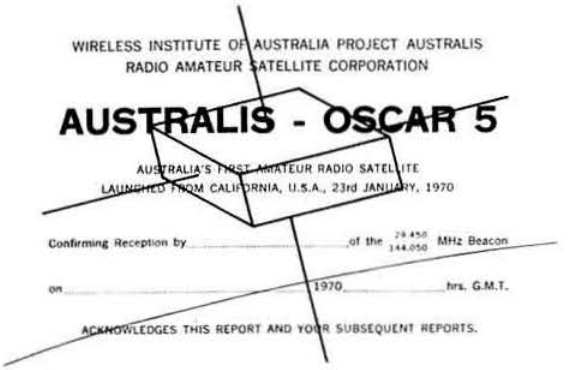
Everyone with 4m equipment available is therefore invited to use the band from 8pm onwards every Wednesday. Regular CQ calls both on phone and cw are important to trigger the band into life.

Says G3KSU, who may well be regarded as one of the leading lights on "Four" with 200 different stations worked in the last 12 months from his portable site on the Isle of Wight: "I think the reason 4m seems so quiet during the week is not so much tvi or lack of operators as to uncoordinated activity, ie, the time that I put out a call does not coincide with the time that the other man is listening."

The Wednesday proposal should help provide this needful co-ordination, both for the transmitting man and for the receiving members, only two of whom so far have earned the Four Metres and Down Receiving Certificate. There is new ground for them to till on "Four".

Aftermath of Australis Oscar 5

There is a special Australis Oscar 5 QSL card. Bill Browning, G2AOX, the UK Oscar co-ordinator, tells us that a first small supply of cards received by G2AOX from Melbourne early in July was despatched to those stations that had reported and lodged an sae for this acknowledgement. A further supply has recently arrived and been completed and



This is the special QSL card which G2AOX, the UK Oscar co-ordinator, is sending to members who asked for an acknowledgement of their reports on the Australian amateur satellite. Before sending off the card, Bill Browning adds the actual number of orbits each station reported. This QSL goes to members who had lodged stamped addressed envelopes with G2AOX

sent out via the QSL Bureau. Any stations that reported but do not keep a supply of SAEs with the bureau should apply direct to G2AOX with an sae. His address: 47 Brampton Grove, London NW4.

So much for QSLs. As for the detailed Oscar 5 logsheets, it is learned that all the reports received by G2AOX were carefully checked for accuracy, and corrected where necessary and then airmailed to Melbourne early in May for punched cards to be made and fed into the computer. The final analysis has not yet come to hand, adds G2AOX.

This extensive checking was necessary on every line of each report form, as any major error would create a wrong final average. The most common errors were using bst or local European time instead of gmt, or a mixture of both; wrong or no orbit numbers given; station location omitted or just a town name given instead of the longitude and latitude. Very important was the signal strength figure: nearly all the well-known stations with large aerial arrays and excellent receivers reported Oscar 5 around S6, but some quite small stations in badly sited areas, using 3-element Yagis at 20ft, gave S9-plus for every orbit heard.

Inevitably, G2AOX received his quota of "funnies".

One station heard Oscar 5 for 10 days before it was launched, and air-mailed to enquire why it had been switched off and when would it go on again. Another sent a three-hour tape recording of the satellite 2m beacon, at a time when it was not anywhere near the station location, and which turned out to be simply ordinary commercial rtty.

The checking and correcting of all the European reports meant 1,770 individual entries. Some 650 letters and enquiries were answered and some 1,400 newsletters, graphs and prediction sheets sent out. And G2AOX collected over 250 foreign stamps!

Beacon News

During the tropo openings a couple of months back, G2JF winkled out two apparently new German beacons on the 144MHz band, namely, DL0UH and DL0SGA. Further details are being sought.

On 70cm there is an important new beacon in Berlin which might just possibly be heard in the UK under super-lift conditions—and there have been one or two of these in the Novembers of recent years. John Lythgoe, G8CLY, of Chelmsford, spotted the news about this beacon in *Funk Technic*'s amateur radio column, and he has been kind enough to do a translation for *FMD*.

The Berlin beacon's callsign is DL7HGA, the frequency 433·485MHz, the rf power out half a watt into an omni-directional aerial of Maltese cross configuration. Operation is continuous.

Four Berlin amateurs have undertaken the building and maintenance of DL7HGA, one of whose number, DL7HG, Dr Peter Brumm, 1 Berlin 37, Claszeile 23, will acknowledge any reports received on its transmissions.

VHF group for Derby

Another vhf/uhf Group has been formed. Sponsored by one of the oldest and largest societies in the country—Derby and District—and centred in an area of outstandingly high metre-wave activity, it should be assured of a vigorous future.

Its first meeting took place on 30 October, and the plan is that future meetings shall be held on the last Friday of each month at the society's headquarters at 119 Green Lane, Derby. In the normal course of events there will be a talk lasting from 7.30pm until 9pm, leaving an hour for informal discussion and coffee, until closing time at 10pm. As with most of the vhf/uhf groups up and down the country, a warm welcome will be given to visitors (shilling a head admission, club members free).

All information from G3KQF and G8BAV, both regulars on 2m and 70cm; if they cannot be raised over the air and resort to a metallic link is inevitable they are on Derby 671012 and 21782, respectively.

* * *

At Dunstable in Bedfordshire there is a high vhf content in the activities of the Dunstable Downs Radio Club. Last month they had the ever-popular Vic Hartopp from J-Beam. This month Texas Instruments visits them on 6 November ("Transistor circuitry on vhf") and none other than G3LTF on 20 November ("Moonbounce"). Meetings are at Chews House right on the main A5 just south of the traffic lights. Starting time 8pm, and once again visitors welcome.

Promoting vhf activity in another direction the club has just concluded a highly successful 2m local contest. Some members turned in scores showing 15-plus stations worked per hour. Next year they are going to add 70cm to the rules—and a very good idea too.

* * *

"Phase locked oscillators for the vhf vfo" is the title of the talk to be given to the Leicestershire VHF Group by Mike Hitchman, G3HAN. Date: Thursday 19 November. Place: Room 45, Leicester Polytechnic. Charge: a shilling a head to defray postages. There is no formal subscription.

Another thirty-two

No fewer than 32 more applications for the Four Metres and Down Operating Award were ratified at the last meeting of the Society's VHF Committee. Special congratulations go to G3GIM of South London for securing a 144MHz Senior Award—this is only the 25th—and to G8DBB of Nottingham, the first man in the G8D– – series to obtain the 144MHz General Award. Here are details of the latest 32:

70MHz Transmitting: G3VJR, GW3OXD/P and G5UM/P.

144MHz Transmitting: G3OHC/M, G8CXM/A, G8CMU, G3YRH, G3YDY, G8BKP, G8CVK, G3PKV, G6FI, G8CUO, GW3OXD/P, GW3OXD/A, G8DBB, G8CCE, G3ENY, G8BQH, G8BUJ, G8ADP/A, G8CVS, G8BXX, G8BGE, G8CUT, G8DLZ, G8DBA/G3ZNW.

144MHz Senior Transmitting: G3GIM.

144MHz Receiving: A6812 and BRS31172.

432MHz Transmitting: G8AMU and G3EHM.

Contesting

Significant statistic, post-Field Day: the Mid-Herts ARS, introducing ssb on "Two" for the first time in their VHF NFD activity, have come up with the following figures:

A3, 13 hours of operating time: points 1,200. Pts per hour: 92.

A1, 3½ hours of operating time: points 500. Pts per hour: 144.

SSB, 5½ hours of operating time: points 1,000. Pts per hour: 182.

* * *

News from G3JKY, secretary of the VHF Contests Committee, is that although no VHF Listeners' Championship will be held during 1971 there will instead be several separate listening events linked with various transmitting events, open and portable. Present plans are to restart the championship in October 1971 and run it through to VHF Field Day of 1972.

* * *

A reminder that the last metre-wave contest of the year is on 6 December: the 144MHz Fixed, between the gentlemanly hours of 8am and 6pm. Not so gentlemanly were the hours of the 144/432MHz CW on 7–8 November, in the opinion of Bill Scarr, G2WS. "An all night 'do': what a stupid decision, especially as it's the old hands who like cw and it's the old hands who need a good night's sleep," he says: precisely the sort of comment to write on the back of the contest log, which the VHF Contests Committee invite entrants to do.

Not exactly expedition time . . .

In spite of the disincentives of the British winter, and of a general hibernation by most stroke P enthusiasts, a few hardy types may still be expected to pop up on the vhf/uhf bands. On Mondays last winter GW8AWS/P on his north Welsh mountain brightened the 70cm scene with many long range contacts even in the foulest of weathers. Down in the far south the Isle of Wight has been consistently put on the 4m map by G3KSU/P, who will be radiating from the island's high spots every Sunday morning ". . . weather and family permitting". Requests for 4m schedules should be addressed to him, Alan Williams, 11 Grange Avenue, Ryde.

Weekends and weeknights frequently see Bob Cliff of Sheffield putting G8BRT/P on the 2m air from the north Derbyshire hills, with wife Ivy enthusiastically logging. Often the cloud base is lower than the vehicle's parking place. Earlier in the year he was one of many who operated with great pleasure from Ireland with an EI2V—visitor's licence.

Another who travelled west was Bob Street, G8BNO, of Sussex, who took his HW30. He acknowledges gratefully the assistance offered by EI6N, EI2BB, EI6U and EI2CB in

helping him to get going on "Two" when he fired up as EI2VCZ from the holiday home.

Travelling from S Wales to N Scotland to put their club station on the air from the top of Ben Nevis as GM3VKL/P, three members of the Barry College of Further Education surprised 49 stations on "Two" with contacts. The three, GW3PPF, GW3WBU and GW8BQN, were in turn surprised when they received a visit right at the summit from F1TC, on holiday in GM-land. Climbing to the site, complete with equipment that included a Honda E300, took the party eight hours. Getting back took seven including injury time when 'PPF fell and twisted a knee. This meant redistributing some of the 130lb load on to 'WBU and 'BQN. Was it all worth while? The 49 who now have the coveted GM3VKL/P parchment will say it certainly was.

Visual vigils on "Four"

It was on 26 July that VE2AIO first heard the TF3VHF beacon on 4m over the 2,027-mile path between Montreal and Reykjavik. On 1 October he heard it again; more accurately, he saw it. From 0138 to 0145gmt the phase locked tracking filter produced a weak but certain response from 70·275MHz. The same thing happened on 26 July five minutes before the beacon came into audibility. On 1 October it remained below the audio noise—but the pen recorder saw it.

On 6 October TF3EA reported to G3JVL on the 20m talk link that a visual aurora north of his location coincided with good video signals from Norwegian television. This on or around 50MHz. As soon as the aurora curtain lifted so did the LA video.

Mike Walters, G3JVL, had word from DJ5BV in Bonn that an Es manifestation on 7 October went as high as 100MHz early afternoon, when Spanish fm broadcasting stations came up out of the noise. On the same day at much the same time, the 'JVL recorder showed signs of TF3VHF for about a minute. And anyone listening on 10, 15 and 20m would have detected short skip effects at this period.

In all, the possibilities of some good dx on "Four" were very present—if only it had not all happened on a workaday Thursday.

GD to GW by video

The believed-first television contact from the Isle of Man to Wales was made on 70cm on 15 September between GD6-FDZ/T near Laxey and GW6JGA/T at Prestatyn, respectively sited at 1,000ft and 350ft asl. Very good pictures were received both ways—and there was no help from conditions.

Next day an almost continuous series of tests was made to evaluate the various units that helped make this important contact possible. As the weather closed in during the afternoon slow deep fading affected the path.

At both ends a Vidicon 405 line camera was in use, and the close co-operation which has existed between Derek Whitehead, 'FDZ, whose home QTH is at Llandudno, and John Lawrence, 'JGA further east along the coast at Prestatyn, was reflected in a common design of transmitter, both running 40W of peak white from a 6/40 at each end. Each used converters with BF180 front ends, and the popular J Beam 46-element aerial once again showing its mettle (if the pun may be forgiven).

Both 'JGA and 'FDZ acknowledge the help unstintingly given by GW3DIX, who loaned the Honda for the IOM site, by GW3UTG, and Messrs Jack Elliott and David Williams. Congratulations are deserved by all for the organizational effort that went into the whole expedition, preceded by painstaking design work to ensure that everything would function as intended by the time it had been hauled up the hill at Laxey.

"Ask and thou shalt be given . . .". The MPT *was* asked for the special permission required for Stroke T portable operations, and it readily acceded (see August *Four Metres and Down*, page 544).

One-way stretch

Most of us on vhf have had the experience when attempting to work a specially wanted station of finding that he either goes back to another's call or offers no reply, but later on provides a QSO with the comment: "I've been calling you for ages!"

Various theories for the phenomenon have been aired on this page at one time or another: rate of tuning and beam heading seem to be two of the terms in the formula. To GI8AYZ there seems to be more in it than these. Seven times during the past summer he has noted this one-way effect while operating from his 1,125ft site near Larne.

During contests "gotaways" are frequent, eg GI8AYZ/P and G3ODY/P called one another for about an hour and a half in VHF NFD, each hearing the other at good strength. Perhaps nothing unusual in that, remembering the wall of QRM which overlaid long haul stations subject to fading. What was more mystifying to 'AYZ was the failure of the regular schedule with G6FK of Wolverhampton when "Freddie King" was RS59 for 40 minutes on end at Larne. GI8AYZ sums up the effect as follows:

"On such occasions, always from the Stroke P site, I either call for hours into a dead band, hearing only the locals, only to find later that reports come in saying 'Five and nine in Manchester. You got cloth ears?' Alternatively, the band is full of signals all apparently not on speaking terms with GI. Maybe someone can explain this phenomenon to me."

French balloon beacon

The French "biological beacon", which went up on 11 October, was heard on the Sussex coast by Ernest Hoare, G8BDJ, at quite low signal levels on a high performance fet converter fed by a 4-over-4 non-tiltable aerial. The one-watter on 2m came up at 1459 and went out at 1510gmt. Did anybody else hear it, and in particular did anyone hear the companion transmission on 23cm? (Details this page September.)

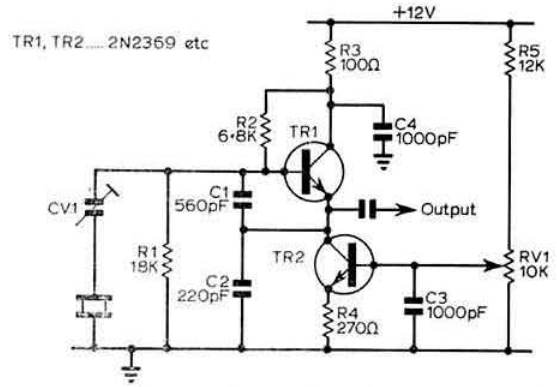
Tech corner

From G3JGO (Barry Priestley of Slough)

Here are some comments on the reference to pulling crystal frequencies by means of parallel 25pF trimmers (*FMD*, page 614, September).

1. Particularly with modern plated crystals the value of Co is much less than the existing circuit capacitance in a Colpitts type oscillator, and in consequence much more "pullability" can be achieved with a trimmer *in series* with the crystal.

2. The HC6U types of crystal have a Co of about 6pF. To achieve maximum range the load capacitance must be



The two-transistor variable crystal oscillator recommended by G3JGO. Values are as follows: R1, 18kΩ; R2, 6·8kΩ; R3, 100Ω; R4, 270Ω; R5, 12kΩ; VR, 10kΩ. C1, 560pF; C2, 220pF; C3 and C4, 1,000pF. Transistors 2N2369 or similar

variable above and below this, say, 3-12pF, which causes difficulties with stray capacitance. The larger plated metal can replacement for 10XS type may be somewhat more convenient, but the pressure plate types FT243, 10X, 10XS have some tens of picofarads built in, and so cannot be pulled far.

3. The maximum shift for a fundamental AT-cut crystal (without a coil to tune out Co) is about 1kHz per megahertz, with half this as a reasonable practical limit. For third overtone operation a ninth of this is practicable, and for fifth overtone a twenty-fifth and so on. In other words a 36MHz third overtone unit which would only pull 2kHz at 36MHz might do 6kHz on its fundamental, which is 18 when multiplied back up to 36MHz. (so much for "unstable" overtone crystals!). Incidentally, X-cut 100kHz crystals can be very pullable: up to 5kHz per megahertz, which could be a long way out at 435MHz.

4. When pulling a crystal a long way take care that it does not jump on to spurious modes some tens of kilohertz away. If this does happen, back off, then switch on and off a few times to ascertain the limits of stable operation.

5. Changing the load capacitance a long way alters the crystal activity. The circuit shown herewith is useful for controlling the oscillator current to compensate for this, or for a different crystal. A potentiometer varies the base voltage of the control transistor, and hence the oscillator emitter current. This transistor also replaces the rf choke otherwise required. If a suitable drive monitor point is available late in the transmitter the potentiometer can be replaced with an agc voltage.

The diehard "glass npn transistor" brigade will find W3QLV's article in *QST* for November 1966 of interest. Here a double-gang capacitor is used to reduce Cl with Cv to offset the variation in activity.

Here and there

"Find the beacons most interesting . . . my congratulations to all beacon keepers"—G3LZN.

* * *

"Now using during tv hours a QRP rig 400mW phase mod with G8ARV pa and 2W of rf. Report from DL at RS58. Also have G8BBY type tower. All I need is the strength to put it up and kid the neighbours that it is in fact growing ramblers"—G8DLZ.

* * *

"Activity on 3cm is contemplated and GW8ACG and myself are constructing two sets of equipment to this end. G8AFJ of Heysham will construct another set. Is there anyone else interested in 10GHz in the North or Midlands?"—GW8AHI (write to him at 48 Victoria Road West, Prestatyn, Flintshire).

* * *

Further to last month's note about the problems of access to National Trust property when operating /P, we have been told by G3HBW that in the light of experience with the Field Day group with which he is identified no objections will be raised provided permission is asked first. This permission should be sought from the National Trust Regional Officer, whose name is usually to be found on the notice boards at access points to National Trust properties.

* * *

"Is Middlesex still a claimable county? It seems to have disappeared from certain maps, and London is much bigger than it once was!"—G3KSU.

Answer: much of west Middlesex remains. Its Thames-level terrain does not favour vhf propagation but does not discourage activity from a large 4m and 2m population. And it QSLs well!

* * *

During the big tropospheric opening on the vhf/uhf bands in mid-September several very long distance contacts were made. Among the most outstanding was a QSO on the 23cm band between G8AUE in Derbyshire with DJ9LU on 22 September. The path distance was 600km.

* * *

From EI9F, hon sec of IRTS, comes a note to remind all friends in the UK that ". . . the QSL address of the Society, the official society for the Republic of Ireland (EI), has been changed to IRTS QSL Bureau, PO Box 462, Stella Avenue, Dublin 9. Cards arriving at the old address 24 Wicklow Street for the next two years will be forwarded to this new address."

* * *

The sensation of the September opening was OE2OML, widely worked on "Two" by many British stations. But how many got him on 70cm? One lucky seventy centimental who did so was G8ATK, who learned to his surprise that the Austrian was radiating only 200mW p.e.p. Output at G8ATK is 5W. Levels each way were RS59. H'm, someone said 70cm was only a local band.

* * *

Check back to logs for 4–8 September and 19–27 September for non-tropo anomalous propagation. Ron Ham reports his solar noise receiver registered up to 1200μA at times against an fsd of 1500μA. That is a lot of noise.

* * *

And as we close for press another big tropo: Continentals worked by the dozen on 432MHz, and several more 1,296MHz successes as well.

THE MONTH ON THE AIR

A monthly feature by JOHN ALLAWAY, G3FKM*

Still more nominations are being received for the title of 'non-QSLer of the year'. These are not all for rare dx stations, as GD6IA seems to be one of the worst offenders who has failed to respond to many SAEs and IRCs. The fact that one should never abandon hope is reinforced by BRS30367 who has just received a card from I1MHT dating from 1963.

Peculiar goings on on 80m now include what seems to be re-broadcasting of 80m signals on other bands. Both GB3RS and G2MI report working MP4TDQ on 80m at around 1600 and discovering later that the MP4 was in fact transmitting and listening on 15m. At this time of day this indicates to your scribe that the offender was in the UK. It is to be hoped that the MPT are aware of what is going on and are able to act accordingly.

A6166 draws readers' attention to a non-amateur net which operates just below 7MHz. The callsigns being used seem to begin with prefixes resembling those used by the amateur service and it would be easy for those who ignore the European Band Plan to find themselves outside the band.

G3WGN is receiving many QSLs for contacts alleged to have been made in early 1970 on 28MHz. The pirate has been giving his name as George and says that he is a CHC member. G3WGN has been off the air for two years and in any case only operated on 160m.

Please note that the QSL manager for FB8XX is F2MO **not** F2MG as given in error on page 699, October *MOTA*.

Readers will be sorry to hear of the death of PA0WEA. He suffered a heart attack on 2 September. Our sympathy is extended to his relatives.

News from overseas

Les, VR2FT, reports that the Fijian Scout station VR2SA worked 220 stations in a total of 46 different countries. QSLs are being despatched via the bureaux unless IRCs have been received for direct mailing. The station will be on the air again for the Jamboree, probably from Suva this time. Visitors to VR2SA at Londoni included ZK1BT and ZL1TU/VR2FF.

Dave, VR1O, is finding that propagation into Europe across the North Pole is good between 1000 and 1215 on 21MHz and he has worked into the UK a number of times. He favours 21,020 to 21,040kHz cw. It seems that the callsign issued to KH6CHC (also KP6AL) for use in the Fanning Is area was VR3AL not VR3I. The latter call belonged to Dr Vitousek from the University of Hawaii and lapsed in 1963. VR3L is at present spending three months' holiday in New Zealand.

EI6AU would like readers to know that QSL cards for his recent operation from Andorra under the C31DE call will be delayed. Michael is at present studying for his MSc in the UK and may not be able to deal with the cards until he returns home at Christmas.

The Ex-G Radio Club net is now back on its regular weekly winter schedules at 1900 on 14,347kHz on Sundays, and UK stations are especially invited to join in. The club itself is for amateurs who were born or naturalised in the UK and who are now living abroad.

VS9MZ has now returned to his home in the UK and his G3LXZ call. QSLs may be sent to the address in *QTH Corner* or via G2MI.

AX6HD (formerly G3HDA) would like readers to know that he QSLs 100 per cent but it seems that some direct cards have not been reaching him recently. He has moved within the last few months and his new and correct QTH will be found in *QTH Corner*. Mick says that both VK0LD and VK0MI will be leaving Macquarie Is during November.

Late news from 5N2ABG indicated that Nigerian stations used the 5N5 prefix during October to celebrate the tenth anniversary of independence.

VS6FX was closing down on 31 October and returning to his G3OSY QTH. Last logs were to be sent to W2CTN on that date and anyone requiring a quick reply should apply to him; cards received via the bureau will be answered on receipt.

Ken Randall, 9H1CB, seated at the rig in his cabin on top of St Angelo, 200ft above Grand Harbour, Malta. The cabinet on the right contains a Z-match for the 40/80m trap dipole, and the small Perspex box covers the paddle of an electronic keyer which was designed by 9H1AZ

* 10 Knightlow Road, Birmingham B17 8QB.

During his Far Eastern travels Mike Matthews, G3JFF/MM, visited the home of 9V1PB, alias G3NAC. Left to right: Mike, 9V1JG, 9V1OK, 9V1PB, 9V1NQ and 9V1OF

Fred, ex-KG6SM/KC6EM/K7OTF etc, has his S-Line with him in Western Samoa and is using the callsign 5W1AM. He asks for QSLs via W2CTN.

MP4TDJ will be returning to the UK soon and asks for all QSLs to be sent via G3ZBA (see *QTH Corner*).

QSL news

G3LQP (56 Combe Rd, Tilehurst, Reading, Berks) will be acting as QSL Manager for MP4MBB from 1 November. He also has logs for the VS5JK operation in May and MP4TDQ in August.

G8KB is acting as QSL Manager for TA3OZ for his European QSOs on and after 2 August this year. Cards accompanied by sae or IRCs will be answered direct by Ron. All others will be sent to TA3OZ who will reply via the bureau.

The "QSL Managers Directory"

This directory, published by W6GSV, not only lists the QSL managers of some 3,000 dx stations but also gives the full QTH of each QSL manager listed, plus an up-to-date list of world QSL bureaux. Copies of the 60-page directory (plus four supplements) may be obtained from Geoff Watts (*DX News Sheet*), 62 Belmore Rd, Norwich, NOR.72.T, price £1 10s in the UK and £1 12s 6d ($4 or 43 IRCs) overseas.

Top Band news

The 1970/71 **Trans-Atlantic** tests will take place between 0500 and 0730 on the following dates: 29 November, 27 December, 10 and 24 January and 14 February. Participants call CQ for alternate five-minute periods with the W/VEs leading off and the rest of the world listening. It is most important that these periods are accurately adhered to unless a contact is established. European stations are asked to use the 'dx window' (ie 1,823 to 1,830kHz) and it would be very much appreciated if other stations could avoid this area during the test periods. W/VE stations will be found between 1,800 and 1,820kHz, with west coast residents using frequencies in the 1,975–2,000kHz zone. Please remember that these are tests, *not* contests, and send your reports to W1BB (Stew Perry, 36 Pleasant St, Winthrop, Mass, 02152) and to your scribe.

A similar series of **Trans-Pacific** tests has been set up and will take place between 1330 and 1600 on 7 and 21 November, 5 and 19 December, 2 and 16 January, and 6 and 20 February. The same calling/listening technique will be followed. JAs will use 1,907·5 to 1,912·5kHz, ZLs approximately 1,876kHz, and VKs 1,802 to 1,805kHz approximately.

European/Japanese tests will take place on the same dates as the Trans-Pacific ones but will be between 2030 and 2200. The possibility of a Top Band UK/JA contact seems more likely following a report from GM3IAA, who has received a correct listener report on his signals from UA0-10771 located in Vladivostock. Jim's signals were RST 459 at 0210 on 3 April while he was in contact with another GM and running 10W to his VS1AA aerial (which is 255ft long, 50ft above ground, and runs N–S).

ZC4RB has been active on 160m around 2300 but no reports of his signals have been received to date.

DX news

ZM4OL/A was reported to be due to appear on the air from Campbell Is during October. ZM4JF/A was also expected to become active around 1 October and has given a list of frequencies which he will use. These are as follows: 3,535, 3,690 7,015, 7,090, 14,035, 14,250, 21,035, 21,350, 28,035 and 28,550kHz. QSLs will be filled in by ZL2GX and ZL2AFZ, respectively.

ZK1MA, Manihiki Is, has been putting quite a good signal into Europe on 14MHz around 0800 with JA1MIN (and others) acting as efficient MCs. Various sources mention a possible visit to the islands by ZL2AFZ in the near future.

5U7AW is now on the air again after sorting out receiver trouble. TY7ATF is frequently to be found on 14MHz and especially on the African dx net on 14,290kHz at 0600 on Saturdays; he may close down at the end of November. 5VZDW is leaving Togo for Tchad (TT8) and will be there for a year.

C21GB has now cleared his hi-fi interference problems and has been active on 14MHz ssb around 1100. C21JW is now VK2AOW.

Mike Hadjimichael, left, recently elected president of the Cyprus ARS, presenting a farewell gift to Jack Hill, ZC4JH, retiring QSL manager, in July

Len Rooms (G8BU) is now in Saudi Arabia and may be reached at PO Box 744, Riyadh. He hopes to be on the air soon with either an HZ or an 8Z call and will welcome calls from the UK.

VQ9CD has now left Chagos and returned to Mauritius. A new callsign from the islands is VQ9CF. This is Jacky, ex-VQ8CFB from St Brandon, who will be there for about one year. *DX News Sheet* reports that he favours 14,028kHz cw still and that he has a sked with a Japanese station on 14,232 kHz ssb at 1400 on Mondays and Thursdays—this is JA0CUV/1 who is believed to be his QSL manager.

There is a new operator at the Arturo Prat Naval Base in the S. Shetland Is. This is CE9AT, Rene, and he asks for QSLs via CE3RR (not CE3ZN). CE9AZ asks for QSLs by the same route.

W1ARF/KS4 is on the air from Swan Is and will be there for at least a year. Bob is reported to be frequently found in the Int'l SSB YL Net on 14,332kHz after 2300, and also around 21,420kHz at other times.

F5QQ/GD5APJ, Ron, is now in Ethiopia for a two-year stay and is awaiting the arrival of his ET3 callsign. Dave, ex-8R1S/5H3MA, is also in Ethiopia using the call ET3DS. He has a KWM-2, SB200 linear and quad aerial and will be there for three years.

KF4GSC was the special callsign allocated to the Ogeechee Fair in Georgia during October. The station was operated by members of the Georgia Southern College RC. WX3MAS is to be on the air for a final period this Christmas. The Delaware-Lehigh ARC, which maintains the station, says that due to severe weather the station did not make as many contacts as had been hoped in 1969 and that transmissions will take place on all bands on cw, ssb and rtty between 19 December and 1 January. Special QSL cards are being printed and may be obtained by sending a large envelope and IRCs to W3OK at the address in *QTH Corner*.

Louis Varney, G5RV, has taken up the post of resident engineer in Papua. The callsign VK9RV has been applied for.

Following the death of VE6AO, the QSL managership of FW8DY, VR1P, VR2FR, VR5AE, VE6AJT/KB6 and 5W1AE has been taken over by VE6AP (1933 32nd Avenue SW, Calgary, Alberta).

FR7ZU/G is reported active from Glorieuse Is and is said to be there for up to four months. He has been heard on 14MHz ssb. FB8WW is now credited with *two* QSL managers —W2AIW (see *QTH Corner*) and F5QE.

GB3SX

Spares are urgently needed for the maintenance of the beacon station. The hf transmitter uses types EF91, 6BW6, 6146 and 5R4; the 70MHz 6SG7, 6V6 and 829. Donations of any of these valves would be greatly appreciated and should be sent to G3DME, "Altadena", South View Rd, Crowborough, Sussex.

Awards

The "5X5" Award

NZART, Box 489, Wellington, New Zealand.

This certificate is being issued as a result of the considerable interest which has been shown in the ARRL 5BDXCC, and the basic award is for contacting the same five stations (in different DXCC countries) on five bands. Endorsements will be issued for 10 and each additional 10 countries worked. Information received from NZART does not indicate a starting date restriction or need for QSL cards. The certificate itself is a coloured picture and applicants should send a certified list of stations worked with relevant QSO data and a fee equivalent to $1 (NZ) to: NZART Awards Manager, ZL2GX, 152 Lytton Road, Gisborne, New Zealand.

The Worked All Pacific Award (WAP)

NZART.

Requires confirmations from 30 Pacific countries as per the following list: CR8, DU, FB8Y, FK8, FO8, FW8, FU8/YJ, KB6, KC6 (E. Carolines), KC6 (W. Carolines), KG6 (Marianas), JD/KG6I (Ogasawara Is), JD/KG6 (Minami Torishima), KH6, KJ6, KM6, KP6, KS6, KW6, KX6, PK/YB (Java), PK/YB (Sumatra), PK/YB (Borneo), PK/YB (Celebes), JZ0 (Netherlands New Guinea), VK, VK2 (Lord Howe), VK4 (Willis), VK0 (Macquarrie), VK9 (T.N.G.), VK9 (Norfolk), VK9 (Papua), VK9 (Christmas), VK9 (Cocos), VR1 (Gilbert), VR1 (Ellis), VR1 (Br.Phoenix), VR2 (Fiji), VR3 (Fanning), VR4 (Solomon), VR5 (Tonga), VR6 (Pitcairn), VS4/9M8 (Sarawak), VS5 (Brunei), ZC5/9M6 (Sabah), ZK1 (Manihiki), ZK1 (Cook Is), ZK2 (Niue), ZL, ZL1 (Kermadec), ZL3 (Chatham), ZL4 (Campbell), ZL5 (NZ Antarctica), 5W1, ZM7 and VK9/C21 (Nauru). An "all phone" endorsement is available.

The Worked All ZL Award (WAZL)

For contacts with 35 NZART branches.

The New Zealand Counties Award (NZC)

For contacts with 20/40/60/80/100/112 counties. Initial award costs 25c or four IRCs. Checking sheets with county information should be obtained (price two IRCs) from ZL2GX.

The New Zealand Award (NZA)

Requires 35 ZL1, 35 ZL2, 20 ZL3, 10 ZL4 and one confirmation from a ZL territory (101 QSLs).

All NZART awards cost $1 (NZ) or equivalent, and certified lists *or* QSLs plus return postage will be accepted. Most CHC rules apply and all applications should be sent to ZL2GX.

G3TXF, 3V8NC operating 4U1ITU during 1970 WAE-CW test

All the **Mayflower 70** certificates applied for from the Plymouth RC have now been despatched. Applications will continue to be accepted until November 1971. Apologies are extended for the delay in processing the awards.

Contests

160m CW International Contest (All Austria)
1900 to 2400 14 November.

Exchanges consist of RST plus serial QSO number. OEs may use 1,823-1,838, 1,854-1,873 and 1,879-1,900kHz. Each QSO counts one point, each OE prefix counts as a multiplier of two, other prefixes as one multiplier. Logs should give date, time, station worked, number given, number received, multiplier (if relevant), and should be accompanied by a summary sheet giving name, callsign etc, and showing points claimed, multipliers, and total score as well as details of equipment used. They should be sent to: Ö.V.S.V. Landesverband Oberösterreich, Ing. Erwin Braunschmid, Eisenwerkstr. 22, A-4020 Linz, Austria. (Within two weeks of the contest).

Results of the **1969 VK/ZL Oceania DX Contest** (CW section) show that UK scores were as follows: **G5RP** (2,244 points), G5WP (1,408), **GM3CFS** (450), G3VW (180) and **GC5AGA** (30). In the phone section **G3NMH** scored 4,680 points, and other entrants were G3PHO (1,050) and G3JVJ (64). In the listener section **BRS15822** came top in the UK with 6,580 points and BRS26431 (3,486), A5662 (3,388), **GW-7796** (1,378) and G-1516 (576) were also listed.

In the **1969 OK DX Contest,** in the all-band section **G3ESF** scored 39,406, and G3NSY 35,742 points. On 7MHz **G3HZL** totalled 5,202 points, and on 14MHz **G3JVJ** 12,152 and G3XYV 4,128 points.

The ARRL 160 Metre Contest
0001 12 December to 1600 13 December.

The rules for this new contest do not encourage international working (QSOs between non-US/VE stations do not count) and it is hoped that they will be amended before the 1971 event. Contacts with US/VE stations count two points and multipliers are the 74 ARRL sections (plus VE8). Entry

F5QQ, GD5APJ, 3V8AA hanging on the TH6 at 4U1ITU

forms may be obtained from ARRL, 225 Main Street Newington, Conn, 06111, USA.

In the **1970 IARC CPR Contest** (all band phone) **G3WTV** was world winner with 361,639 points. In the single band cw section **G3SGH** (17,784 points) beat G3OCA (2,450 points) to lead the Zone 27 entries on 14MHz.

Detailed results of the **1969 CQ WW DX CW Contest** are now available and results are as follows:

Single operator, single transmitter

G3FXB	**665,567**	**points**	**(All bands)**	GM5AME	42,228	points	(21MHz)
G2DC	118,597	,,	,,	GM3JDR	20,384	,,	,,
G3EDW	87,894	,,	,,	G8DI	8,541	,,	,,
GW3LZQ/A	**62,320**	,,	,,	G3XYC	7,337	,,	,,
G3JKY	50,900	,,	,,	**G3NSY**	**19,529**	,,	**(14MHz)**
G2BOZ	**83,749**	,,	**(28MHz)**	**G3KMA**	**24,360**	,,	**(7MHz)**
G3ESF	72,335	,,	,,	G3TVW	17,270	,,	,,
GW3GHC	**33,001**	,,	,,	G3XAP	17,105	,,	,,
G2BW	13,500	,,	,,	G3HZL	16,320	,,	,,
G3CWL	5,760	,,	,,	**G3IGW**	**29,358**	,,	**(3·5MHz)**
G3HCT	**222,488**	,,	**(21MHz)**	G3KDB	19,027	,,	,,
G3RUX	53,562	,,	,,	G3DYY	6,426	,,	,,
GM3CFS	**43,734**	,,	,,	**G3NT**	**253**	,,	**(1·8MHz)**

Multi-operator, single transmitter

GD3TXF	**1,141,936**	**points**	G3CXX	208,262	points
GW3XEJ	853,840	,,	**GW6GW**	194,425	,,
G3ATD/A	249,798	,,	G3VYI	151,522	,,

Congratulations to certificate winners (listed in heavy type).

QTH corner

AC3PT	(Op'n by K2IXP) via K2MME.
AP2KS	via IDXA, Box 125, Simpsonville, Md, 21150, USA.
AX2APX/LH	via W6DI, 1756 22nd St, Santa Monica, Cal, 90404, USA.
AX2BKM/LH	via W2CTN, 159 Ketcham Avenue, Amityville, NY, 11701, USA.
AX6HD	M. Bazley, 32 Flora Terrace, Lesmurdie, 6076, W. Australia.
C31DE	via EI6AU, 44 Synge St, S. Circular Rd, Dublin 8, Eire.
C31DG	G3CDK, 153 Boundary Rd, Wallington, Surrey.
CE9AT	via CE3RR, PO Box 13630, Santiago, Chile.
F0HI/FC	G3KFT, Jesmond Cottage, Cowley, Cheltenham, Glos.
F0VB/FC	via DL8UW, Bahnweg 9, 82 Rosenheim 2, Egarten, Germany.
F0VC/FC	via DJ5DU, Faeberstr, 17, 82 Rosenheim, Germany.
FB8WW	(new **QSL manager**) W2AIW, C. W. Rogers, Curtis & Union Avs, Manasquan, NJ, 08736, USA.
FH8CE	via W2MZV, Box 102, Yonkers, NY, 10702, USA.
FH8CG	BP 135, Moroni, Comoro Is.
FP0CA	via K2OJD, 32 High Ridge Rd, Dover, NJ, USA.
GC3ZIP	M. E. Fretter, Les Varendes Cottage, Les Varendes, Castel, Guernsey, CI.
KM6CE, KM6DV	via WA3HUP, Mary Crider, 105 June Drive, Camp Hill, Pa, 17011 USA.
WA1ARF/KS4	via WA6MWG, 4040 Via Opata, Palos Vert Est, Calif, USA.
KX6DR	(new **QSL manager**) WA5UCT, 707 Cottonwood Drive, Richardson, Texas, 75080, USA.
MP4QBK	via K4MQG, 801 Chelwood Place, Charlotte, NC, 28210, USA.
MP4TDJ	via G3ZBA, Dr S. Sefton, 8 Sandmoor Av, Leeds, LS17 8QW.
OH0AL	OH2MK, Katajaharjuntie 21-C-25, Helsinki 20, Finland.
TA3OZ	via G8KB, 733 Worrall Rd, Sheffield, S30 3AU.
TJ1AZ	via K4ASI, RFD 4-Box 165, Grafton, Va, USA.
VP2AP	PO Box 340, Antigua.
VP8JV	via W3DJZ, RFD 1-Box 331, New Cumberland, Pa, 17070, USA.
VS9MZ	G3LXZ, 9 WilberforceWay, Bracknell, Berks.
WX3MAS	via W30K, 1719 Callone Av, Bethlehem, Pa, 18017, USA.
YA1GJM	Guy Pappot, PO Box 5, Kabul, Afghanistan.
ZA2RPS	via DL7FT, Franz Turek, Petunienweg 99, 1 Berlin 47, Germany.
ZK1MA	via KH6GLU, 95213 Waimeli Place, Waipio, Hawaii, 96786, USA.
ZM4JF/A	via ZL2AFZ, 48 Nuffield Avenue, Napier, New Zealand.
ZM4OL/A	via ZL2GX, 152 Lytton Rd, Gisborne, New Zealand.
3B7DA	via PO Box 467, Port Louis, Mauritius.
5H3MM	via SM5CEU, Loftgatan 4, Linkoping, Sweden.
5U7AR	BP 442, Niamey, Niger.
5U7AW	BP 1001, Niamey, Niger.
5W1AJ	Gerry Johnson, Dept of Education, Pago Pago, American Samoa 96920.

RSGB QSL Bureau: G2MI, Bromley, Kent, BR27 NH.

1970 Countries Table

	1·8MHz	3·5MHz	7MHz	14MHz	21MHz	28MHz	Total
G3JVJ	4	75	45	48	37	29	238
G8VG	3	21	30	37	75	53	219
G3VPS	11	9	11	54	29	16	130
G3SWX	—	16	13	42	27	16	114
G3VBL	—	—	30	100	126	49	305
BRS25429	3	111	93	154	162	125	648
A7054	4	103	42	133	159	47	487
A6265	5	93	89	223	274	146	730
A6148	5	84	19	49	46	68	271
A5489	—	76	21	95	83	123	398
BRS27880	6	59	52	142	122	85	466
A6278	4	53	47	112	90	43	349
A6248	5	51	71	165	147	108	557
A7006	18	32	28	183	183	138	582
A6904	10	36	47	149	145	95	483
A6023	5	38	39	78	37	19	216
A6553	6	24	30	58	102	57	277
BRS30694	6	24	29	70	61	44	234
A6098	4	21	12	26	37	25	125
A6242	2	19	7	38	26	29	121
ORS31427	—	14	18	193	125	123	473
A6992	—	—	2	175	—	48	225

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

Dxpeditions

Iraq. According to the *DXers Magazine*, OH2BH has reported that he will possibly be on the air from the premises of the Finnish Embassy in Baghdad for a few days in October or November. SP9VU is also reported to be visiting YI on a three months' business trip and he will try to obtain operating permission.

Clipperton Is. A letter received from Dick, F2QQ, one of the F0NH group, says that the transport problems have now been sorted out and that the expedition may take place this winter.

Albania. The 3,000 contacts made by DL7FT, DL7LV and DH0UJ from ZA2RPS (Republika Popullore Shqiperise) during mid-September were with stations in 79 different countries. The Albanian authorities have invited the group back in 1971 and if this invitation is accepted better equipment and a beam will be taken.

Laccadive Is. K2IXP has not been able to arrange his hoped for visit to this rare spot and will be in Australia by the time this is being read. He may operate from some Pacific areas later. The latest rumour is that VU2CK and VU2US are attempting to go there during February 1971.

Kuwait/Saudi Arabia Neutral Zone and **Kuwait/Iraq Neutral Zone.** According to the *West Coast DX Bulletin*, 7Z3AB (who is currently in the USA) is planning a visit to the first named zone (8Z5) at the end of November. He hopes to have an MP4 operator with him and JA6KSO is mentioned as his QSL manager. A visit to the other zone (8Z4) in February 1971 is also under consideration, but both these trips depend on the political situation in the area being suitable.

Manihiki, Cook and **Tokelau Is.** AX6HD reports a conversation with ZL4BO who told him that he and George, ZL2AFZ, were trying to make arrangements to visit these islands sometime in January or February 1971.

Band reports

The most notable feature of the month has been the upsurge of activity on 28MHz with the band remaining open until quite late in the evening some days. Some reporters suggest that the lower bands have not been as good as they were this time last year however. Your scribe would like to thank the following for sending in logs and news items from which this section has been compiled: G2HKU, G3AAE,

G6LK, Ted Laker of Surrey, who has turned in a very fine performance on 160

(Photo via W1BB)

GW3AX, G3GVV, G3HB, G3JVJ, G3KWK, G3LPS, G3SWX, G3UKH, G3UYM, G3VBL, G3WBT, G3YWX, G5JL, G6GH, G8VG, BRS2098, BRS17567, BRS27880, BRS29748, BRS31231, A4148, A6248, A6265, A6658, A7053 and A7054. Calls listed in italics were on cw, the rest ssb.

3·5MHz. 0100 7X2CC (1kW of a.m.). **0500** *HC2GG/1*. **0600** CR4BC, VE8RX, W7RM, ZMs. **2000** F0ZF/FC. **2100** CR7GJ, KL7DTH/KG6, MP4TCJ, VS6DO, 5Z4MO, 9Q5BS. **2200** JW1CI, OY7JD, VP2VI, VP9MI, 6W8DY, 9M2s DW, WS, 9V1s PP, QE. **2300** *EL2CB, UL7GW*, VU2BEO.

7MHz. 0400 *9G1HM*. **0500** COs, HKs, PYs, VE8AZ, XEs, 6Y5GB (QSL via VE3DLC). **0600** *FP0NQ* (QSL via W2NQ), *KH6GF, KL7MF*. **1800** VS6DO. **1900** AX2KM. **2000** CR6KK, *JA8ACZ*, JA6YB etc, 5Z4KL. **2100** DU1FH, TR8DG, ZS1s JA, MH. **2200** ZC4IK. **2300** *AX6HD*, CE3RR, *CR6AI*, PY0AD, VP2AA, *3A0FH, 9E3USA*. **2400** CX8CZ.

14MHz. 0100 9N1MM. **0500** FK8AU, *KF0NEB/0*, VP1AJ. **0600** EA9EJ (Rio de Oro), *FK8KAA*, FO8CH, KC6RK, VR4CG, VR6TC, *ZM1AAT/K*. **0700** AX3OG (ex-G6OH), AX9ES, FB8YY, FK8AZ, FK8BG (QSL via W5IXQ), *KM6DW*. **0800** KH6s (KH6FF on 208-215kHz daily—will make skeds for 80m), KJ6CF, *UV0IP* and UK0KAA (both Wrangel Is, QSL via UW3FD), *VK9RH*, VR2EK, ZK1MA, ZK2AF. **0900** AX0LD. **1300** AX0GR (Antarctica). **1600** FB8ZZ, JD1ABO, KX6DR. **1700** FR7ZU/G, KH6s, SU1MA, *YB1BC*. **1800** HM1BB, UA9VH/JT1, KL7AQV. **1600** KX6DR, M1I. **2000** TR8MC, ZA2RPS, ZD7SD, ZD9BO. **2100** FR7AH, KH6BBU, VP2SU, VP8s KD, LR, 6Y5GB. **2200** AX8UG, *KC4AAD*, *VP2GLE*, XT2AA.

21MHz. 0800 KA9MF (QSL via WA7NDK), ZB2AV. **0900** KW6EG, ZM1AAT/K. **1000** JD1YAA (rapid QSL), KJ6CF, KX6II, VR1L. **1100** KL7HCM, KW6GM, *VR1O*, VR2SA, AX9DM (c/o PO, Kerema, Papua). **1200** AX9s GA, KS, SS, KC6JC, *LG5LG*. **1300** EA9EJ, FB8XX, *FK8AH*, KC6WS. **1400** CR5SP, FR7AB, WA9YGT/KG6. **1500** AP2MR, FB8XX, *JW8MI*, XT2AA. **1600** *UA0YD*, *ZA2RPS*. **1700** *FL8RC*, ZD3D. **1900** CR6GA, JY1, KC6WS, *KL7HLN/KL7*, PZ5RK, VP1RA, VP8LV, G3YBH/VP9, *VS9MZ*, 4S7AB. **2000** CE0AE, 5H3JR. **2100** KC4AAD (QSL via K7YMG), TY7ATF, VR6TC.

28MHz. 0900 XT2AA. **1000** FB8XX. **1100** AX9ES, GN, CR8AG, 5R8AP. **1200** UA1KAE, ZD3IL. **1300** DU1FH, FH8CG, FR7ZU. **1400** CE8CE, VS6AI, VU2BK (QSL via W1GL), YB0AAG (QSL via DJ2JB). **1500** *FP0NQ*. **1600** TJ1AZ, TY7ATF. **1700** CR5SP, FP0CA, VP8CW, VQ9EP, ZS3CJ (QSL via W3HNK). **1800** *CE2RF*, KH6s COB, HIH, PY8GS, VP2GBL. **1900** KG4EO, W6/W7s. **2000** FG7XT, 9Q5ID.

Grateful thanks to all contributors, and especially to the following for permission to reproduce items from their publications: **Long Skip** (*VE3DID*), **On the Air** (*ON4AD*), the **West Coast DX Bulletin** (*WA6AUD*), the **Ex-G Radio Club Bulletin** (*W3HQO*), **DX'press** (*PA0TO*), **DX News Sheet** (*Geoff Watts*), **International Communications** (*Euradio*), **QUAX** (*G3DME*), the **DX'ers Magazine** (*W4BPD*), **Florida DX Report** (*W4FRO*), the **DX'er** (*K6YGS*), and **NARS Newsletter** (*5N2AAF*). Please send all items for the **December** issue **to reach G3FKM** no later than **9 November,** and for **January** issue by **11 December.**

Propagation Predictions

Towards the end of October and during the beginning of November propagation conditions on the hf bands reach their maximum value. The present high level of sunspot activity implies good conditions on both 28MHz and 21MHz.

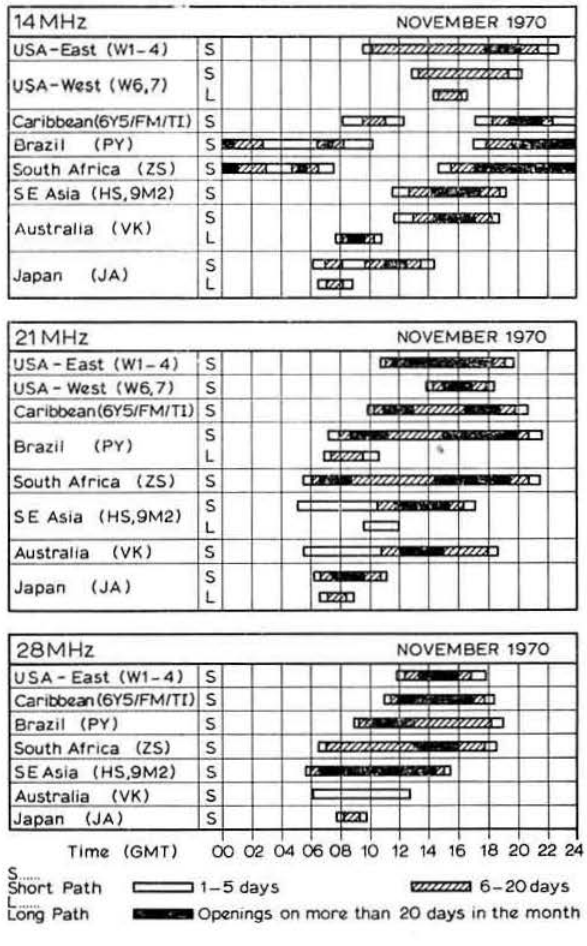
Traffic with all continents should be possible on **28MHz,** with western North America only on favourable days (ie days with above average MUFs), for a few hours. Chances of contact with western North America should be better for stations in the south in Europe. Because of the winter season, 28MHz will close between 1800 and 1900 gmt.

On **21MHz,** all continents will be workable with certainty. On this band the midwinter months will give opportunity to work dx by the long path in stable conditions, in contrast to the months of March and September. Towards the end of the month 21MHz should close around 2100gmt.

On **14MHz** dx traffic will be heaviest from afternoon till about midnight. In the latter half of the night, usually only South America and Africa will be workable.

On **7** and **3·5MHz,** conditions will change little from those of the previous month. On 3·5MHz local traffic may be interrupted by the dead zone in the early morning.

The provisional sunspot number for September 1970 from the Swiss Federal Observatory was 98·8 with a period of high solar activity occurring during the first ten days of the month. The predicted smoothed sunspot numbers for January, February and March 1971 are 88, 86 and 84, respectively.



Council's Annual Report on the Society's activities

The Council is pleased to report on the more significant activities and happenings which took place in the 12 months beginning July 1969.

Installation of President
Dr J. A. Saxton, DSc, PhD, CEng, FIEE, FInstP, was installed as the 36th President of the Society at the Bonnington Hotel, London WC1, on Friday 16 January 1970, before a large gathering of members and distinguished visitors.

Staff
The appointment of the general manager, Mr A. R. Dowdeswell, G4AR, was terminated with effect from the end of September 1969.

Mr R. G. B. Vaughan, G3FRV, was appointed general manager with effect from 1 October 1969.

Following the emigration of Associate Editor J. Adey to Australia during August, Mr A. W. Hutchinson was appointed editor of *Radio Communication*. It is planned that Mr Hutchinson will eventually assume responsibility for many of the Society's publications in addition to *Radio Communication*.

In the period covered by this report, the administration of headquarters has involved much hard work on the part of the Society's permanent staff. Council wishes to take this opportunity of thanking its staff, and the many voluntary helpers who found it possible to assist headquarters in various ways during the year.

Licensing matters
On 1 October 1969 licensing control of the amateur service passed to the newly constituted Ministry of Posts and Telecommunications. The Society has been fortunate in establishing an excellent working relationship with the new authority. The Society's MPT Liaison Committee was active in consolidating this relationship, and in discussing plans for the future of the amateur service.

In preparation for the Space Communication Conference, due to begin in June 1971, the Society has been engaged in discussions with the Ministry of Posts and Telecommunications on matters affecting amateur frequency allocations. IARU policy with respect to the conference was formulated at a meeting of IARU Region 1 vhf managers at Brussels on 1-2 May, when the Society was represented by its vhf manager, Mr G. M. C. Stone, G3FZL.

Licences
The number of amateur licences current at the end of June 1970 was:

Amateur (Sound) A	—	13,536
Amateur (Sound) B	—	2,171
Amateur (sound mobile) A	—	2,589
Amateur (sound mobile) B	—	295
Amateur television	—	184
Model control	—	18,397

Membership and representation
At the end of the period under review, the membership was as follows:

Corporate members	—	13,299
Associate members	—	1,528
Overseas members	—	1,707

The increase in membership in the past year was 1,142 compared with 1,347 for the previous year.

At 30 June 1970, 209 societies and clubs were in paid-up affiliation with RSGB.

Regional Representatives Conference
A triennial Regional Representatives Conference was held in London on 13 October, affording regional representatives an opportunity to discuss Society affairs with the Council.

Considerable attention was given to the problem of improving the liaison between the members and the Society. As a result, it was unanimously agreed that the Society's Council members elected on a zonal basis should also forthwith become managers of their respective zones, and that the present regional representatives would operate as their assistants in the regions, while retaining their original titles, status and responsibility. The responsibility for representation arrangements in each of the zones now lies with the zonal manager concerned, and meetings have already been held in many zones to set up suitable arrangements for representation.

Council hopes that the new, more flexible, arrangements will give a streamlined, efficient and simplified means of communication between the ordinary member and Council.

Committees
Council again wishes to take this opportunity to record its thanks to the large number of volunteers who served on committees during the period under review.

The **Education Committee** devoted a great deal of time to the preparatory work associated with a new edition of the *RAE Manual*. The Society again organized a centre for the Radio Amateurs' Examination in December 1969 and May 1970.

The **Exhibition Committee** was responsible for arrangements in connection with the International Radio Engineering and Communications Exhibition which took place between 1 and 4 October 1969. The exhibition was opened by Mr R. J. Halsey, CMG, FCGI, BSc(Eng), a director of Cable and Wireless Ltd. A full report appeared in the November 1969 issue of *Radio Communication*.

The **MPT Liaison and TVI Committee** was again concerned with many liaison matters, and also assisted with a number o applications for planning permission for radio masts.

Mr G. S. Bracewell, G3EGK, has given valuable assistance with the compilation of material relating to planning matters.

A TVI Study Group was set up to offer technical advice on tvi difficulties experienced by members and to advise on new technical developments. Members of the group included Mr and Mrs B. Priestley, G3JGO/G3XIW, who operate the "TVI Clinic," and several other amateurs active in the technical sphere.

The **HF and VHF Contests Committees** again spent many hours in adjudicating and arranging an increased number of contests held during the year.

The **Membership and Representation Committee** was concerned in implementing the policy settled at the Regiona Representatives Conference.

The **Mobile Committee** again arranged the Woburn Abbey National Mobile Rally, which was well supported as in previous years.

The **RAEN Committee** discussed matters connected with the extension of the RAEN network.

The **Scientific Studies Committee** continued with the establishment of beacons for scientific investigation purposes, and with investigation of auroral and sporadic-E propagation.

The **Technical Committee** were concerned with the checking of technical material for publication in *Radio Communication* and the preparation of new publications.

The **VHF Committee** again organized a successful convention at Witton, in Middlesex. During the year, as a result of decisions taken at the Brussels IARU Conference, a special meeting was held with *Shortwave Magazine* to formulate a revised vhf/uhf band plan. An announcement appeared jointly in *Shortwave Magazine* and *Radio Communication* in October 1969.

The **IARU Working Group** was responsible for considering Society policy in regard to IARU matters.

RSGB certificates
Applications for the Society's hf operating certificates continued to be dealt with by Mr C. R. Emary, G5GH.

During the year under review, a sub-committee was formed to consider new designs for Society certificates. The opportunity was also taken to revise the requirements of the Society awards

QSL Bureau
Mr A. O. Milne, G2MI, has again been assisted by his wife and the sub-managers to deal with approximately 30,000 cards per week

RSGB slow morse transmissions
Mr M. A. C. McBrayne, G3KGU, operates this service on behalf of the Society and is always pleased to receive reports on slow morse transmissions.

The Radio Amateurs' Examination Advisory Committee (a joint committee of members of the Society, the Ministry of Posts and Telecommunications, and the City and Guilds of London Institute), met at intervals during the year to consider and moderate draft examination papers and to consider the results of previous examinations.

RSGB Tape Library
Mr A. Milne, G2MI, has continued to act as curator of the tape library.

RSGB Intruder Watch
Regular reports continue to be submitted to the Ministry of Posts and Telecommunications by Colin Thomas, G3PSM, and his helpers. As a result of their efforts, several intruders have been removed from the amateur bands.

Representation on external bodies
As in previous years, the Society was represented on committees of various external bodies, such as the British Standards Institute, including the Ministry of Posts and Telecommunications Frequency Advisory Committee.

Publications
Council is pleased to report that sales of our publications to the American continent continue to increase, with the *Radio Communication Handbook* and the *VHF/UHF Manual* competing very favourably with American publications covering the amateur field.

Radio Communication Handbook has now sold over 24,000 copies.

The 1970 edition of the *RSGB Amateur Radio Call Book* was published, as usual, to co-incide with the opening of the International Radio Engineering and Communications Exhibition. Once again, an increase of the previous year's print order failed to satisfy the demand, and the 9,000 copies were sold before the end of May.

Although no new publications appeared in the year under review, a number of new editions have been issued. Work continued on further new publications which it is hoped will appear during the next year.

Lectures and meetings
An RSGB Lecture was given during May 1970 at the IEE, when the President, Dr J. A. Saxton, lectured on "Radio Research into Propagation and Radio Meteorology".

The Society sponsored the Woburn National Mobile Rally on 10 August and the Scottish Mobile Rally at the end of October. The arrangements for the Woburn Rally were in the hands of the Mobile Committee, under its chairman, Mr N. Miller, G3MVV, while the Scottish Mobile Rally was organized by the Society's regional representative for North-East Scotland, Mr A. W. Smith GM3AEL.

The Scottish VHF Convention at Edinburgh was well supported. Official Regional Meetings were held in Region 11 during October 1969, and Region 4 during June 1970. Council representatives attended each meeting to answer questions on Society affairs.

Attendance at meetings of Council

The following tabulation gives information on attendance at Council meetings between July 1969 and June 1970.

Name	Possible	Actual	Comments
Dr E. J. Allaway, G3FKM	6	5	Elected Jan 1970
B. Armstrong, G3EDD	12	11	—
N. Caws, G3BVG	10	4	Resigned due to ill health
J. Etherington, G5UG	6	5	Retired Dec 1969
J. C. Graham, G3TR	6	6	Retired Dec 1969
R. J. Hughes, G3GVV	12	10	—
A. F. Hunter, GM3LTW	12	9	—
E. G. Ingram, GM6IZ	12	9	—
G. R. Jessop, G6JP	12	11	—
H. E. McNally, GI3SXG	12	5	—
A. C. Morris, G3SWT	3	3	Elected Hon Treasurer April 1970
L. E. Newnham, G6NZ	12	12	—
C. Parsons, GW8NP	5	3	Co-opted Feb 1970
J. R. Petty, G4JW	12	12	—
Dr J. A. Saxton	11	10	Elected President Jan 1970 (previously by invitation).
W. A. Scarr, G2WS	6	6	Elected Jan 1970.
R. F. Stevens, G2BVN	12	11	—
G. M. C. Stone, G3FZL	12	12	—
J. W. Swinnerton, G2YS	12	11	—
D. M. Thomas, GW3RWX	6	1	Resigned Jan 1970.
G. Twist, G3LWH	6	1	Retired Dec 1969.
F. C. Ward, G2CVV	12	11	—
E. W. Yeomanson, G3IIR	12	12	—

REPORTS ON ORMs

Region 1

Just short of 100 members, with their wives in some cases, visited Southport's Floral Hall on 27 September. They were talked in on 2m by G3VNQ/A, on 4m by G3XIM/A and on 160m by G3SZV/A.

Many took the opportunity to arrive early and were able to spare time inspecting the bargains on the trade stands etc. Some stayed for lunch and upwards of 80 attended the business meeting in the afternoon.

The regional representative welcomed all present, in particular G2CVV and G4JW, Messrs Ward and Petty, respectively, who represented the Council of the Society. G3SMM, Bill Furness, was introduced to members as the recently appointed deputy regional representative—also introduced was G2CUZ who had agreed to take on the duties of "watchdog" over the region's trophies. At the same time thanks were expressed to G2CUZ and his band of helpers for the able organization of the ORM.

Questions from members were invited and they covered a wide range, including tvi and the cost of the maritime licence. After tea, Norman Kendrick, G3CSG, in fine form, gave his entertaining lecture on "Japanese Morse". For three-quarters of an hour he held his audience with his interesting descriptions and exciting stories of wartime experiences.

During the afternoon the regional trophies were presented and the opportunity is taken to record here the winners of the various events:

Region 1 VHF Contest
Winner, GD2HDZ; runner-up, G3WIN/P (Windveale).
Band leaders—(Fixed) 4m, G3EKP; 2m, GD2HDZ.
Band leaders—(Portable) 4m and 2m, G3WIN/P; 70cm, G8BRF/P.

Region 1 Field Day
Winner, G3VAL/P (Leyland); runner-up, G8GG/P (Blackpool).

Regional Representative's Trophy for NFD
Winners, G3NWR/P and G2AMV/P (Wirral).

Harold Hilton Rose Bowl—160m NFD
Winner, G3DBY/P (Chorley).

Region 10

The Official Regional Meeting for Region 10 took place on 26 September at University College, Cardiff. The attendance was just over 70, and Council was represented by Roy Stevens, G2BVN, Bill Scarr, G2WS, and Cyril Parsons, GW8NP. The chairman was David Thomas, GW3RWX, the regional representative.

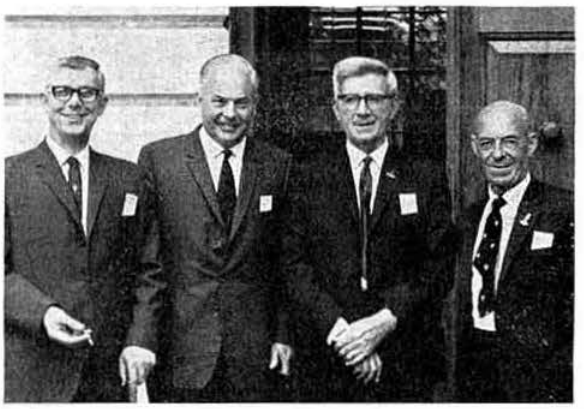
The highlight of the business meeting in the afternoon was an address by Roy Stevens on the state of the Society, its aims and difficulties, and its place in the international

amateur radio scene. The concise presentation and the amount of ground covered in the limited time available was greatly appreciated by the meeting. Very lively discussion was stimulated, and the three Council representatives were kept busy answering questions.

After an excellent meal, presentation of prizes and the traditional raffle took place.

The meeting terminated with a lecture-demonstration by Mr Keith Winter, Leverhulme lecturer in physics and music in the Department of Physics, entitled "New Sounds for Music". Members obtained some idea of the complex computer techniques involved in this relatively new subject, and had an opportunity to try for themselves some of the sophisticated equipment in use. The lecture was of absorbing interest and was extremely well received.

The organizers wish to express their thanks to Heath (Gloucester) Ltd and A. B. Metals Ltd for the excellence of the display they presented. Also to GW3FKO and the members of the East Glamorgan Raynet Group for the very professional two-metre talk-in arrangements made.



Attending the Region 10 ORM. Left to right: GW3RWX, G2BVN, GW8NP and G2WS

Mullard Jubilee Exhibition

The amateur radio station GB3MUL, which was operational at the three-week Mullard Golden Jubilee Exhibition at Mullard House, London, during October, made more than 400 contacts with some 25 countries during the first five days of the exhibition. One of the most remote stations contacted was an oasis called 29 Palms in the Californian desert.

Equipment used was a KW2000B driving one of three linear amplifiers—a KW1000 linear, a 45-year-old SW2 valve linear and a solid-state linear—the whole working into a tri-band Yagi rotatable beam aerial 130ft up on the roof of Mullard House. A vhf station operating on 144MHz with a rotatable beam and a trap dipole on the lower fixed bands completed the set-up.

Special QSL cards were issued.

OBITUARIES

R. Alsop, BRS31991
Mr Robert Alsop, of 151 Leeds Road, Kippax, Leeds, was killed recently in a motoring accident.

R. T. Dale, BRS30846
Mr Reginald Tom Dale of 16 Tarrs Avenue, Kingsteignton, Newton Abbot, has died.

P. Denison, G8OK
Mr Percy Denison has died after a short illness at the age of 75. An audio engineer by profession, he went to sea as a Marconi operator as a teenager and later founded the firm of Denison Bros to make radio receivers before the advent of the BBC. He was an honorary member and former chairman of the Spen Valley ARS.

G. W. Guy, G8TH
Mr George Guy died on 29 September at the age of 65. A well-known dx worker, he had been very active on the amateur bands since 1935.

N. T. Hodgson, G2ABK
Mr Norman Hodgson died at the age of 58 in hospital at Boston, Lincs, on 20 September. He obtained his full licence in 1946 after service with the RAF.

R. J. R. Jefferson, G3EMC
Mr Ron "Jeff" Jefferson died suddenly of a heart attack on 23 September. He will be missed from the Sunday morning Top Band net

J. Kean, GM2FKG
Mr James Kean, of 37 Kearn Avenue, Glasgow died recently.

B. Pickers, BSc, MICT, G3YUA
Mr Brian Pickers died at the early age of 33. A former member of Silverthorn Radio Club, he was senior cardiological technician at Groby Road Hospital, Leicester, and earned a reputation for the development of pace-makers.

J. Targett, G3NUP
Mr John Targett died at his home at Pulham Market on 18 September aged 70. A former RN telegraphist and civil aviation radio operator, he took out his amateur's licence on his retirement in 1959.

H. J. Tronson, ZS1CZ
Mr Harold Tronson, a staunch supporter and worker of the SARL, died on 19 August at the age of 52.

V. E. Whitaker, G3HRG
Mr V. E. Whitaker of 50 Alderbury Road, Langley, Bucks, died on 11 August.

SOCIETY AFFAIRS

A brief report of the Council meeting held at Society HQ on 7 September 1970.

Present: *Dr J. A Saxton (President, in the chair), Dr E. J. Allaway, Messrs B. Armstrong, R. J. Hughes, A. Hunter, G. R. Jessop, A. C. Morris, L. E. Newnham, C. Parsons, J. R. Petty, W. A. Scarr, R. F. Stevens, J. W. Swinnerton, G. M. C. Stone, F. C. Ward, E. W. Yeomanson (members of the Council), R. G. B. Vaughan (general manager) and A. W. Hutchinson (editor).*

Mr J. O. Brown attended by invitation to advise Council on financial matters.

An apology for absence was received from Mr E. G. Ingram.

Prior to the commencement of formal proceedings, Dr J. A. Saxton presented Mr A. C. Morris with his badge as Hon Treasurer.

Register of forthcoming events
Mr Yeomanson reported that an appropriate notice had now appeared in *Radio Communication*.

East London RSGB Group
The general manager confirmed that he would be able to attend the East London RSGB Group Meeting on 20 September.

Honorary trophies manager
The general manager reported that Mr L. Hill was now unable to continue as honorary trophies manager because of ill health. Enquiries are continuing in order to fill this vacancy.

Membership and affiliation
It was resolved:

(i) to elect 183 corporate members and 58 associates;
(ii) to grant corporate membership to 15 associates;
(iii) to waive the subscription of six members due to blindness or other disability;
(iv) to grant affiliation to the 29 DX Club of Western Australia.

Mr Vaughan reported that the 29 DX Club of Western Australia has over 35 per cent RSGB members and is mainly composed of "ex G" operators. The secretary is Alan Gibbs, G3PHG/VK6PG.

Provisional booking for Presidential Installation
Mr Vaughan confirmed that a provisional booking for the Presidential Installation had been made with the Bonnington Hotel for 15 January 1971.

Extraordinary General Meeting
The President reported on the outcome of the Extraordinary General Meeting, and Council asked that a vote of thanks to Mr A. C. Morris be recorded in appreciation of his work in connection with the meeting.

Mr H. E. McNally
The general manager reported that he had been in contact with Mr McNally who had agreed to continue to deal with the Society's *Radio News of 1968* film.

Subscription rates
Council resolved that the following subscription rates should be effective from 1 January 1971:

Corporate members, £4; associate members, £2; *Radio Communication* subscription for libraries and technical institutions, £4 10s; affiliation fee for societies requiring a copy of *Radio Communication*, £2; affiliation fee for societies not requiring a copy of *Radio Communication*, 10s.

(It should be noted that by the terms of Article 20 the Council has the power to waive subscriptions for blind and disabled members and to approve a reduced subscription for old age pensioners who have been members of the Society for at least 15 years.)

Council noted with pleasure a resolution passed at a recent meeting of the City and County of Bristol RSGB Group supporting the proposed subscription increase.

Edgware & District Radio Society
Council noted the contents of a letter received from the Edgware & District Radio Society requesting the attendance of a member of Council to give a talk to that society.

In response to this request Mr Yeomanson volunteered to attend and give a lecture on the RSGB.

General manager's holiday
Mr Newnham agreed to take over headquarters administration from 16 to 30 September while the general manager was on holiday.

Minutes of committee meetings
Council approved the minutes of the RAEN Committee (30.5.70); HF Contests Committee (9.7.70); VHF Committee (3.8.70); VHF Contests Committee (5.8.70); Membership and Representation Committee (7.8.70); Exhibition Committee (12.8.70); and Finance and Staff Committee (17.8.70).

YOUR OPINION

The Editor
Radio Communication

Sir—I wonder who wrote up—or wrote down—that account of *our* Exhibition in *Wireless World*? It is wrong to draw any conclusions from the small number of entries for the home-construction section. I have been building gear for 33 years, and have never constructed anything that I would care to exhibit. I would not expect to: not being an engineer, and having had no formal workshop training.

On the other hand, my efforts have given me both success and enjoyment. For example, I have just built a top-band transmitter. The metal work is third generation, having started life in 1948, and the total cost was nil. But the circuitry, with full break-in by G3PDM, is not to my knowledge paralleled by commercial gear.

Yours faithfully,
J. B. Roscoe, GM4QK

The Editor
Radio Communication

Sir—I enclose for your information a copy of a letter sent to the editor of the *Financial Times*.

It is very hard to run a crystal service under these conditions but 95 per cent of radio amateurs treat the problem with real understanding. We continue to do our best here!

Yours faithfully,
M. Crowther-Watson, G3IAR EMSAC

The Editor
Financial Times

Sir—This firm is engaged in the importation of quartz crystals for the electrical industry. We maintain a two to three week delivery service by use of special delivery express air mail and air freight facilities. Goods were despatched by one of our USA suppliers on 5 September and arrived in this country three days later. The crystals were packed in three separate parcels as they were the product of three separate orders (and invoices). The Postal Customs Depot, London Overseas Mail Office, in its wisdom decided to "batch" the three parcels, treating them as a single consignment. As such they became liable for the import deposit levy. Individually, none of the parcels was liable.

The authorities, after some heated telephone conversation, agreed to "unbatch" the consignment. However, they "had not the time" to do this without recourse to three documents which I had to fill in. No mention was made of the time it took to "batch" them. It is apparent that this can only be done by an examination (physical?) of all parcels entering the depot in a period of 24 hours.

At the present time, nearly two weeks after their arrival in this country, I still have not received any of the three parcels. As a result of this avoidable delay I have something like 150 disappointed customers.

Yours sincerely,
M. Crowther-Watson, Director

CONTEST NEWS

VHF NFD

At the time of going to press, the 144MHz entries were still being checked, other bands having been completed. Subject to confirmation, leading stations are as follows:

70MHz. Winner, GD3PSH; runner-up G3FDW.
432MHz. Winner, G8AWS; runner-up, G3LTF.
1,296MHz. Winner, G3LTF; runner-up, G2RD.

The entry for the IARU contest rose from 9 to 67, a very gratifying increase. A full report on VHF NFD will appear in the December issue.

4m CW Contest, 15-16 August 1970, Results

Both conditions and weather were awful and many competitors mentioned G3JYP/P as the only bright spot, and he provided most stations with their best dx. The late night and early (for some!) morning sessions met with a mixed reception with more "pros" than "antis".

Subject to Council approval, certificates will be awarded to G3JYP/P and runner-up G3OHH.

G3EDD

Posn	Callsign	Score	QSOs	Best dx in km	Power	Aerial
1	G3JYP/P	230	23	438	30	4
2	G3OHH	202	31	290	50	4
3	G3RLE	178	24	341	50	4
4	G5NU	169	31	370	45	4/4
5	G3TDH	151	33	320	50	4
6	G3VSA	105	15	—	50	—
7	G6HD	94	22	400	32	4
8	G3KSU/P	88	17	330	10	3
9	G5UM	86	16	205	16	4
10	G3RDQ	81	17	345	30	4
11	G3SJX	76	24	—	20	4/4
12	G3VNQ	67	12	320	50	4
13	G8LY	59	10	318	42	4
14	G3REP	52	8	320	30	—
15	G2WS/P	44	7	275	14	3
16	G3VFD	41	9	400	50	4
17	G3JKY	21	12	—	10	4
	BRS15822	91	27	—	—	6

Check log received from G3NKS.

RSGB DF Final Contest 1970, Results

All 18 previously qualified teams took part in the 1970 RSGB National Final D/F Contest held in Worcestershire on Sunday 20 September.

Organized by the Slade Radio and Scientific Society, the start was at Elmley Castle, near Evesham, and in perfect weather conditions good signals from both stations were received, although both were in the same direction and one was much stronger than expected. Station "A" was in fact on the north side of Breedon Hill only 1¼ miles from the start but nearly 900ft above sea level, and although it could be approached from several directions all involved a long uphill climb along rutted tracks. This station was operated on 1,920kHz by Bert Simmonds, G3XRH, and the half-wave aerial and counterpoise employed gave strong signals at the start but was hardly audible a few miles to the south.

Station "B" was hidden on a wooded hilltop 11¼ miles south of the start at the south end of Cleeve Common near Cheltenham and was also nearly 1,000ft above sea level. Manned by John Smith, G3JZF/P, on 1,850kHz, this transmitter was very difficult to reach from the north but was easily approachable from Cheltenham Needless to say, the majority of the competitors found they had to approach it from the more difficult side involving an arduous climb of nearly 1,000ft on a hot sunny afternoon.

Tea was provided by Mrs P. M. Williams and Mrs J. Hughes, ably assisted by John Hughes in the Elmley Castle Village Hall.

The provisional results were announced and prizes awarded by Mr G. C. Simmonds on behalf of Mr A. S. Page, President of the Slade Radio and Scientific Society, who was unfortunately in poor health and unable to attend. The organizers would like to congratulate Alan Hitchcock for a very well deserved win and to thank Mr and Mrs G. T. Peck, members of the transmitting parties and the many willing helpers at the tea for all their unstinting assistance.

Posn	Competitor	Club	Time of arrival Stn "A"	Stn "B"
	A. Hitchcock	Derby	1601½	1449
2	B. Bristow	High Wycombe	1437	1605
3	R. Pearce-Boby	Oxford	1454	1616
4	D. Newman	Rugby	1454½	1618
5	E. Bristow	Oxford	1619	1511
6	J. Vickers	Faringdon	1627	1503
7	M. Gee	Oxford	1628	1526
8	O. L. Harding	Lincoln	1443	1639
9	I. Butson	Chelmsford	1534	1639
10	M. Hawkins	Chelmsford	1534½	1639
11	P. Tyler	Oxford	1437½	—
12	B. Mahoney	Rugby	—	1503
13	E. L. Mollart	Oxford	—	1507
14	W. North	High Wycombe	1510	—
15	A. Simmons	Oxford	—	1553
16	P. Wells	Dartford Heath	—	1618
17	P. Rich	High Wycombe	1621	—
18	T. Gage	Oxford	—	1626

Contests calendar

7–8 November—7MHz Phone
7–8 November—144MHz CW
14–15 November—Second 1.8MHz
20–21 November—Malta Independence Day Contest (cw/phone
27–28 November—CQ WW DX Contest
6 December—144MHz Fixed Station

1971
9–10 January—AFS
13–14 February—1st 1·8MHz
30–31 January—CQ WW 160m DX Contest
6–7 February—ARRL DX Contest (phone)
20–21 February—ARRL DX Contest (cw)
6–7 March—ARRL DX Contest (phone)
13–14 March—BERU
20–21 March— ARRL DX Contest (cw)
4 April—LP 80m
5–6 June—NFD
3–4 July—Summer 1·8MHz
10–11 July—HP FD
12 September—80m FD
9–10 October—21/28MHz
23–24 October—7MHz CW
6–7 November—7MHz Phone
13–14 November—2nd 1·8MHz

RADIO AMATEUR EMERGENCY NETWORK

by S. W. LAW, G3PAZ*

As this column is written, the main topic in the news is the problem of pollution. A moment's thought will show that this is something which concerns RAEN. There is a frightening possibility that the removal of labour from various sewage processing works could result in flooding of the most dangerous kind in some low-lying and densely populated places. Needless to say, we have every confidence that RAEN controllers in the areas likely to be affected are fully aware of the position. Paradoxically, we shall be only too pleased to have nothing to report on this situation next month, since its seriousness is only too obvious.

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

More from the Midlands and North
Those who monitor the 2m band may well hear the net on Thursday evenings at 1930bst which is run by the Leeds-Bradford group under the leadership of Controller Keith Wells, G3WIX. Prospective members are invited to join in. At the time of writing there is a membership of 20, which leaves ample room for expansion for this area.

It appears that the Cumbria group has established good relations with the police, but could do with a larger membership in order to provide the service envisaged. The present group numbers 40 which is little enough in view of the extent of the area.

Nothing more has been heard from the Wirral, but Liverpool appears to be going well by the content of its news-sheet.

The isolated member
There is still the occasional complaint from members who feel out of things. Often it is found that either there has been a change of address or the registration card has not been sent in for updating. We actually spoke to one "member" with a complaint of neglect whose card was several years out of date! Please ensure that you have done your share in respect of registration and notification of any change of address before you brew up a sense of frustration.

If a check with the hon registrations secretary shows that you are too far from an established group reasonably to take part in any activities, may we suggest a little recruiting drive in your own area with a view to starting your own group? The RAEN Committee is always glad to assist in these matters.

Unmanned repeaters
A study of commercial radio systems will show a wide usage of unmanned repeater stations to give coverage over difficult terrain. Needless to say there are many RAEN groups who could make good use of such facilities if permitted; for the present we must continue to take into account the necessity for setting up a chain of relay stations over paths which we know may be required at any time. We do not preach to the converted in this matter as we know of several groups who have the matter well in hand, but may we suggest that it may have been overlooked in some areas and could well repay some tests. Consult your user services and it may be to the advantage of all concerned.

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. Tel Botley 4482**

RAEN Group of the Month

by P. Balestrini, G3BPT, (Chairman, RAEN Committee)

Kent RAEN Group

Group controller: A. E. Pritchard, G3ODB, 8 De Lapre Close, Orpington. Telephone, Orpington 22830.
Group channels: 70·355MHz with 145·2MHz as a second channel.

During 1967 the chairman of the RAEN Committee called a meeting of interested amateurs with the view of forming an RAEN group in Kent. As a result of this meeting a nucleus of four persons commenced operations on 10m in Orpington. Following a talk at the Maidstone "Y" Centre further members signed on, enabling a subgroup to be formed in this area, and early in 1969 a further sub-group in Gravesend was integrated into the county network. Membership now stands at 42, 17 of which are fully operational on one of the group's channels.

Originally it was felt that no approach should be made to any potential user service until membership exceeded four or five in each sub-area, and until all were equipped for portable or mobile operation on the 4m channel. Since first impressions are of paramount importance much message handling practice was also undertaken. These targets having being achieved late in 1969, approaches were made to the three approved user services and were welcomed in particular by BRCS.

Many small exercises have been held to improve the efficiency of this young and enthusiastic group.

Thank you, Kent!

Cornish ARC Rally with a difference, 22-23 August

This was not the usual mobile rally, being the West of England Steam Engine Rally at Sinns Barton, Redruth, but CARC was in attendance.

Using the club call G3OHB/A the exhibition station attracted hundreds of interested visitors, as did a display of commercial and home-built pieces of amateur equipment.

On the Sunday afternoon the club created a /M "first". The club chairman, Keith Harding, using his call G3XFL/M, operated a Top Band station from the oldest steam engine at the rally. Using the Codar AT5 and an EC10 receiver he worked G3RMG a few miles away in Camborne. Another EC10 was placed beside the PA microphone so that the large crowd could hear both sides of the QSO as the engine drove around the arena. The engine was built in 1894 and runs 6hp.

Keith Harding, left, operating his traction engine mobile station

Camping Club Amateur Radio Group

An amateur radio group has been formed as a section of the Camping Club of Great Britain & Ireland Ltd. This is proving successful and worthwhile, as both hobbies seem to go together quite well. The honorary secretary is Mr R. E. Heathcote-Walker 84 Beverley Road, Hessle, Yorkshire, HU13 9BP, Tel Hull 643347.

G3CDM, left, and G3UVY working a mobile home-brew 160m a.m. rig while the Camping Club ARG was camping at Rudding Park, Harrogate, on 17-19 July

CLUB NEWS

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

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

REGION 1 — RR B. O'Brien, G2AMV

Special regional events:
9 May—1971 Belle Vue Convention.

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

Ainsdale ARC—4, 18 November, 2 December, 8pm, Morris Dancers, Scarisbrick.

Allerton (Liverpool) Scout Amateur Radio Society North-West Region—Thursdays, 8pm, Allerton Group Headquarters, Aigbyrth Vale, Liverpool 17. All Scouts interested in amateur radio are welcome.

Blackburn (East-Lancs ARC)—5 November (Talk by G2HFP), 3 December (AGM), 7.30pm, Edinburgh House, Shearbank Road, Blackburn. Further details are available from G4JS.

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

Bury (B & RRS)—Second Tuesday each month with an informal meeting on the fourth Tuesday, 8pm, The George Hotel (private room), Market Street, Bury. Secretary; G3VVQ, 411 Holcombe Road, Greenmount, Bury.

Carlisle (C & DARS)—Mondays, 7.30pm, Currock House, Lediard Avenue, Currock, Further details from A. Treanor, G3FZG, 171 Scotland Road, Stanwix.

Cheshire (Mid-Cheshire ARC)—Wednesdays, 7pm, Technical Activities Centre, Winsford Verdin Grammar School, Grange Lane, Winsford.

Chester (C & DARS)—Tuesdays except first Tuesday of each month which is net-night, 8pm, YMCA, Chester.

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

Douglas (D & DARS)—Second and fourth Wednesday each month, 7pm, 19 Rosemount, Douglas. Further details from W. J. McEvoy of that address. Tel Douglas 6146.

Eccles (E & DRC)—Tuesdays, 8pm, Bridgewater School, Worsley, Lancs. Thursdays: Club top-band net 2030gmt.

Leyland Hundred Amateur Radio Group—Net nights: Thursdays 2000gmt, 1915kHz. Saturdays 1900gmt, 145·8MHz.

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

Liverpool (NLAC)—6 & 20 November, 4 December, 8pm, Labour Party Headquarters, 13 Crosby Road South, Liverpool 22.

Manchester (M & DARS)—Wednesdays, 7.30pm, 203 Droylesdon Road, Newton Heath, Manchester 10.

Manchester (SMRC)—6 November (Technical topics), 13 November (Films—"Apollo in Ascension", and "East West Island"), 20 November (Mini lecture contest), 27 November ("Silk screen printing", by T. W. Cannell–diy QSL cards), Fridays, 8pm, Conservative Divisional Office, 449 Palatine Road, Northenden, Manchester.

VHF section of club meets on Mondays, 8pm, at the club shack, "Greeba", Shady Lane, Manchester, 23. Secretary: G3WFT.

Preston (PARS)—12, 26 November, 10 December, 7.30pm, Windsor Castle (private room), St Pauls Square. Secretary: G. Windsor 26 St Gregorys Road, Preston.

Salford (Dial House Radio Society)—A society formed of GPO engineers. Wednesdays, 6pm, 8th floor, river end of Dial House, Chapel Street, Salford 3. Further details from the secretary at this address.

Southport (SRS)—Write to secretary, A. White, 91 Portland Street, Southport for details.

Southport (73 SSB Society)—Please note that this society has ceased its activities.

Stockport (SRS)—Second and fourth Wednesdays, 8pm, The Blossoms Hotel, Wellington Road South. Further details from the secretary, G8BCG.

Thornton Cleveleys (TCARS)—11 and 25 November, 9 December 8pm, St John Ambulance Brigade Hall, Fleetwood Road North Thornton, Blackpool.

Warrington (Culcheth ARC)—Fridays, 7.30pm, Chat Moss Hotel Glazebury. All visitors welcome. Secretary: K. Bulgess, 32 Hendon Street, Leigh.

Westmorland—Fridays, 7.30pm, 24 Park Road, Milnthorpe. All visitors welcome. Secretary: J. Forester, 44 New Street, Carnforth.

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

Wirral (WARS)—First and third Wednesdays each month, 7.30pm former Civil Defence Headquarters, Lipton Road, Bidston, Birkenhead. Secretary: A. Fisher, G3WSD, 34 Glenmore Road, Oxton, Birkenhead.

Wirral (Wirral DX Association)—Last Thursday in each month at homes of members. November (at G3UFO for a showing of slides of members stations). Arrangements for December Christmas Dinner are underway. Secretary: J. A. Share, G3OKA.

REGION 2 — RR K. Sketheway, BRS20185

Bradford (BRS)—3 November (Visit to Firts Carpets Ltd), 17 November (Mullard Film Show), 7.30pm, 10 Southbrook Terrace, Great Horton Road, Bradford 7. Morse practice prior to the meeting by arrangement. *G3HJP*.

Durham (DCARS)—12 November ("Where the bargains are" pin-pointing the best buys in components and equipment), 19 November (Annual constructional contest), 7pm, Room 146, Durham University's Elvet Riverside Arts Block, New Elvet, Durham City.

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

Halifax (NHARS)—11 November (Mr Craven's lecture), 25 November ("Radio astronomy", by L. M. Dougherty), 7.30pm, Peat Pitts Inn, Ogden, Near Halifax.

Hull (H & DARS)—6 November ("Leads or pins", by F. Longson G3SSA and J. Lawrence, G3PQY), 13 November (Film Fun), 20 November (Short wave listeners night), 27 November ("Tips on soldering", by T. Pearson G3RDM), 4 December (Construction night), 7.45pm, 592 Hessle Road, Hull. RAE lectures every Friday evening commencing 9.30pm.

The Open Night At Hull, held on 2 October, was attended by 110 amateurs. Mr A. Watson, G6UJ, the oldest known amateur in the area, gave a short talk on amateur radio going back to 1926. This was followed by a film made and presented by G3PQY, showing club activities on field days, both NFD and VHF NFD. Amateurs came from Hull, Scarborough, York, Goole and many smaller places between. This was a very successful event and it is hoped to make it an annual one. *M. Longson.*

North Riding (NRARG)—Group meets in the back room on the

Ship Inn, Flasgrave, Scarborough, alternative Tuesdays and Thursdays fortnightly. Details from the secretary, Jeff Jones, G3VLM, at Bingley Private Hotel, Albermarle Cresent, Scarborough. *G3VLM.*
Scarborough (SARS)—Thursdays, 7.30pm, c/o RAF Association, Fulbeck House, 3 Westover Road, Scarborough.
South Shields (SS & DARC)—13 November (Visit by Mr Robertson of Marconi Marine for talk and film show on marine radio), 8pm, Trinity House Social Centre, Laygate, South Shields.

The AGM was held on 18 September and officials elected were as follows: President, E. Clarke, G8AO; chairman, K. Sketheway, BRS20185; secretary, F. Harrison, G3SFL; treasurer, T. Williamson, G3RKR.
Sheffield (SARC)—24 November (Construction competition, no rules just bring what you have), 8pm, Crosse Scythes Hotel, Totley *G8NN.*
Spen Valley (SVARS)—12 November (Visit to Baird Television, Bradford, for a talk and demonstration on the spectrum analyser), 19 November ("What not to twiddle", by D. M. Pratt, G3KEP), 26 November ("The Ansafone", by J. Milnes, G8DSB), 7.30pm, The Grammar School, High Street, Heckmondwike. *G8BSC.*
Sunderland (SARS)—Meetings on first and third Tuesdays of each month. 17 November ("Microwave radio links" by C. Forster, 7pm, Sunderland Polytechnic.

REGION 3 — RR R. W. Fisher, G3PWJ

Birmingham (MARS)—10 November (Annual surplus gear sale), one month early, 7.45pm, Midland Institute, Margaret Street, Birmingham 3.
Coventry (CARS)—6 November ("Circuits to success", a lecture by Mr M. Kinseells), 13 November (Club night on the air), 20 November (RSGB tape and slide lecture), 27 November (Night on the air), 8pm, City of Coventry Scout headquarters, 121 St Nicholas Street, Radford.
Dudley (DARC)—3 November (The club project), 17 November (Talk, equipment and observations on uhf/shf by Mr A. Wakeman, G3EEZ), 8pm, Central Library, St James' Road, Dudley. *G3PWJ.*
Lichfield (LARS)—First Monday and third Tuesday of each month The Swan Hotel, Lichfield. *G8CNB.*
Rugby (R & DAR & EC)—Informal meetings are held every Tuesday, First Tuesday in each month, special activities lectures, demonstrations, etc, 8pm, 10 Drury Lane, Rugby. *G3YQC.*
Shrewsbury (SARS)—Every Thursday evening, 7.30pm, Harlescott Youth Centre, 218 Sundorne Road, Shrewsbury. *G3UDA.*
Stoke-on-Trent (NSARS)—Every Monday evening, 7.30pm, Harold Clowes Community Association Centre, Bentilee, Stoke-on-Trent.
(S-o-TARS)—Every Thursday, 7.30pm, 2a Race Course Road Oakhill, Stoke.
Solihull (SARS)—17 November (Post Office and RSGB film), 7.30pm, The Manor House, High Street, Solihull. *G3VPE.*
Stourbridge (STARS)—10 November (Talk and demonstration on amateur tv by G6KQJ/T, G8ACB), 8 pm, Longlands School, Stourbridge. *G8CVK.*
Stratford (SoA & DARC)—13 November ("Electron microscope", by G3OOQ), 27 November (Electron microscope demonstration by G3OOQ at NVRS Wellesbourne), 7.30pm, Halls Croft, Old Town, Stratford.
Telford (WARS)—Every Wednesday evening, 8pm, Ketley Bank Youth Club, Main Road, Ketley Bank, Telford, Salop. *G3YEW.*
Worcester (W & DARC)—14 November (Junk sale), 8pm, Perdiswell Park, Droitwich Road, Worcester. *G3VJN.*

REGION 4 — RR T. Darn, G3FGY

Derby (DADARS)—4 November (Surplus sale), 11 November ("Remembrance night"—ragchew on war-time experiences), 18 November (The oscilloscope), 25 November (Informal discussion on club matters), 27 November ("23cm and down", by G3EEZ), 2 December (Surplus sale), 9 December (Constructors contest for the Founder Member's Trophy). All meetings commence at 7.30pm and are held at Room 4, 119 Green Lane, Derby. Visitors are welcome
Derby (NHCAARG)—6 November (Annual general meeting), 13 November (No meeting), November 27 (Talk—"The principles of alignment"), 20 December (Night on the air). *G3LCV.*
Heanor (SEDRS)—3 November (Forum—questions and answers), 10 November ("The superhet", by G. Benniston), 17 November (Talk by F. H. Smith), 24 November ("The signal booster").
Melton Mowbray (MMARS)—20 November (RSGB recorded lecture—"Amateur radio, my window", by a blind amateur, G3TJO). Meetings commence at 7.30pm at the St John's Ambulance Hall, Ashfordby Hill, Melton Mowbray.

REGION 5 — RR S. J. Granfield, G5BQ

Stan Granfield, G5BQ, regional representative for Region 5 for many years, was married in Cambridge on 16 September to Helen Mary Farren. G5BQ is a member of the Cambridge City Council, and his wife is the daughter of the late Sir William Farren, FRS, at one time director of the Royal Aircraft Establishment at Farnborough, and a director of the Hawker Siddeley aircraft firm.

Bedford (B & DARC)—5 November (Informal), 12 November (Receiver night — demonstrations on BC348, Eddystone 640, Mohican) 15 November (Club contest 0800-1200. All bands and all modes), 19 November (Ancient documents by a visiting lecturer—bring the xyl), 26 November (2m sound, 70cm tv—G3SOA), 3 December (Light beam transmitter by G3LYD), meetings at "The Dolphin Inn", Broadway, Bedford.
Cambridge (C & DARC)—Club meets on Fridays at 7.30pm, at the club headquarters, Corporation Yard, Victoria Road, Cambridge.
Dunstable Downs (DDRC)—Meetings held on Friday evenings at Chew's House, High Street, Dunstable, Bedfordshire. Full particulars obtainable from G8BWZ, 51 Manor Park, Houghton Regis, Dunstable, Bedfordshire.
March (M & DRAS)—Club meets on Tuesday evenings at the old police headquarters, High Street, March, Isle of Ely.
Peterborough (P & DARS)—Meeting at 7.30pm on first Friday in the month, in the Electronics Section, Peterborough Technical College, Eastfield Road. On other Friday evenings meetings are at 8pm in the club headquarters, the Old Windmill, behind the Peacock Inn, London Road, Peterborough.
Shefford (S & DRS)—Thursdays, 5 November ("Atmosphere phenomena", by G8CTB), 12 November (Quiz and judging construction competition—club), 19 November (Annual dinner preparation and surplus sale—club), 26 November ("Integrated crystal calibrator", by G3XTQ), 28 November (Annual dinner), 3 December (Annual dinner review, how much do we owe?), 8 pm, Church Hall, Ampthill Road, Shefford. Morse classes at 7.45pm.

REGION 6 — RR L. W. Lewis, G8ML

Cheltenham (RSGB Group)—First Thursday, 8pm, Great Western Hotel, Clarence Street, Cheltenham.
Gloucester (GRS)—Second and fourth Thursdays each month, RAFA Club, 6 Spa Road, Gloucester.
South Bucks VHF Club—3 November (Sales-demonstration of vhf equipment), 1 December (Convivial evening), 8pm, Bassetsbury Manor, High Wycombe.
North Buckinghamshire Amateur Radio Society—Second and fourth Wednesday at the Wolverhamton Youth Club, RAE class at Wolverton College of Further Education. G3ZNY, 11 Kingston Avenue, Stony Stratford.

REGION 7 — RR P. A. Thorogood, G4KD

Do not forget to notify headquarters if you are an area representative. If you are the new secretary of an affiliated society notify both headquarters and me to enable records to keep you up to date with new members.
Acton, Brentford & Chiswick (ABCRC)—17 November (General discussion), 7.30pm, Chiswick Trades & Social Club, 66 High Road Chiswick.
Addiscombe (AARC)—Second and fourth Tuesday 7.30pm, Toc H Hall, 158 Lower Addiscombe Road.
Ashford, Echelford (ARS)—Second Monday and last Thursday in each month, 7.30pm, St Martins Court, Kingston Crescent, Ashford Middx.

Congratulations to five new RAE passes, four with licences already.
Barking (B & DREC)—Tuesdays and Thursdays, 7.30pm, Gascoigne Recreation Centre, Gascoigne School, Morley Road, Barking.
Bexleyheath (NKRS)—Second and fourth Thursdays In each month. 7 November (Annual dinner and dance, together with CVRS,

will be at "Woodman", Blackfen), 12 November ("Talking about cw", by P. Baber), 26 November ("Radio and private flying", by G3GOG), 7.30pm, Congregational Church Hall, Chapel Road, Bexleyheath. 35 Members (30 RSGB) heard G. Stone, G3FZL, and R. Burns, G3OOU, give a most interesting talk on vhf/uhf transmitters at the last meeting.

Cheshunt (CDRC)—First Friday of month, 7.30pm, Methodist Church Hall, opp Theobalds Station, Cheshunt.

Chingford (RSGB Group)—Friday. Telephone 01-524 0308.

Chingford (SRC)—Fridays, 7.30pm, Friday Hill House, Simmons Lane, Chingford, E4.

Civil Service (CSRS)—First and third Tuesdays, 6.30pm, Civil Service Recreation Centre, Monck Street, Westminster.

Croydon (SRCC)—Third Tuesdays. 17 November (Extraordinary general meeting followed by a ssb talk by M. Emmerson, G3OQD, and G. Mitchell, G3OFJ), 7.30pm, Swan & Sugarloaf, South Croydon.

Crystal Palace (CP & DRC)—14 November ("Amateur radio in Australia" and illustrated talk, by Ron Vaughan, G3FRV), 19 December (Grand junk sale and Christmas Party), 8pm, Emmanuel Church Hall, Barry Road, SE22.

Dorking (DR & DRS)—Second and fourth Tuesdays. Second Tuesday, "Wheatshaft"; fourth Tuesday, "Star & Garter", Dorking.

Ealing (E & DARS)—Tuesdays, 7.30pm, Northfields Community Centre, Northcroft Road, W13.

East London Group—15 November ("Transistor amplifiers", by F. Schnuss, G5AAN), 3pm, Wanstead House, The Green, Wanstead, E11. (200yds Wanstead station, Central line).

Edgware & Hendon (E & DRS)—9, 23 November, 8pm, St Georges Hall, 51 Flower Lane, Mill Hill, NW7.

Farnham, Bucks (Burnham Beeches RC)—Fortnightly on Mondays, Farnham Common, Village Hall, Victoria Road.

Gravesend (GRS)—Thursdays, 7.30pm, Northfleet Recreation Centre, Springfield Road, Northfleet. Secretary: A. Moules, 166 Darnley Road, Gravesend.

Guildford (G & DRS)—Second and fourth Fridays, Guildford Engineering Society, Stoke Park.

Hampton Court (TVARTS)—First Wednesday in each month, 7.30pm, The Three Pigeons, Portsmouth Road, Surbiton.

Harlow (DRS)—Tuesdays (General and cw practice); Fridays (Junior meetings), 7.30pm, Mark Hall Barn, First Avenue,

Harrow (RSH)—Every Friday, 8pm, Harrow County School for Boys, Sheepcote Road, Harrow.

Havering (H & DARC)—Fortnightly, 8pm, British Legion House, Western Road, Romford.

Hemel Hempstead (HH & DARS)—First and third Fridays, 7.30pm. "Addmult" Sports Club, Hemel Hempstead.

Holloway (GRS)—Mondays (RAE, 7pm); Wednesdays (Morse, 7.30pm); Fridays (Club, 7.30pm), Whittington School, Archway School Annex, Highgate Hill, N19.

Ilford—Every Thursday, 8pm, 50 Mortlake Road (off Ilford Lane), Ilford.

Kingston (K & DARS)—Second Wednesday. 11 November ("About aerials", by hon secretary, R. S. Babbs, G3GVU). 9 December ("Current developments in frequency standards", by C. Cardwell of the National Physical Laboratory, Teddington), 8pm, Penguin Lounge, 37 Brighton Road, Surbiton.

Leyton & Walthamstow—Tuesdays, 7.30pm, Leyton Senior Institute, Essex Road, E10.

London (UHF Group)—First Thursday, 7.30pm, Whitehall Hotel, Bloomsbury Square, Holborn, WC1.

Loughton—Fortnightly on Fridays, Loughton Hall, Rectory Lane (near Debden station).

New Cross (Clifton ARS)—Wednesday and Fridays, 8pm, 225 New Cross Road, SE14.

Paddington (P & DARS)—Thursdays, 7.30pm, Beauchamp Lodge, 2 Warwick Crescent, W2.

Peterborough (P & DARS)—First Friday in each month, 7.30pm, the lecture hall of the Engineering Block at Peterborough Technical College, Eastfield Road, Peterborough. Other Fridays, 7.30pm, at the clubroom in the Old Windmill, behind the Peacock Inn, London Road, RAE classes on Tuesdays, 7pm, at the College.

Purley (P & DRS)—First and third Fridays, 8pm, Railwaymans Hall, Side Entrance, 58 Whytecliffe Road, Purley.

Reigate (RATS)—First Wednesday, 7.45pm, George and Dragon, Cromwell Road, Redhill.

Romford (R & DRS)—Tuesdays, 8.15pm, RAFTA House, 18 Carlton Road,

Scouts (ARS)—Third Thursdays of month. 19 November (Film on satellites), 17 December (Christmas social), 7.30pm, Baden Powell House, Queensgate, South Kensington, SW7.

Sidcup (CVRS)—5 November ("Vhf solid state transmitter design and construction", by R. F. Burns, G3OOU). 19 November (Natter night), 3 December ("The joystick antenna", by E. H. Chaudri G3DCS) 8pm, Congregational Church Hall, Court Road, Eltham, SE9.

Slough—Any RSGB members interested in forming a local group please contact G4KD.

Southgate (SRC)—Second Thursday of month, 7.30pm, Civil Defence Hut, Bowes Road, N21.

St Albans (Verulam ARC)—18 November ("Radio in Antarctica" with illustrated colour slides, by R. Kressman, G3SIT, ex VP8), 7.30 for 8pm, Council Chamber, Town Hall, St Peters Street, St Albans.

Congratulations all on reaching the 10th anniversary and dinner on 3 October. There were 47 present and nine members were presented with certificates for being at the inaugural meeting on 3 October 1960.

Sutton & Cheam (SCRS)—Third Tuesday in each month. 18 November (Junk sale), 8pm, The Harrow Inn, High Street, Cheam.

Welwyn (Mid-Herts ARS)—Second Thursday in each month. 12 November (Second lecture in the series on construction practice by G. Eddowes, G3NOH, who will be talking on construction of vhf vfos), 8pm, Welwyn Civic Centre, Welwyn.

Wimbledon (W & DRS)—Second and last Fridays. 13 November (ITA will talk on their transmitters), 27 November (Club station G3WIM will be on the air.—Can you find them on what frequency?), 8pm, St John Hall, 124 Kingston Road, South Wimbledon, SW19.

Wembley (GECARS)—Thursdays, 7pm, Sports Club, St Augustin Avenue, North Wembley. (This club is open to non-GEC employees by invitation, telephone Dain Evans, G3RPE, 904 1262 for details).

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

Brighton (BTCARC)—Meetings held in the club shack, 7.30pm. Details of programme from G3XUS.

Canterbury (EKRS)—19 November ('Aerials', by G3JIX), 17 December ('Mobile' by G3WAW). Meetings held at present on a monthly basis. Details from G3MDO, QTHR.

Dover (SEK YMCA ARC)—Meetings held every Thursday, 7.30pm, YMCA Leybourne Road, Dover.

Eastbourne (SARS)—Meetings held on first Monday in every month at the Victoria Hotel, Latimer Road, Eastbourne.

Maidstone (M YMCA ARS)—Meetings held every Friday at Y Sports Centre, Melrose Close, Loose, Maidstone. Details of meetings from G3WXL, QTHR.

Mid-Sussex (M-SARS)—All meetings and club station at Marle Place, Leylands Road, Burgess Hill.

Thanet (TRS)—6 November ('Colour television', by M. Jordan), 13 November (Film show), 20 November ('VHF Portable', by G8AJC) 27 November (Visit to South-East VHF Group meeting at Canterbury), 4 December ('RSGB Affairs', by regional representative).

Worthing (W & DARC)—10 November ('International aspect of amateur radio'—slide lecture). Meetings every Tuesday at Rose Wilmot Youth Centre, Littlehampton Road, Worthing. Further details from G6KFH/T.

REGION 9 — RR J. Thorn, G3PQE

Bristol, City and County (BARC)—Every Tuesday and Thursday. The Annual General Meeting was held on 29 October and reports of the many activities of the club were made. Club HQ (G3TAD), 41 Ducie Road, Barton Hill, Bristol 5. *G3SXY.*

(RSGB)—23 November, 7.30pm, Beckett Hall, St Thomas Street, Bristol 1. *G3ULJ.*

(Shirehampton)—Every Friday, Twyford House, *G3YIQ.*

(University ARC)—Each Saturday afternoon, Dept of Physics, Royal Fort, Tyndall Avenue, Bristol 8. *G8ADP.*

Cornish (CARC)—Meetings at SWEB Club Room, Poole, Camborne. *G3UCQ.*

(Falmouth)—G3OJN.

(Newquay)—G3THT.

Exeter (EARS)—3 November (Film show), 1 December (Nattering), 7.30pm, St Davids Hill YMCA, Exeter. *G3HMY.*

North Devon (NDARC)—11 November (Talk), 25 November (Ragchew), 9 December (Talk), 7.30pm, "Grinnis", High Wall, Sticklepath, Barnstaple. *G4CG.*

Plymouth (PRC)—3 November (Members slide show—bring yours along), 14 November (Annual dinner and dance at Davie Hall, North Hill, Plymouth. Tickets from G3SPI at 25s each,) 1 December ("Emphasis on transistors" by G3OIQ). *G3SPI.*

Saltash (S & DARC)—6 November (Talk by G3WYJ), 20 November (Annual reports), 7.30pm, Burraton Toc H, Saltash. *G3XWA.*

South Dorset (SDRS)—RAE course is being held at the Technical College each Friday. 6 November (Talk by G3XTK—SDTC), 4 December (Talk on hf aerials by G3COV—SDTC), 7.30pm, Weymouth Technical College.

Taunton (T & DARC)—Annual General Meeting held in September. G3DTB carries on as chairman with G8CWD as his secretary. Club meetings resume each Friday at 7.30pm, in the County Control, beneath the new County Building. *G8CWD.*

Torbay (TARS)—Every Tuesday and Friday. Last Saturday (Business meeting). All at the Club HQ (G3NJA), Bath Lane, rear of 94 Belgrave Road, Torquay. *G3NQD.*

Weston-Super-Mare (WSMARS)—6 November, 4 December. Both meetings start with a part of a new film on "Aerials", then follows a talk. 7.30pm, Small Lecture Theatre, Ground Floor, New Building. *G3GNS.*

Wells—Contact G3MVA.

Yeovil (YARS)—Wednesdays, The Park Lodge, Yeovil. *G3NOF.*

REGION 10 — RR D. M. Thomas, GW3RWX

Blackwood (ARC)—Fridays, 7pm, Blanche Cottage, off High Street, Blackwood, Mon.

Barry College of Further Education (ARS)—Thursdays, 7pm, College of Further Education, Colcot Road, Barry, Glam.

Cardiff RSGB Group—Mondays, 7.30pm, lecture at TA Centre Park Street, Cardiff.

East Glamorgan Raynet Group—Meetings being re-organised. Full details from GW3ZFG. Cardiff 62411.

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

Port Talbot (ARC)—Meetings second Tuesday of month, 7.30pm Trefelin Club & Institute, Port Talbot. Secretary is GW5VX.

Pontypool (ARC)—Last Friday of each month, Defensible Barracks, Pembroke Dock. *GW3LXI.*

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

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

Swansea Telephone Area (ARS)—Tuesdays, 7.30pm, Telephone Engineering Centre, Gors Road, Swansea. Club callsign is GW3ZTK and the secretary Mr D. E. Connor, 7 Glanmon Park Road, Sketty, Swansea, Glam.

University College, Cardiff (ARS)—Details of meetings from the secretary, Students Union, Dumfries Place, Cardiff. Callsign is GW3UWC. Shack location at rear of Communications Centre, Park Place.

University College, Swansea (ARS)—Details of activities from the secretary, c/o Students Union, University College, Singleton Park, Swansea.

REGION 11 — RR P. H. Hudson, GW3IEQ

Conway Valley Radio Club (CVRC)—19 November ("More about vhf and uhf", by G. Barnes, G3OAS, who is the sales representative of GEC), The Parade Hotel, Llandudno.

The meeting on 17 September discussed the club's future activities.

REGION 12 — RR A. W. Smith, GM3AEL

Aberdeen (AARS)—Fridays, 7.45pm, 6 Blenheim Lane, Aberdeen. GM3HGA, telephone Aberdeen 33838.

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

Inverness (IRS)—Thursdays, 7.30pm, 4 Falcon Square (near railway station), Inverness.

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

Lhanbryde (MFARS)—Wednesdays, 7.30pm, St Andrews School Lhanbryde, by Elgin, Morayshire. GM3UKG, telephone Clochan 225.

REGION 13 — RR V. W. Stewart, GM3OWU

Border Amateur Radio Society (BARS)—Meets on the first Sunday of each month, 3pm, the Cross Keys Hotel, Greenlaw, Berwickshire. Further details are available from GM3WIG, QTHR.

Lothians Radio Society (LRS)—12 November ('Components at vhf', by Texas Instruments Ltd), 26 November ('Transistor dc to dc converters', by GM3UDL and GM8CFL), 7.30pm, 66 Hanover Street, Edinburgh.

REGION 14 — RR N. G. Cox, GM3MUY

Ayrshire (AARG)—8, 22 November, 7.30pm, YMCA Howard Street, Kilmarnock.

Ayrshire (Ardeer Recreation ARC)—3, 5, 10, 12, 17, 19, 24, 26, November, 7.30pm, Ardeer Recreation Club, Amateur Radio Section, Stevenston. Details from J. F. McCreight, GM3DJS, 10 Auchenharvie Road, Stevenston, Ayrshire.

Falkirk & District RSGB Group—7.30pm, Temperance Cafe, Lint Riggs, Falkirk.

Glasgow University (GURC)—13 November, 7.30pm, George Service House, University Gardens, Glasgow W2.

Greenock (G & DARC)—6, 13, 20, 27 November, 7.30pm, James Watt Library, Union Street, Greenock.

Mid-Lanark RSGB Group—20 November, 7.30pm, YMCA Brandon Street, Motherwell.

West Scotland (ARS)—6, 13, 20, 27 November, 7.30pm, Royal Signals Lowland HQ, 14 Jardine Street, Glasgow W2.

REGION 15 — RR J. Thompson, GI3ILV

City of Belfast YMCA Radio Club—Mondays, morse practice; Wednesdays and Saturdays, club nights. 8pm, City YMCA (3rd floor), 12 Wellington Place, Belfast, BT1 6GE. Information from YMCA General Office.

At the AGM the following officers were elected: President, R. J. Boal, GI3AXI; chairman, C. J. Rourke, GI3IVJ; vice-chairman, J. F. Campbell; hon secretary, D. G. Baxter; assistant hon secretary, J. Beattie, GI3NQH; hon treasurer, T. J. Moss, GI3UFH; committee members, Messrs R. A. Graham, B. Humphries, I. J. Kyle, GI8AYZ, R. E. Lindsay, R. Lorenz, A. J. Ruff, GI3ZJR, D. Waugh.

REGION 16 — RR W. J. Green, G3FBA

Basildon (VARS)—Thursdays, 7.30pm, The Scout Hall, Fairview Road, Vange, Basildon. *G3VOP.*

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

Colchester (CARS)—Wednesdays, 7pm, NE Essex Technical College, Colchester, *G3VAG.*

Gt Yarmouth (GYRES)—Fortnightly, 7.30pm, 98 South Market Road, Gt Yarmouth, *G3HPR.*

Ipswich (IRS)—Details from G3YWM, QTHR.

Norwich (NARC)—Mondays, 7.30pm, The Brickmakers Arms Sprowston Road, Norwich. Secretary: G. Purcell. Tel Drayton 459.

REGION 17 — RR Cliff Sharpe, G2HIF

Basingstoke (BARS)—7 November (Constructors evening), 21 November (Talk on aerials), 7pm, Chineham House, Popley Way, Basingstoke. Visitors and new members are always welcome. *G3CBU.*

Farnborough (FDARS)—10 November (Annual junk sale), 24 November (Annual general meeting), 8 December (Practical ssb), 7.30pm, Railway Enthusiasts Club, 310 Farnborough Road, Farnborough, Hants. *G8BVM.*

Fareham (FDARC)—1 November ("Dx on top band by balloon aerials", by G3RCE), 7-8 November (MCC), 15 November ("Etching a printed circuit", by G3LFM), 22 November (RSGB tape/slide lecture—"A history of radio"), 29 November (Committee meeting and club 'natter nite'), Slow morse on request at each meeting by G3YRO.

7.30pm, Portchester Community Centre, Portchester, Fareham, Hants. *G3XIV*.

Newbury (NDARS)—Meetings on the first Monday in each month. Next meeting on 2 November. 7 December ("IDesign of networks for transistor circuits", by Cliff Sharpe, G3HIF). 7.30pm, South Berkshire College, Oxford, Road, Newbury, Berks.

It is proposed to run a RAE course if there is sufficient demand in the district. Enquiries please, to G3KJC or G3TEK. *G3TEK*.

N Berks (AERE, Harwell, ARC)—Meetings on the third Tuesday in each month, and every Friday lunchtime. 17 November ("At home" to members of the Swindon & District ARC), 7.30pm, Social Club, AERE, Harwell, Didcot, Berks. *G3NNG*.

Reading (RDARC)—7-8 November (The 2m cw contest), 10 November ("The commercial approach", an engineer from Storno Ltd shows the commercial approach to vhf transmission and reception), 24 November ("Pedestrian portable", by Roy Powers, G8CKN). 7.30pm, Victory Public House, The Meadway, Tilehurst, Reading. *G3NBU*.

Swindon (SDARC)—4 November (Aerial lecture by Hal Perkins, G3NMH), 5 November (Firework party), 18 November (Junk Sale), 7.30pm, Penhill Junior School, Penhill, Swindon, Wilts. *G3JAP*.

Looking ahead

4 December—RSGB AGM.

11 December—RSGB Dinner Club, Kingsley Hotel, London WC1.

MEMBERS' ADS

These advertisements are accepted free of charge as a service to members of RSGB. They must be submitted on the Members' Ads order form printed on the penultimate page of each issue of *Radio Communication*, or on a post-card similarly laid out. Each must be accompanied by a recent *Radio Communication* wrapper addressed to the advertiser, as proof of membership.

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

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

The closing date for each issue is the 7th of the preceding month, but no guarantee of inclusion in a specific issue can be given. No correspondence concerning this free service can be entered into.

See the current order form for further details.

FOR SALE

Property of late G3IRD: Three Collins 455kHz mech filts, two 2kHz, one 8kHz bandwithds, full specifications. Offers to G3OUQ, QTHR. Tel 3390.

Property of late amateur: S37, 128 to 218MHz, excellent cond. CR100 wkg and fairly gd at hf. R1132A, rough wkg. Sensible offers, buyers test/collect. G3ADZ, QTHR. Tel Liss 3314.

Property of late G3PBP: Heathkit valve-voltmeter V7AU with rf probe 309CU, £10. Avo universal meter Mk3 model 8, with leather case, £22 10s. Pye desk mic, £4 10s. G3WLX, QTHR. Tel Beaconsfield 4965.

Property of late BRS20732: KW77 rx beam rotator, 4m convtr, Heathkit gdo, back copies of RSGB *Bulletins* and other publications. Contact H. R. Skelhorn, G8BPU, School House, Lowerhouse, Bollington, Macclesfield, Cheshire SK10 5HJ.

EA12, unused, £158, carr £1. BRT 400, £30, carr £2. Swan 500, re-valved, £200. G2BQZ, 19 Station Road, Tadcaster, Yorks.

Heathkit Mohican GD-1U rx, ex cond, with manual, £25 buyer coll from Ealing. Ashworth, tel 01-998 5753 evenings.

FR500DX with cw filter, ex cond, £100. G3POG, 24 Hilltop Road, Childwall, Liverpool. Tel 051-722 9502.

HW32A, psu and ptt mic. Factory checked June this year, £65. G3KNF, 458 Alum Rock Road, Birmingham 8. Tel 021-327 0398.

HRO with 9 gc coils and psu, £15. BC1000, pair £2. Creed 7B printer cab, £2. B2 tx, 30s. Pref buyer coll. G3SCZ, 192 Regents Park Road, Finchley, London N3.

Panda PR120V, £20. Buyer coll. G3MEJ, tel 01-648 5895.

Collins KWM2, 516F2 psu, 30L1 amp. All ex cond, £600. Crutchfield, 32 Eldorado Road, Cheltenham, Glos.

Viceroy 1, £80. Drake 2B and Q mult, £90. HQ170A, £90. Offers. Carr at cost. G3NOF, QTHR.

Truvox tape recorder, £10. BCC rx type 715 and circ. 80–100MHz but will modify for 2 or 4m, £2. Wanted: Marriott tape heads R/RP3 and R/E/1. G3NXT, QTHR.

RA1 with xtal calib, one year old, mint cond, factory aligned, £30. GW3YIL, QTHR. Tel Dyserth 321.

HRO with 8 coils (3 bandspread), psu and spkr, £12. Codar PR3OX preselector, £4. New cond, buyer coll. G3GZ, QTHR.

Swan 500C and ac psu. DX40U and vfo. GM3OFV, QTHR. Tel Glenrothes 3461.

HA500 rx, vy gd cond, £30. Vfo section of LM freq meter and psu, all in one, £5 ono. G3UBL, 9 Rampton Drift, Longstanton, Cambridge.

R107. R1392D with hndbk. 3339 Cossor scope, not wkg. Avo test bridge. Offers for any or all. G3KYG, QTHR. Tel Totton 3225.

Misc psus, valves, 2, 4 and 160m txs, electronic bug key, Z match, swr indicator. Send sae for list of prices. G8DT, QTHR. Tel Cheltenham 57969.

Sommerkamp FR100B rx, FL200B tx, FL1000 lin. Ex cond, comp with all necessary interconnections, hndbks and orig packing, £200. G3TDJ, 7 Glamorgan Road, Coombe Glen, Cheltenham, Glos GL51 5JF. Tel Chelt 26530.

Eddystone 888A, £60. Eddystone EC10, £30. Codar AT5 and 240V psu, £18. BC221, psu and charts, £18. Wavemeter No2 and charts £8. All in gd cond. Harrop, 9 Ferndale Road, Coal Aston, Dronfield S18 6BT. Tel Dronfield 4415.

BXI tilt-over 50ft two section telescopic tower with remote control motorized winch. Hot dipped galvanised, 2 years old and as new cost £190, accept £110 for quick sale. G3MCG, QTHR. Tel 01-303 9252.

Eddystone EC10 rx, vy gd cond, £30 buyer coll. Jones, 4 Llewelyn Road, Colwyn Bay.

Heathkit DX4OU, gd cond, £18. KW Victor, 120W, am/cw, relay operated, rack mounted or cabinet, with Reslo mic on table stand, £55. G2BSW, QTHR. Tel Axminster 3163.

Labgear quad spider, wire frames, insulators, 3 × 30ft coaxials. Comp less bamboo poles. Offers or monobander in part exchange. GI3SSR, QTHR.

Denco DCR19, bc to 30MHz, comp, revalved, needs alignment, £7. Scaling unit 1266B, 22 valves, dekatron readout, manual, £6. Buyers view and coll. G2BVN, QTHR. Tel 70 46749.

1MHz xtals, HC6/U, wire ended, 5s inc post and packing. G3REP 94 Canterbury Walk, Cheltenham, Glos.

Admiralty B40 rx with manual, serviced and re-aligned, £18. Will deliver London area. Horder, 152 Maidstone Road, New Southgate. London N11 2JP.

Magslips 50V 50Hz. Tx 3in diam, 40s ea. Rx 3in diam, 30s ea. Later model better type Tx 3in, 60s. Rx 3in, 60s ono. G3SJR, 29 Elm Walk, Stevenage, Herts. Tel Stevenage 51297.

AR88D, exc cond with manual, £30. 150W cw/am. tx, Geloso vfo, 813 pa, £25. BC221P, mint cond, charts and built-in psu, £20. CR300, built-in psu, £5. 5in oscilloscope, £5. G3NJU, 2 Rostherne Road, Wilmslow, Cheshire. Tel Wilmslow 24665.

High-gain TH3jr beam, £25 ono. 25ft all welded steel tower, any offers. Hansen, swr bridge, £2. GW3IMQ, QTHR.

Pye Reporter wkg on 4m, £5. Pye PTC114 20W boot mounting with control box, comp unmod and wkg on 4m, £6. Wanted: Creed teleprinter equipment. G3WJG, 22 Woodrow Close, Perivale, Greenford, Middlesex. Tel 01-997 0901.

Vhf power transistors, new, 2N3375 (7) £3 ea, 2N3553 (2) 15s ea, 2N3866 (4) 15s ea, 2N2893 (1), 12W out at 20MHz, £2. Pair 2N3583 for 160m lin *Radio Communication* July 1970, 30s pair. RCA40341 (1), 40W out at 50MHz, £2 10s. G8AVA, QTHR.

Minimitter MR44/11 rx for sale or would exch for gen coverage rx, 200kHz–530kHz, 1·5–4·5MHz. Cash adjustment as necessary. G3XOI, QTHR. Tel Southend 557468.

Sommerkamp FR100B rx with 160m, mint cond, as new, £75. Newey, 23 Lea-House Road, Causway Green, Oldbury, Warley, Worcs.

AR88D with S meter, manual, £40. Scope OS1 with manual, £12. Both ono. 70cm tx, QQVO2–6, a.m. 2m tx, QQVO3–20A, a.m. Will deliver up to 50 miles. G8ASL, QTHR. Tel 01-965 3688.

Hartley double beam scope, £12 10s. Stabilized psu, 400V 2 × 300V lts etc, £5. SCR522 tx/rx, £3. Wanted: rtty auto tape tx and olivetti T2 reperforator attachment. G3YLQ, QTHR. Tel Luton 25595.

Valves: 5Z3, 6X5, ECC34, 6J7, 6V6, EF80, 6SN7, 6J5, EF50, 6AC7, 6AG7, OD3, EF80, VR150, A1714, 6140, 6AK6, PCC89, EF91 ECL80, 10F1, EL42, EB91, 6F13, 6D2, UCC85, EZ41, GV5A, 6140, 5s ea. Jeapes, 165 Cambridge Road, Great Shelford, Cambridge.

G2DAF Mk1 rx, £25. G2DAF Mk2 tx, £20, with psu. Hro rx, £5. Oscilloscope OS-8B/U, £15. Callers only or phone after 6.30pm. G3WYY, QTHR. Tel Eccleston 373.

60W hi-fi amplifier with 120W ldspkr in strong ¾in chipboard cab, both rexine covered, peak ratings, suit bass, lead, organ. Sae for photo and info, £30. Needham, 50 The Mall, Faversham, Kent. Tel Faversham 2162.

US air force equipment: USM38 scope comp with manual, probes etc, £45. TS505D valve voltmeter, manual etc, £32. Command rx, 1·5–3MHz, £10. BC221, £25. All in mint cond, carriage extra. Wanted: TW2 tx. G3GUU, QTHR.

B2 spy tx/rx and psu, bat/mains, comp as issued with hndbk, coils, key etc, £28 ono. Wanted: 10–15–20m beam, cheap. Also 250-0-250V 80mA, 6·3V, 5V transfmr. Wright, 34 Webbs Way, Stoney Stanton, Leicester. Tel Saplote 3404.

Panda PR120V, 150W a.m./cw 80–10m tx, new valves, fp respray, perf wkg order, vgc, £35 ono. 160m a.m./cw tx, 10W pa (5763), ex RSGB design, £15 ono. PR120V atu, £5. Wanted: 3E3B beam. Telomast or sim tower, 30–50ft. G3ZAF, 72 Arnal Crescent, Beaumont Road, Wimbledon, SW18. Tel 01-789 6354.

Two 807 valves, 5s ea. Mains trnsfmr, 450–400–0 double, lt windings, 15s. 5 gang capacitor apprx 50pF, slow motion drive, 10s. Three Carpenter polarised relays, 7/6d ea. One Mercury 1000Ω relay, 7/6d. Three 10X 2m xtals, approx 144·62, 144·79, 144·54, 7/6d ea. G8BYC, 56 Holden Park Road, Southborough, Tunbridge Wells. Tel Tunbridge Wells 29849.

CR100, wkg but case tatty, £8 ono. 4m vhf xtal, 70·575MHz wire ended miniature, 15s. G3RDQ, QTHR. Tel Radnage 2461.

Texas 2N5245 fet, brand new, 8s ea or £4 10s a doz. Lovoi 375-725MHz wavemeter, £5. 115U Venturi fan, £1 10s. 144MHz convtr, 2N5245s throughout 24–26MHz i.f., printed circuit, £8 10s. Diecast box, 10¾in × 6¾in × 2¾in, 15s. Wanted: QQVO3-20A. G8APV, QTHR.

CR100, £12, del by arrangement. Xtals: 10X; 6180, 3738kHz, 5s ea. 10XJ; 8070, 8075·63, 8092kHz. FT243; 6025, 8025, 8100kHz. FT241; Chan 70 HC6U; 33·333 35·216MHz, all 10s ea. G8ANU, QTHR. Tel Stafford 62533.

Heathkit Mohican GC1U Mk2, factory built, as new custom cabinet, £28. Will exchange Juliette NA5018A with bfo in similar cond. Bigley, 89 Rocheway, Wellingborough, Northants. Tel Wellingborough 4530.

SB301E with cw filter mint cond, hardly used, £95. DX100U, gd cond, £25. Both with manuals. Write for further details. Wil deliver 150 miles. G3VUS, QTHR.

New aerial masts. Heavy gauge aluminium alloy tube. 16ft by 1⅛in od by 1¼in od tube for telescoping, £5 4s. Will deliver Midlands only. G8AHH, 25 Canning Road, Parklands, Walsall, Staffordshire.

Redifon vhf/fm hi-band, multi channel, simplex/duplex, dual watch, table-topper. No xtals. Cost £220, snip at £65 ono. 888A, re-aligned, fb cond. £70. Marconi 15W mobile, hi-band, dash mounting £22 10s. Donohue, Tel 051-428 6851.

Kokusai mechanical filter type MF455–10CK, 2·5kHz bandwidth, comp with usb/lsb xtals, £12 10s ono. GM6ABP/T, c/o MESL Newbridge, Midlothian. Tel Kirkliston 277.

Labgear spider quad, 10–15m, will extend for 20m. Burma cane spreaders, £8. New 4CX250B, base, chimney and spare, £4. Almost comp 800W pep linear for personal caller, £12. GW3DZJ, QTHR. Tel St Asaph 3333.

GEC BRT402E rx, vgc, £40. Heathkit RA1, vgc, £25. Ranger lo-band £7. G3RAS, 17 Oakdale Drive, Shipley. BD18 1PD.

Lafayette KT340 rx, 550kHz–30MHz, ex cond, £15 ono. G8BLJ, 63 Tilewood Ave, Coventry CV5 7GT. Tel Coventry 462870.

CR100/8, one owner, vy gd cond, £20. G3USZ, QTHR. Tel Upminster 23699.

Transfmr: sec 350–0–350 and 6·3V, mains pri, 12s. 3 gang vari capacitor, 500pF per section, 6s. Both good cond. G3XYF, QTHR. Tel Nafferton 295.

Transceivers suit 2m. Pair Cossor 102PD with aerials, headsets rechargable batteries, hndbk, £30. Model 2000C dc/af oscilloscope, £15. Exch both for Eddystone hf rx? RA-1, ldspkr, £30. With 100kHz calibrator, £35. G8AWE, QTHR. Tel 01-574 0418.

2·8/3kV trnsfmr at conservative 280mA, 110/220V primaries, £4. 12V 80W pe gen, currently advertised for £18 10s, yours for £4 ono. Philips 3555 4 track stereo tape recorder, 3 speed, £35. G3LHZ QTHR. Tel Crawley 22476.

Mosley AR22 ant rotator and control unit, 6 mths old, £15. New factory built HM15 reflected power meter, £7. New Shure 201 mic, £4. Kellow, Glenvale, St Dominic, Saltash Cornwall.

Xtals as per Sept *Radio Communication*. Part built G2DAF rx, £20. Pye Ranger, £10. Pye Reporter, £10. For callers only, stacks of junk going cheap or free. G3VUT, QTHR. Tel 01-550 9300.

Lafayette HA350, cal xtal, spkr, as new, £35. Electroniques QP166 in case with 898 dial, S meter, psu, £10. 100mA meter, MR38P 12/6d. 150mA 3in sq, £1. 15V dc 2½in sq, 12/6d. Voxiphone intercom, 45s. G8AWV. QTHR. Tel 794 9934.

Trio JR60 rx, 550kHz–30MHz, 142–148MHz, selectivity and freq, Q mult, variable bfo and product detector, fm detector, 500kHz cal, S meter, avc/mvc, slide-rule scale, bandspread 80–10m, recorder socket, headphone socket, £35 ono. Freedman, Tel 01-590 0324.

Ekco ratemeter 1037A. Dynatron scaler 1009E. Dynatron operational amp 1430A, £9 ea. buyer coll, GM8APX, Braes of Dall, by Rannock Station, Perthshire, Kinloch. Tel Rannock 379.

HRO rx with 5bs coils and psu, £18. Codar PR30 pre-selector with separate psu, £4. Minimitter Z match, £6. R209 rx, 12V, 1–20MHz, slight fault, £9. *Radio Communication* and *SWM* for 1961 68 and 69, comp, offers. Wilkinson, 35 Street Lane, Leeds 8. Tel 664823.

Basic Electronics parts 1–6, vgc. Part 5 trainer tester. £3 the lot. *RAE Manual* (RSGB) and RAE question papers, 3s inc. *Manual of Modern Radio*, pub 1933, 10s. All post free. Pick, 30 Merlin Grove, Beckenham, Kent.

Will some members please relieve me of at least some of my Lambda stock, cash urgently required. Offers to G3KHA, 3 Cherry Grove, Yatton, Bristol, BS19 4DJ.

AR88D with cab and makers hndbk, £30. Class D wavemeter, mains operation, makers hndbk, £5. BC453B (Q5er), brand new, boxed, £5. Variable stabilised ht psu, £10. Also various trnsfmrs, meters, etc. Barnes, 105 Godstow Road, Wolvercot, Oxford. Tel Oxford 57697 evenings.

Class D wavemeter, wkg, hndbk, phones, int dc psu, £4. GM3YYY 94 Larkfield Road, Lenzie, Kirkintilloch, Glasgow. Tel 041-776 4833.

Bulletins and *SWM*, 1964–1970 inc, £2. Semi-auto bug key, 30s. Ledso swr bridge, £2. Quantity gd quality junk. G3SHM, 2 Braddon Avenue, Urmston, Nr Manchester, Lancs. Tel 061-748 9815.

3in Oscilloscope, circuit sim OS1, new tube, matching wobbulator, plugs into scope, £15. Martin, 46 Mill Drove, Bourne, Lincs. Tel Bourne 2498.

4ft chassis, 8½in × 4½in, very clean with neat face plate, contains four STC 5B255Ms, (min 807 no top cap), two EB91s, two EF91 valves, plus 11 position switch, high quality resistors, etc, £2 10s ea. G3WWL, QTHR.

VQ4EV 2m convtr. Top-band tx with modulator and psu, offers Swansea area. GW2FBG, 125 Dunvent Road Killay Swansea SA2 7NN. Tel Swansea 25352.

22 Set tx/rx, 2 to 8MHz, 10W output and transistor psu, £6 or exch for 19 Set and psu, all cons etc, or 52 Set tx with psu, cash adjustment pos. Vickers, 2 The Denes, Laughton Road, Ringmer, Sussex.

Tx/rx No 18, Mk3, comp with vibrator, £6 10s. Marconi 4m tx with rack psu, £9. Avo valve voltmeter, £8. Cossor scope, 2100, comp with probe, manual, £60. Seymour, 25 Ryde Buildings, Webb Street, London SE1.

Magslip transmitter No 5 and Magslip indicator, 8in dial, £3 the lot. Top band tx, 3 xtals, ext vfo, 6L6 pa, two 6L6 mod, self-contained psu, £5. Buyer collects. 143 *QSTs*, 1951–1963, offers. G3EJA, QTHR.

70cm convtr, GMO290 rf amp, GMO290 mixer, 3N140 i.f. amp quarterwave lines, i.f. 24–26MHz, £5. 70cm rf head requires osc/mult, 2 rf stages 2N3478, with circuits, £1 10s. 1in Vidicon deflection/focus coils, £1 10s, no data. G3TTV, QTHR.

BC221M, £15. CR300, int psu, £15. USA atu's, £5 10s. Crossover meters, £1. Avo 47A in case, £9. Aircraft rx R7303, 50s. Atu 7305, £4. Wattmeter af No 1, bargain, £5. All carr paid. GM3BQA, QTHR. Tel North Berwick 2519.

Two Doppler radar detectors, small, light, suit yachts etc, £8 ea or exch for dc coupled scope. Eht transfmrs, approx 1000W, 2, 3 or 4kV, offers. Ex rf heaters. G2HCJ, QTHR. Tel 051-426 4378.

Galaxy 5 Mk2 with 12V dc psu, home-built 230V ac psu and manual, air-tested only, del reasonable distance free, £175 ono. G3KPO, Jersey House, Eye, Peterborough. Tel Eye 351.

Heathkit RA1 rx with 100kHz xtal cal and fitted with variable bfo control, spkr and hndbks, good cond, £35 ono. G3ZAQ, Fields End, Gastrells, Stroud, Glos GL5 3PY. Tel Stroud 2189.

R1475 rx, £10 ono. 2m nuvistor convtr, 3·5–5·5MHz i.f., £4. TT21s, 12/6d ea. Sae for components list. G3NPZ, 7 Somaford Grove, East Barnet, Herts. Tel 01-440 6219.

Oscilloscope crt, type D6SQ, square, 6in, double beam, with info and similar tube, £15. Stabilized psu, 0–500V, 250mA, with hdbk, £20. Meek, 39 Horsebrook Lane, Brewood, Stafford. Tel Brewood 760.

EC10, S meter, calibrator, £35. Furzehill calibrator, 10kHz, 100kHz, 1MHz, £2. Erskine 13A, hndbk and probe, £12. KW77, one owner, cw filt, £65. KW Viceroy, 3g, extra filt, £80. HW32A, ptt mic, mobile ant, ac and dc psu, £60. G3RUG, QTHR. Tel: 061-439 7183.

Cheap transistors, 2N2369A, 24 for £1. BFY50, 10 for £1, both brand new, fully tested, post free. G3WVT, QTHR. Tel 061-652 2306.

BSR record deck (Monarch record changer) UA8, never used, £5. Newnes *Radio and TV Servicing* books, ex cond, vols 1 to 6, £4. Dale, 16 Tarrs Avenue, Kingsteignton, Newton Abbot. Tel Newton Abbot 4365.

Channel-Master Auto Tennaliner rotator and control unit, £15. Heathkit car radio K/CR–1, £8 ono. Wanted: synchronous motor, 1rpm, and uniselectors for digital clock (*Radio Communication* May 1969 issue). G3VLL, QTHR.

Star SR500 amateur bands rx, and hamgear PM2, £40. BC639A vhf rx, 100MHz–150MHz, mains, £10. Wavemeter D No 2, £10. Marconi B28 rx, £8, needs work. Hansen transistor checker, new, £5. Much more spares, sae list. Oxnard, Bungalow, Compton Chase, Westerham, Kent.

HRO 5R rack, gen cover coils, rack psu, £20. BC221 int psu, £15. Advance rf sig gen, D1, £5. Wanted: MCR1 coil pack, range 3 (4–8MHz), and loan of circuit and notes. G8BIH, 9 Yellowhammers Alton, Hants.

Eddystone S640, gd cond, new valves, £10. 813, 10s. TMR5 with clip on 4m convtr, £15. CN5, new, £5. 2002 modified 2m, £2. G3WMU, QTHR. Tel 65704.

200W modulator, push/pull KT88s, comp with bias supplies, stabilisers, multi-ratio mod transfmr, £5. 40W mod, comp, push-pull 6L6s with gd size psu, £3. Transfmr: 500–0–500 at 0·17A, £1. G8BKK, QTHR. Tel 01-850 3492.

Ventilated screened cabinet, copper plated steel, chrome handles, light grey crackle, 18½in × 10in 9in deep, £1, buyer coll. Valves: TZ40, 25s pair. DA100, 35s pair. Xtals: 1MHz, 15s. 8·066MHz, 10s. G3SBA, QTHR. Tel OLU27 4815.

Two Parvalux two rpm 35 lb/in geared motors with em brake, 25s ea. Two 30 rpm 33 lb/in without brake, 25s ea. All plus post. G3BZB, 5 Holts Lane, Tutbury, Burton on Trent, Staffs. Tel Tutbury 3209.

Wireless World, June 1968 to October 1970 inc, perf, 1/6d ea or 30s lot. RSGB *Bulletins*, August 1967 to October 1970 inc, perf, 1/6d ea or 45s lot. *Peking Reviews*, 58 copies from 1968 onwards, 1s ea or 50s lot. All items post paid. Also Red Chinese literature. All perf, sae list. Cash or exchanges, why. Hazelton, 7 Dorset Road, Burnham-on-Crouch. Tel Burnham-on-Crouch 2400.

Swop Collins mech filt, 3·1kHz at 455kHz, for good 9MHz filt (KVG, McElroy or sim). New 6–40A, £3. Pair 6GE5s for HW-rigs, new, unused, £3. G3LIV, 5 Lancashire Drive, Belmont, Durham. Tel Durham 63111.

Pair used 10E/222 (VCR97) scope tubes plus base, screen, suitable trnsfmr etc, offers. Also many valve ht trnsfmrs and high volt wkg paper capacitors. Sae for list. GM3WXR, QTHR. Tel 041-959 2966.

QQVO3–40A, new sealed boxed, £3. 832A, £1. 866, 10s. Pye Ranger /P hi-band, not wkg, fair cond, £4. Smith, 84 Kings Road, Brentwood, Essex. Tel Brentwood 2907.

14 ele Parabeam for 2m, £5 10s. 14 ele Skybeam for 70cms, £3 10s, both J Beam, good cond. Allen, "Rosswan," Dimmocks Lane, Sarratt, Rickmansworth, Herts. Tel Kings Langley 62438.

BC221, £15. Wavemeter TF643A, 20–220MHz, £5. Joystick atu, £1. Xtals my choice, 2s ea. Various other items, inc comp darkroom, sae. Wanted: cassette tapes, details of price. G3AAJ, 94 Herongate Road, London, E12 5EQ. Tel 01-989 6741.

LG50, faithful servant now ousted by "Disneyland" Swan, seeks new home. First £20 secures, buyer coll. Wanted: borrow gen on master oscillator No 27. GW2BOU, QTHR. Tel Barry 2703.

Mullard 5 valve tape pre-amp with 3 speed equalization. Comp with psu, £6. Grundig TK1 battery tape recorder with mains psu, £7. Pratt, 30 Lyndale Road, Eldwick, Bingley, Yorks. Tel 097-66 3699.

Manuals, original, brand new, for SCR269G (BC433), and IE19A TBST equip, (includes SCR522 circ), 30s ea. RCA trnsfmr, 230V input, 115V twice at 4 amps, 6000V 80mA output, unused, £4. Sae enquiries pse. G3IUD, QTHR.

Dubilier nitrogol capacitors (not polarized), 8uF, 1000V, at 70°C, with fixing clips, 5s ea. Wanted: Barograph. G3KSU, 11 Grange Avenue, Ryde, IOW. Tel Ryde 5551.

Drake TR4 TCVR1 and psu, perf mint, original pack, with manual, £290. Hunter bandit 2000A linear, 2000W ssb or cw, Collins, grey switchable for lower outputs, immac cond, manual, £180. EI6AX, QTHR. Tel Allihies 11 (Eire).

Katsumi EK9X electronic bug key, £5. Browns international princess lightweight hdphns, £1. G3HSC advanced morse record, 25s. All post paid. G5NU, QTHR. Tel Reading 81200.

HW32 trnscvr, comp with home-built psu, most mods to HW32 std fitted professionally, £40. Pye Ranger, high band, unmodified, comp except xtals, £5. G3RTJ, QTHR. Tel Buckingham 3442.

Trio 9R-59DE, 10 months old, really fb cond, with phones and stabilizer tube, buyer coll or add carr. £31 10s. G3YMP, 42 Southwall Road, Deal, Kent.

Cossor 892 storage tube ex equipment, gd cond, £3. 2TX504 transistors, 8/6d. 5000µF 25V, 10s. 5000µF, 50V, 15s. 680 Ω 3W, ww resistors 1s. Sae for full list. Wardle, 13 Lynn Street, Chester-le-Street, Co Durham.

WANTED

Electroniques IFA 1·6 ssb Mk2 i.f. strip. Pse state price. Coghill, 82 Kingston Road, Bishopton, Renfrewshire, Scotland. Tel 2347.

AR22 rotator and TA33 beam. G3HQH, QTHR.

Case for Hallicrafters S27, size 14in by 9in by 19in. Scrap BC348 with case. GW3MDK, QTHR.

Cossor 1035 circuit or hndbk for copying and return. Williams, 31 Sherborne Way, Hedge End, Southampton SO3 4GZ.

Circuit or manual for B40 rx, KW Viceroy tx and Z match atu. G3MCL, QTHR. Tel Winchester 61334.

Handbk for Murphy B40 rx. Will buy or borrow. Also class D wavemeter No 1 will pay about £3. Steinkamp, 1 Grosvenor Road, Wallington Surrey. Tel 01-647 9883.

T28 rx. Convtr for 160–18m to mw car radio. Fb cond pref. G3TIH, 192 Garretts Green Lane, Birmingham B26 2SB. Tel 021-743 5833.

Pye Cambridge, low band dash mounting. Must be in gd cond. High band considered. G3IKN, 14 Willow Drive, Bracknell, Berkshire RG12 2HK

Copy of ITU publication *From semaphore to satellite*. Pse state cond and price. Grindley, c/o MESL, Newsbridge, Midlothian. Tel Kirkliston 277 ext 34.

S meter for AR88. Krystofiak, 128 Park Lane, South Harrow, Middx, HA2 8NL. Tel 01-422 3284.

HW32 or 32A only. Any cond considered. G3UBL, 9 Rampton Drift, Longstanton, Cambridge.

HRO dial. Also HRO chassis with hardware for comp rebuild. G3ELG, QTHR. Tel Sheffield (0742) 63193.

2m convtr with 4–6MHz i.f. Also 4m convtr using any i.f. G3MPN, QTHR. Tel Wymondham 3382.

Any information or loan of manual on National NC183D. G3UKH, 58 Bolbec Road, Newcastle on Tyne 4, NE4 9EP.

Set of plug-in coils for R1448. Griggs, 5 Collinwood Ave, Muswell Hill, London N10. Tel 01-883 3474.

AR88, any cond, wkg or not. Must be cheap. Please state price. G3GYQ, QTHR.

ZQM transistor tester circuit and data. Wanted for loan in order to copy. Lewis, 271 Popes Lane, London W5. Tel 01-567 6389.

RSGB blazer badge, wire type. Sale: Class D wavemeter and phones, £6. G3WXT, QTHR.

Buy or borrow hndbk for Cossor No35 scope. Also BT312 tv 21in sheet and will purchase wkg chassis and tube, cond optional. Davis, 5 Citroen Close, Herne Bay, Kent.

Sommerkamp FL200B tx. G3ZIG, 2 Attleborough Road, Little Ellingham, Attleborough, Norfolk.

Cowl gill or prop pitch motor. Will coll. G3IXI, QTHR. Tel Bishops Cleeve 2282.

Avo model 8. Must be perfect. Will buy or part exchange new Heathkit RF1U sig gen, used once. Cash adjustment. G3MQ, QTHR.

LG300 in wkg order or otherwise cond and price please. G3RFG, QTHR.

Info, hndbk or otherwise, on alignment details for Minimitter MR44/11 rx. GI3YMT 15 Everton Drive, Belfast 6.

Hndbk for Class D wavemeter No2, 1·2–19MHz. G3PIX, 24 Forest Ave, Foresthall, Newcastle upon Tyne.

Circuit and hndbk info for No19 Mk3 set. Mills, 46 Marlborough Road Shipley, Yorkshire. Tel Shipley 55159.

AR88 S meter, 5mA, rh zero. Also coaxial type ant changeover relay, QQVO6–40A and 5763 valves. Evans, Glendale, Mount Pleasant, Drury, Buckley, Flintshire CH7 3ET.

Hndbk for Marconi CR300/1. 12V relay with 500Ω coil (one set each changeover normally open, and heavy duty normally closed contacts), in gd cond pse. Waterman, 1 Ards Place, East Lothian, Scotland.

R1392 vhf rx. Cheap 4m or 70cm convtr, full details pse. RF26 circuit. Swift, 341 Walsall Road, West Bromwich, Staffs.

'Twenties and 'thirties wireless Books for beginners, man-in-the-street and home-constructers, pre-war wireless catalogues, amateur callsign books and lists, QSL, AA and swl cards. G3IDG, 96 George St, Basingstoke, Hants.

Morse keyboard tape perforator. Also morse tape sender. G3SRK, 7 Hilltop, Lingards, Slaithwaite, Huddersfield.

Xtal controlled 2m convtr. 150W ssb trnscvr. Multi-band vertical ant. WN5ZKQ, Sullivan, Co A 1st Bn (M), 54th Inf, APO NY 09139, USA.

Ant rotator, 2m tx, 2m convtr with 2–4MHz i.f. (or unmodified Pye Cambridge). Urgently needed for club station. North Bucks ARS, c/o G3ZNY, 11 Kingston Ave, Stony Stratford, Wolverton, Bucks.

Buy or borrow Creed 7B hndbk. Also cheap scope. G8DZH, 9 Albion Hill, Loughton, Essex. Tel 01-508 3434 after 6pm.

Pre or post-war all wave rx with push-pull output, ie Armstrong, Polarless, Dynatron, Challenger, Imperial, Eddystone. Wkg or not. G3XYX, QTHR. Tel 0734-31 5348.

Beam rotator and 2m fixed station. Also morse course suitable for beginner. Gallagher, 24 Sunnybank Ave, Coventry.

Schoolboy tv enthusiast requires. either to buy or borrow, blueprint for Decca DM4SC. Miles, 42 Ford Lane, Rainham, Essex RM13 7AS.

Compact gc rx (HE30, HE80 etc) for boys bedroom. Must be reasonable. Brown, 67 Sherbourne Road, Middleton, Manchester. Tel 061-643 5375.

Cavity for 4X150A (70cm). HC6/U xtal between 24·250 and 24·333MHz. G8CGK, QTHR.

1155N rx output trnsfmr. Also high impedence phones for same. Newton, 35 Poplar Road, Rayleigh, Essex. Tel Rayleigh 4195.

Gen mods for R1155. *Radio Constructor* No4, Nov 1960. Why. Craine, 223 Park Road, Formby, Lancashire.

Loan or buy circuit for Minimitter MR37 rx. Thmopson, 27 Lingamoor Leys, Thurnscoe, nr Rotherham, Yorkshire.

2m J Beam omni V. G2HR, QTHR. Tel 01-529 2932.

Urgently need RCA 15in shadow mask colour tube type 15GP22. State price. G8DHS, Hillcroft, Larkhill Road, Canewdon, Rochford, Essex. Tel Can 389.

Ex-service or GPO type morse key, brass construction. Dawson, 34 Orchard Way, Holland, Oxted, Surrey. Tel Oxted 4277.

Circuit mods for using Collins mechanical filter in AR88D. G3RDK, QTHR.

Two bases and chimneys for 4CX250Bs. GM3YRK, 57 Dumgoyne Drive, Bearsden, Glasgow. Tel 041-942 2767.

Trnscvr suit mobile use. Exchange super 8 Canon 814, auto-zoom cine camera, case (list £200), absolutely mint. G3XVH, QTHR.

First edition RSGB *Handbook*. Photographs, logs, QSLs, share certificates. Material on early wireless, any language. K8IKO, Box 222, Worthington, Ohio 43085, USA.

Manual or circuit for Collins TCS12 rx. Buy or loan. Thompson, 27 Lingamoor Leys, Thurnscoe, nr Rotherham.

Schoolboy amateur requires Sphinx or similar ssb tx, with Delta changeover unit. GW3ZQN, 1 The Parade, Whitchurch, Cardiff Glam. Tel Cardiff 62636.

Eddystone S meter type 669. Will accept non-wkg type if comp but less meter. All replies answered by return. G3MZF, 3 Ruthven View, Leeds LS8 3RQ.

Magazines and books for local swl distribution, cheap pse. Tower construction details. Trnsfmr for mobile psu. Heathkit single-bander for vhf trnsvtr. Xtals: 5–5·5MHz, 13·6MHz, 35·7MHz. EI5CD, "Coombe Down," Ballylynch, Carrick-on-Suir, Ireland.

Heathkit HW32A and mobile psu, gd cond essential. Would also welcome opportunity to visit shacks N. London region where HW32A in use. G3WVW, 11 Oakhurst Gdns, London E4 6BQ. Tel 01-529 8550.

Student ham requires rx for tuneable i.f. Must cover 28–30MHz and be reasonably priced. CR100 ideal. Sell: R209 Mk2, £14 ono inc post and packing. G8CXK, 22 Lowes Wong, Westgate, Southwell, Notts. Tel Southwell 3418 weekends.

AR88 cabinet, chokes and spares. HRO spares, coil parts etc. R208. P104. DX100. 3 ele beam. Damaged or faulty FL200B, cheap. G3IPM, 2 Hobbes Walk, Roehampton, London SW15.

On behalf of young hi-fi addict: Offering £3 for Shure 1744–5, M44–7, M44–C, M31–E, Goldring 800 or 800H cartridge, or similar for stereo. Must be comp and in perf wkg order. GM3EHH, 22 Cameron St, Stonehaven AB3 2HS.

Eddystone 598 dial, please contact G3AHB, QTHR.

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MARK 2. 2 metre. FET mixer, improved noise figure and sensitivity. GMO378–GMO378–GMO378–2N3819 or equiv. Matching 28–30MHz IF coil. Printed circuit. 8–14 vdc. Neg or Pos earth. Complete panel ready aligned. Less crystal ex stock **£7 17 6**
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MARK 1. 2m similar to above but with diode mixer. IF's around 25·5–27·5 26–28 or 29–31MHz. IF can be as low as 9–11MHz when xtals are available. Panel only less xtal. Working and aligned. **£5 5 0**
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With 28–30 MHz IF. **£10 7 6**

GAREX 70CM CONVERTER

2N708–2N708–2N3478–GMO290–GMO290. Post 2/6 **£14 17 6**
Size 4½ × 3½ × 2in. diecast box FF 28–30 MHz.

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For crystals from 2–20MHz. Band edge marker, etc. Output up to 70cm. Post 2/6 **£3 10 0**
PHASE MOD. EXCITER UNIT. Fully transistor. 4½ × 2½ × 1in for 2m TX's 8MHz xtal. 24MHz output. Post 2/6. **£8 12 6**

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With toroidal transformers. Circuit and instructions.

265v at 150mA bridge rec, inc. chassis 6 × 4 × 2½in	1	Post 4/6	**£4 0 0**
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360v at 150mA bridge rec.	3	Post 4/6	**£5 2 6**
390v at 200mA V. doubler	4	Post 6/6	**£4 12 0**
400v at 200mA plus	5		N.F.
250v at 150mA V. doubler		Post 6/6	**£6 18 0**

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EMSAC

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A speech amplifier and series gate modulator provide the AM facility. FM is provided by means of a varicap diode in the crystal circuit. A CW facility is also provided. These are all switched facilities so that the key and microphone may be left plugged in at all times.
A front panel meter is switched to measure PA grid, anode currents. Valve line-up 12AT7—5763—QQV03-10. 12AX7—12BH7.
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PS2 A suitable power source for the EMSAC TX1/2. "On-off" switch and pilot indicator. "Send-standby" switch and indicator. Chassis construction. Assembled and tested. Price **£16.10.0.**

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2 metre converter. Double Nuvistor cascode design. Band-width better than 4 dB over band. Measured NF better than 3dB. Complete with 38·666 MHz crystal for 28–30MHz IF. Low Z cathode follower output. Well proven design.

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A 4 metre converter similar to the CN1. Complete with 42MHz crystal for 28·1–25·7MHz output.

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The 4 metre version of the CN2. Attractive case to match.

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Crystal controlled 160 metre converter. Transistorised. 9v. PP11 internal battery required. In cabinet 6½" × 3⅝" × 3" high. Input 1·8-2MHz. Output 800–600KHz (car radio medium wave).

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All-band vertical suitable for 1·8–30MHz. 7ft.-23ft. fully adjustable.

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Smaller version of GD1. 55ft. top and 90ft. feeder.

Production of the TX1 and TX2 is limited so please check delivery to avoid disappointment. At the time of writing all other lines are available for immediate delivery. G3RYV will be away in VK-land for the next 12 months so goods will not be available at Maidenhead for this period. We wish Peter and his family well and a safe journey. Mike/G3IAR.

SAE with enquiries please

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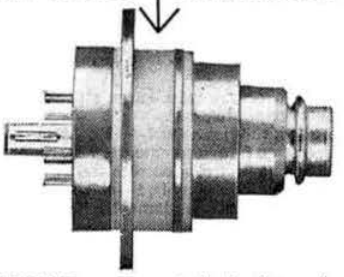

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TWIN FEEDER 75 ohm **8d yd.**, 300ohm/Ribbon **8d yd.** P. & P. (any length) 2/6.
INSULATORS. Egg **6d. ea.** RIBBED CERAMIC **2/6. ea.**
DIPOLE CENTRE PIECES "AT" **2/6d. ea.** plus P. & P.
TOUGH POLYTHENE LINE ideal Halyards, Guys etc. ML1 (100 lb) **12/6 100 yds.** ML2 (220 lb) **25/- 100 yd.** ML4 (400 lb) **6d yd. only.** P. & P. (any quantity) 2/-.
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"RAYMART" SUPER BANDCHECKER Absorption Wavemeter. Very sensitive 3·5-35MHz. **£4.4.0.** or inc. 160 metre band **£4.10.0.**—P. & P. 4/6d.
2 METRE GEAR ECHELFORD Tx. built with MIC. **£32.0.0.** Kit version **£25.** AC PSU. **£10.10.0.** (Built)
6 ELEMENT YAGI 2 Metres with masthead bracket. **£2.18.0.** P. & P. 6/-
"J" BEAM AERIALS for 2 metres, good range in stock.
SHURE MICROPHONES. Hand type 201 F.B. for SSB. P.T.T. **£5.12.6.**

S.A.E. for Lists and enquiries.

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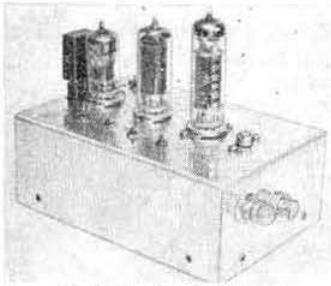

NEW:

THE 4MH 2 METRE TX

15 watts Input. XTAL Supplied.

Immediate delivery.

Price £10. inc. post.

Constructed from a simple, trouble free, effective circuit, using obtainable valves ECC81, 6CH6, QQV03/10. Each unit is air tested and requires 250V DC, modulated to PA. and 250V DC to supply the osc and multiplier. Size 6 × 4 × 2½.

Send SAE for further details to the

AMATEUR RADIO SHOP

13 Chapel Hill, Huddersfield. Tel. 29774

CAPACITORS - 2/6 DOZ

500 volt tubular ceramics : - 50, 150, 700, 2000, 3000pF; also -
500 volt disc ceramics : - 15 and 30pF (few only) and 0.01μF;
- ALL ONE PRICE .. .. **2/6 per dozen** (any mixture).
ALSO.. .. ..
Painton **RF chokes,** high quality, 17.5μH only .. .. **1/6 each.**
PTFE Feed-through insulators .. .. **4d each.**
Coax leads. ready-made, 6ft. long with standard coax plug each end .. **6/- each.**
Nylon trimming tools, suit hex or slotted cores .. .. .. **1/- each**

Send SAE for lists (or supplement only if you have our March 70 lists)
Handling charge 1/6 up to 15/- order value, 2/6 for all other orders.

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TELECOMMS G3SED

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TRANSCEIVERS. 62 set. 1·6 to 4 Mc/s, 4 to 10 Mc/s, in two ranges. Crystal or VFO controlled transmitter, complete with modulator for phone. 12 volt operation, but easily modified to mains use. Receiver incorporates BFO for morse and SSB reception. Each set is supplied with a circuit diagram. Just the job for mobile or portable use, **£12 10s.** plus 20s. post. Headset with microphone can be supplied at **10s.** extra.

WE ARE TRIO AGENTS FOR THE SOUTH COAST

TRIO 9R59DE general coverage receiver now only **£42,** plus 30s. post.
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SP5-D Speaker to match above receivers, **£4 7s. 6d.,** post 10s.
TRIO HS-4 Headphones with padded earpieces, etc., **£5 7s.,** post 10s.
TRIO TS510 and A.C. p.s.u. Fantastic transceiver for the price, **£175,** post free. Test any of these TRIO items at your leisure on the end of a BIG ANT. at our shop.
HP TERMS AVAILABLE ON THE ABOVE TRIO GEAR.
CT52 MINIATURE OSCILLOSCOPES. Ideal for the workshop or as a handy portable scope. Time base free running 10Hz. to 40kHz. Bandwith 1MHz. Incorporates Y amplifier, and delay line. Dimensions L. 13in, H. 8in, W. 5½in, supplied with metal carrying case at **£17 10s.,** plus 20s. post.
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CT54 VALVE VOLTMETERS. Measures A.C. volts from 20 c/s to 200 Mc/s. Resistance to 10 M. ohm, etc., **£7,** plus 15s. post.
LATEST COMPONENTS LISTS NOW AVAILABLE—SEND S.A.E. FOR YOUR COPY
WE URGENTLY WISH TO PURCHASE FOR CASH ALL TYPES OF COMMUNICATIONS RECEIVERS
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G3LRB # STEPHENS-JAMES LTD. **G3MCN**

70 Priory Road, Anfield, Liverpool L4 2RZ. Tel 051-263-7829

FTDX 250	£205	2Metre 5 Element Beams	£2.10.0
FTDX 500	£250	2Metre 6 Element Beams	£2.15.0
FL 500	£145	2Metre 8 Element Beams	£3.2.6
FR 500	£160	4Metre 3 Element Beams	£3.0.0
KW2000B Transceiver	£220	70cm 9 Element Beams	£2.10.0
KW202 Receiver	£125	Antenna Rotators	£18, £25, £40, £70
KW204 Transmitter	£135	Garex 2m Convertors 28-30	£11.18.6
KW1000 Linear	£125	Mosfet 2m Convertors	£12.10.0
KW105 Matching unit	£25	2Metre Mobile Tc	£42.10.0
KW E-Z Match	£13.10.0	2Metre Tx with AC psu	£42.10.0
KW Antenna switch	£3.10.0	75 ohm twin feeder per yd	8d
KW Low pass filters	£5.12.0	300ohm twin feeder per yd	8d
Trio TS510 Transceiver	£180	50 ohm co-ax per yd	2/3
Trio JR310 Receiver	£77.10.0	Dipole "T" Pieces	2/6
Trio 9R59DS Receiver	£42.10.0	Highpass filters	27/6
Trio SPD5 Loudspeaker	£4.7.6	AS100D Test meters	£12.10.0
Trio HS Headphones	£5.19.6	Hansen SWR Bridges	£4.0.0
Lafayette HA600 Rx	£42.10.0	SECONDHAND EQUIPMENT	
Codar AT5 Tx	£19.10.0	EC10 12/24V DC psu	£4
Codar T28 Receiver	£17.10.0	Codar T28 ATS DC	£35
Codar PR30x Preselector	£9.10.0	Codar ATS DC psu	£21
Codar "Q" Multiplier	£8.17.6	KW77 & Loudspeaker	£62
Hy-Gain TH3MK2 Beam	£69.10.0	Eddystone 940	£85
Hy-Gain TH2MK2 Beam	£48.0.0	Inoue Tx & Rx psu	£145
Hy-Gain TH3Jnr	£48.0.0	Trio JR500	£50
Hy-Gain 12AVQ Vertical	£16.10	Trio 9R59DE	£35
Hy-Gain 14AVQ Vertical	£19.10.0	DX40 & vfo	£25
Hy-Gain 18AVQ Vertical	£35.10.0	NCX3 & psu	£100
Eddystone EC10MK2	£74.10.0	Swan 350 & psu	£170
Eddystone EA12	£205	Trio 9R59DE with Cal	£37
TTC 3005 SWR Bridge	£7.5.0		

Complete range of the ever increasing range of G-WHIP. Single banders, duo-banders, tri-banders, and the new Multi-mobile. Sae will bring you full details of this range now in use in a number of countries.
Full range of Eddystone, Datum diecast boxes, chassis, panels, meters, plugs, cable, valves. RSGB Publications now in stock. Large sae will bring you latest lists. Postage/Carriage is extra on all items.
HP and credit terms arranged on all orders over £35. Part exchange. After sales service. SAE with all general enquiries pse.
Half day Wednesday. No parking problems except Sat afternoons as we are only a short distance from the Liverpool and Everton football grounds. We can also supply most leading brands of HIFI equipment.

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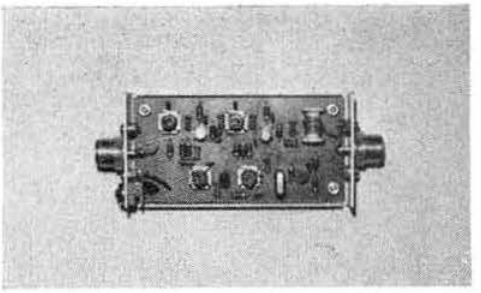

2 METRE MOSFET CONVERTER

Designed and built to professional standards using highest quality components throughout.

Noise figure	**2·8db**
Gain	**30db**
Input	**144-146MHz**

IF outputs in stock:-

28-30MHz	**14-16MHz**
24-26MHz	**4-6MHz**
18-20MHz	**Others to order**

Power requirements 12 volts at 7·5mA
Size $3\frac{11}{16}'' \times 2'' \times \frac{13}{16}''$
Finish two tone blue grey
Price £16-10-0 Post Paid

SQUIRE ELECTRONICS, CHAPEL GREEN, FILLONGLEY, COVENTRY, WARWICKSHIRE.

AERIAL & EARTH EQUIPMENT

From the Author of the article in the March issue

WOODEN MASTS in 10ft by 2in Douglas Fir sections complete with synthetic rope guys and halyard, ready for easy one-man erection. 30ft, £15; 40ft, £19; delivered. Commercial and military enquiries invited.

GREEN MONOFILAMENT POLYPROPYLENE ROPE 6mm (¼in) dia. strength 1200lb (544 Kg); 1/- per metre. 8mm (⅜in) strength 2000lb (900 Kg): 1/6d per metre. Reels of approx. 240m (800ft): £8 and £12 respectively. No extra for cutting to length; splices 2/6d, thimble extra.

PULLEYS. Latest yacht type in nylon and stainless steel. Single sheave for 6mm rope; 10/-. For 8mm rope, 12/-. Other types available.

AERIAL WIRE. Hard-drawn cadmium copper, 7/.036 strength 450 lb, as used professionally: 2/6 per metre.

RIBBED PLASTIC INSULATORS: 2½in, 1/6d

DIPOLE CENTRE INSULATORS: 2½in. 8/-

EARTH RODS: 4ft by 9mm copper with steel core: 35/-.

EARTH STRIP: 50mm by 0·5mm soft copper: 6/- ft.

"D" SHACKLES: for 6mm rope, galv. 2/-; bronze 2/6d. For 8mm rope, galv. 2/6d; bronze 3/6d. **THIMBLES:** 1/- and 1/6d. **KNOTS & SPLICES** pocketbook: 8/-.

CWO (prices include p & p); 9 × 4 SAE list and samples.

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Tel: Roman Way (070-135) 4330.

SOLID STATE MODULES

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Tel: Huddersfield 25173

THE SPITFIRE 2 METRE A.M. TRANSMITTER

A printed circuit module size 4" × 4" running 4–5 watts input, 2 watts RF output from a 12 volts supply. Contains audio wave shaping circuits and limiting circuits to ensure 100% modulation. Five silicon planar multiplier and driver transistors and two selected modulated P.A. overlay transistors. Crystal required 8MHz or 24MHz. Price **£17.0.0.** Modulation transformer . . . primary impedance 3 ohms for matching to any standard audio amplifier. Price: **15/-.**

BUY NOW TO SAVE 10%

THE SENTINEL DUAL GATE MOSFET 2 METRE CONVERTER

Dual gate MOSFET cascode circuits for the RF amplifier and mixer for excellent overload and cross modulation performance. Noise figure 2dB. Injection stages—silicon planar VHF transistors and a VHF crystal. Supply 12–18 volts. IFs 4–6MHz, 9–11MHz, 14–16MHz, 23–25MHz, 24–26MHz, 28–30MHz. In a neat aluminium stoved silver hammer enamel box size 2½" × 3" × 1½". Price **£12.10.0.**

Since every morning's post seems to include an invoice regretting a price increase, and we have improved the presentation of our converters recently, we shall have to increase the price of the Sentinel converter by 10% (to **£13.15.0**) from 1st December. So if you are tottering on the brink—buy now.

We shall have 4 metre converters available at least by the end of November but probably not just now. Anyway you can try us or put your name on the list.

THE SENTINEL LOW NOISE FET PRE AMPLIFIER

The FETs and components are selected for a noise figure of less than 1dB. Gain of 20dB. Boxed as the converter. Price: **£6.10.0.**

All this equipment should be ex stock but you can always (nearly always) ring us and make sure.

BLANK CHASSIS

FOUR-SIDED 16 S.W.G. ALUMINIUM

Size	Price	Base	Size	Price	Base
6 × 4 × 2"	6/3	2/11	10 × 6 × 2½"	12/-	5/6
7 × 4 × 1½"	6/	3/2	12 × 7 × 2½"	12/-	5/11
7 × 5 × 2"	7/6	3/5	12 × 9 × 2½"	13/9	7/-
8 × 4 × 2"	7/-	3/4	13 × 8 × 2½"	13/9	6/11
8½ × 5½ × 2"	8/-	3/9	14 × 7 × 3"	14/6	6/6
9 × 7 × 2"	9/3	4/10	14 × 10 × 2½"	16/-	8/7
10 × 4 × 2½"	9/-	3/8	15 × 10 × 2½"	16/6	9/1
12 × 4 × 2½"	10/-	4/3	17 × 10 × 3"	19/6	10/1
12 × 5 × 3"	12/-	4/9			

Plus post and packing.

PANELS. Any size up to 3ft. at 6/- sq. ft. 16 s.w.g. (18 s.w.g. 5/3). Plus post and packing.

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R.T. & I. offer the finest selection of first-class new and fully overhauled second-hand communications and electronics equipment in the U.K.

- *Constantly changing stocks of a vast range of equipment.*
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- *Part exchanges welcomed.*
- *We are 'spot cash' buyers for almost all electronic equipment.*

Send S.A.E. for our latest list of over 50 receivers and many other interesting items.

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Ashville Old Hall, Ashville Road, London E.11 *Tel: 01-539 4986*

SPECIAL OFFER (THIS MONTH ONLY)

To Readers of "Radio Communication" only

HONDA E300E . . .

PORTABLE PETROL ELECTRIC GENERATORS

LIST PRICE £79

OUR PRICE £65

C.W.O. for IMMEDIATE DESPATCH. All equipment is new and GUARANTEED and CARRIAGE PAID U.K.

Write, call or phone, Weybridge 46201

ADVANCED DEVELOPMENTS

49/51, St Mary's Road, Weybridge, Surrey

KITS, P.C.B.s, COMPONENTS TRANSISTORS etc.

for the

G3NNG VHF RECEIVER

Send large SAE for information about this and *previously* advertised kits

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10 Wyndham Rd., Shaw, Newbury, Berks.

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Advertisements should be prepaid. Private rate 1/- (5p) per word, minimum £1. Box no. 3/- (15p) extra, which includes forwarding replies.

Words comprising name and address should be counted for advertisements not requiring a box number

Trade advertisements should be submitted by letter.

Remittance £.....

Classification (for sale etc)

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Box No. Yes/No

Please insert this advertisement in Radio Communication. **(BLOCK CAPITALS PLEASE)**

			£1(min)
			£1.4.0.
			£1.8.0.
			£1.12.0.

NAME .....

ADDRESS .....

.....

.....

DATE..... *SIGNED*.....

POST TO SAWELL & SONS LTD., 4 LUDGATE CIRCUS, LONDON, EC4

MEMBERS' ADS ORDER FORM

Please type or print clearly in block letters

Tick classification

For Eale ☐

Wanted ☐

Callsign		**QTHR**		
or Name and Address				
Telephone number				

DATE..... *SIGNED*..... *CALLSIGN, BRS or A No.*.....

The number of words in each advertisement must not exceed 32, not including name and address or callsign and QTHR or telephone number Four pages of each issue are allocated to Members' Ads at present, and in order to include as many advertisements as possible licensed members are requested to give their callsign and QTHR instead of their name and address. (QTHR means: "My address in the current call book is correct").

Also to conserve space, please keep advertisements as brief as possible consistent with a clear basic description of the equipment. Advertisements will be edited to conform to a set style of abbreviations, so it is unnecessary to submit them in abbreviated form.

Conditions under which Members' Ads are accepted are published on the first Members' Ads page of each issue.

POST TO MEMBERS' ADS, RADIO COMMUNICATION, 35 DOUGHTY STREET, LONDON WC1N 2AE

INDEX TO ADVERTISERS

Radio Society of Great Britain

FOUNDED 1913
INCORPORATED 1926

PATRON H.R.H. THE PRINCE PHILIP
DUKE OF EDINBURGH, KG

APPLICATION FOR CORPORATE* OR ASSOCIATE* MEMBERSHIP

RADIO SOCIETY OF GREAT BRITAIN,
35 DOUGHTY STREET,
LONDON WC1N 2AE
Tel 01-837 8688
Giro A/C No 533 5256

* I hereby apply for election as a Corporate Member of the Society and enclose a remittance for £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.

Date _____

Signed _____

PERSONAL DETAILS TO BE COMPLETED BY APPLICANT

SURNAME (BLOCK LETTERS) _____

CHRISTIAN NAMES (IN FULL, BLOCK LETTERS) _____

ADDRESS FOR ALL CORRESPONDENCE (BLOCK LETTERS) _____

_____

NATIONALITY _____ *AGE (IF UNDER 21)* _____

CURRENT CALL-SIGN (IF ANY) _____

DETAILS OF PREVIOUS MEMBERSHIP (IF ANY) _____

DETAILS TO BE COMPLETED BY THE PROPOSER †

I WISH TO PROPOSE _____ *FOR * CORPORATE/* ASSOCIATE MEMBERSHIP*

PROPOSER'S NAME (BLOCK LETTERS) _____

ADDRESS (BLOCK LETTERS) _____

CALL-SIGN (OR BRS NO.) _____

SIGNED _____

* Please delete where inapplicable.

† If the applicant is not acquainted with a Corporate Member willing to propose him for election he may submit a suitable reference in writing as to his interest in Amateur Radio.

The first subscription of 50/- or 25/- should be enclosed with this application to avoid delay.

FOR OFFICE USE ONLY

APPROVED BY COUNCIL _____ *BRS OR A No. ISSUED* _____ *FIRST SUB. PAID* _____

RADIO SOCIETY OF GREAT BRITAIN

and

LAMBDA INVESTMENT COMPANY LIMITED

Reports and Accounts
for the
Year Ended 30 June 1970

D

Radio Society of Great Britain

35 DOUGHTY STREET, LONDON WC1N 2AE

Patron :

HRH THE PRINCE PHILIP,

DUKE OF EDINBURGH, KG.

COUNCIL 1970

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General Manager and Secretary
R. G. B. VAUGHAN, G3FRV

Auditors
EDWARD MOORE & SONS
Chartered Accountants

Bankers
BARCLAYS BANK LTD.

REPORT OF THE HONORARY TREASURER

I beg to submit to the members the Balance Sheet of the Society at 30 June 1970, and the Income and Expenditure Account for the year to the same date.

The accounts have been prepared on similar lines to those of last year, but some changes have been made in the sequence of presentation. Expenditure is grouped to show totals for:

(*a*) Costs associated with running Headquarters;

(*b*) The net cost of printing and distributing *Radio Communication*;

(*c*) Expenditure on various membership services;

(*d*) Costs of meetings—Council, committee, regional etc.

Income during the year benefited from increased membership, which is a most encouraging factor, but once again the Society's financial situation was saved by the excellent return on the sale of publications. Sales in the previous year reached record levels due to the introduction of the new Handbook, and having satisfied the initial demand, sales for 1969/70 were expected to be at a somewhat lower level. It is a great tribute to all those involved that sales have been maintained, including fairly substantial deliveries of the Handbook abroad.

Over-all expenditure is not substantially higher than last year, but when allowance is made for non-recurring items in 1968/69 there has been the equivalent of an increase of £3,100.

The expenditure on Headquarters shows a reduction of £3,260, of which part is the non-recurring expenditure on removal to Doughty Street, and the majority of the balance is on Salaries. Following the appointment of a full-time Editor for *Radio Communication*, staff re-organisation took place which lead to some reduction in Administration salaries.

Costs of *Radio Communication* continue to rise, and, as indicated on a number of occasions, the price of paper and printing costs are constantly subject to substantial increases—indeed, further rises have been notified as this report is written. A proportion of the increased cost is attributable to the appointment of the Editor.

Expenditure associated with membership services requires little comment, other than to say that the cost of the QSL Bureau is very much dependant on postal charges.

The cost of holding meetings is lower than last year, to some extent occasioned by the availability of facilities at Headquarters which avoids the need to hire outside accommodation.

The Accounts and the Report of the Directors of the wholly owned Subsidiary Company of the Society, Lambda Investment Company Limited, are appended to the Society Accounts, and I would state that the Auditors and the Council of the Society still consider that the consolidation of the two sets of accounts would not be suitable.

The year 1969/70 has not been a very easy one, where, as reported last year, staff difficulties arose, and this problem was followed by the loss to the Society of the services of Mr Norman Caws, whose illness lead to his resignation as Honorary Treasurer. As your new Honorary Treasurer, I hope to be able to answer any questions that members may wish to ask, but to enable the fullest detail to be available, advance notice of questions would be appreciated.

The success of the Society depends very largely on the voluntary help given by so many people, and to all these I would like to convey the thanks of the Society. Last, but by no means least, a most hearty vote of thanks is due to the General Manager and the Headquarters Staff for the admirable way in which their efforts in the past year have aided the progress of the Society.

A. C. MORRIS
Honorary Treasurer

RADIO SOCIETY OF GREAT BRITAIN

(COMPANY LIMITED BY GUARANTEE)

35 Doughty Street, London WC1N 2AE

INCOME AND EXPENDITURE ACCOUNT
for the year ended 30th June 1970

1969 £	1969 £	1969 £		1970 £	1970 £	1970 £
			INCOME			
		36,132	Subscriptions (including proportion of life members subscriptions) ..			38,532
			Profit on Sales of Publications:			
	12,968		General		13,751	
3,263	(1968)		At Exhibition (1969)	1,351		
696			*Less* Net cost of Exhibition	674		
	2,567				677	
		15,535				14,428
		316	Interest on Investments (Gross)			316
		51,983	**Total Income**			53,276
			EXPENDITURE			
3,819			Headquarters Rent, Rates, Heating, Lighting & Cleaning	3,253		
16,293			Salaries, National Insurance, Pension Premiums, Luncheon Vouchers	14,016		
455			Agency Fees & Advertising for Staff	462		
200			Payment to Widow of past Employee	200		
346			Telephones	433		
1,737			General Postages	1,789		
1,732			Printing & Stationery	1,600		
246			Insurances	327		
157			Repairs & Maintenance	223		
631			Depreciation of Furniture & Equipment	595		
318			Bank Charges	259		
—			Legal Expenses	39		
220			Audit Fee	220		
112			Deficit on Vending Machine	106		
—			Hire of Equipment	60		
417			*Removal Expenses*	—		
675			Sundry Expenses	451		
—			Provision for Bad Debts	65		
	27,358				24,098	
			Radio Communication—Distributed free to Members:			
25,357			Printing, Postages etc.	30,237		
4,392			*Less* Receipts from Advertising	4,366		
	20,965				25,871	
123			Membership Certificates & Badges	169		
262			Awards Trophies, & Contests	158		
24			Tape Recorded Lectures	12		
230			Film Library	310		
1,059			Cost of QSL Bureau	1,216		
23			Radio Amateurs Examination	33		
543			Contribution to IARU Region 1	555		
270			*IARU Region 1 Conference*	—		
55			Cost of Beacons	69		
37			Intruder Watch Expenses	31		
47			RAEN Expenses	17		
	2,673				2,570	
			Council & Committee Meetings:			
455			Hire of Rooms	—		
1,621			Members' Expenses	1,546		
274			Regional, Club & Overseas Meetings	140		
(44)			*Less* Surplus on Various Rallies & Conventions	89		
					51	
409			Annual General Meeting	258		
—			Regional Representatives Conference	223		
35			Regional Representatives Expenses	92		
144			*Sundry Expenses*	—		
49			London Lectures	33		
	2,943				2,203	
		53,939	**Total Expenditure**			54,742
		£1,956	**EXCESS OF EXPENDITURE OVER INCOME FOR YEAR**			£1,466

BALANCE SHEET 30 JUNE 1970

1969 £	1969 £	1969 £		1970 £	1970 £	1970 £
			CURRENT ASSETS			
	361		Cash in hand		145	
	—		Bank Balance		327	
	9,832		Debtors *Less* Provision for Doubtful Debts		5,637	
	1,107		Payments in advance		711	
	11,395		Stock of Publications etc (as certified by the Honorary Treasurer) ..		12,388	
		22,695				19,208
			FIXED ASSETS			
	9,274		INVESTMENTS AT COST			
			Quoted on Stock Exchange (Note 1)		9,274	
			Middle Market Value *£7,500* (1969 *£6,714*)			
			INVESTMENT IN SUBSIDIARY COMPANY			
100			100 Shares of *£1* each, fully paid	100		
18,495			Loan	19,249		
	18,595				19,349	
			FURNITURE & EQUIPMENT			
5,981			At Cost	6,071		
3,049			*Less* Depreciation	3,536		
	2,932				2,535	
		30,801				31,158
		£53,496				£50,366

NOTES

(1) INVESTMENTS

Middle Market Value at 30 June 1969 £		Middle Market Value at 30 June 1970 £	Cost Price £
3,750	*£5,000* 3% Savings Bonds 1965/75	4,225	5,219
2,964	*£4,145.1.6* British Transport 4% Guaranteed Stock 1972/77	3,275	4,055
£6,714		£7,500	£9,274

1969 £	1969 £	1969 £		1970 £	1970 £	1970 £
			LIABILITIES			
			BEVAN SWIFT MEMORIAL LECTURE FUND			
	55		Balance at 1 July 1969		50	
	5		*Less* Prize awarded..		5	
		50				45
		486	LIFE MEMBERS' SUBSCRIPTIONS RESERVE ACCOUNT			485
			CREDITORS			
	14,898		Sundry Creditors & Accrued Expenses		12,281	
	20,215		Subscriptions in advance		21,721	
	550		*Bank Overdraft (Secured)*		—	
		35,663				34,002
		36,199	**Total Liabilities**			34,532
			ACCUMULATED FUND			
	13,555		Balance at 1 July 1969		17,297	
	—		*Add* Surplus on Disposal of Equipment		3	
	5,407		*Headquarters Trust Fund*		—	
	291		*Taxation Recovered*		—	
	19,253				17,300	
	1,956		*Less* Excess of Expenditure over Income for the year		1,466	
		17,297				15,834
		£53,496				£50,366

J. A. SAXTON, *President* **A. C. MORRIS,** *Honorary Treasurer*

REPORT OF THE AUDITORS TO THE MEMBERS OF RADIO SOCIETY OF GREAT BRITAIN

In our opinion, the Accounts set out above give a true and fair view of the state of the Society's affairs at 30 June 1970 and of its excess of Expenditure over Income for the year ended on that date and comply with the Companies Acts 1948 and 1967.

4/7 Chiswell Street, London EC1
30 September 1970

EDWARD MOORE & SONS
Chartered Accountants

THE PILOT OFFICER NORMAN KEITH ADAMS PRIZE TRUST FUND

BALANCE SHEET 30th JUNE 1970

	£ s. d.	£ s. d.		£ s. d.
TRUST FUND		165 0 0	**INVESTMENT**	
Creditors:			7% British Savings Bond	165 0 0
Prize to be awarded under the terms of the Trust Deed for year ended 30 June 1970	8 5 0		**CASH AT BANK**	25 1 5
RSGB to reimburse prize paid for year ended 30 June 1969 ..	8 5 0			
		16 10 0		
ACCUMULATED FUND				
Balance at 30 June 1969	5 5 5			
Surplus on conversion of Investment	3 6 0			
		8 11 5		
		£190 1 5		£190 1 5

INCOME AND EXPENDITURE ACCOUNT for the year ended 30th June 1970

	£ s. d.		£ s. d.
Provision for prize for year ended 30 June 1970	8 5 0	Interest on Investment	8 5 0
	£8 5 0		£8 5 0

NOTE:

On 15 May 1970 the 5% National Development Bonds matured, and under the Conversion terms the Trustees accepted £165 7% British Savings Bonds in lieu. A redemption premium of £3 6s 0d was received and credited to the accumulated Fund.

J. A. SAXTON, *President*

A. C. MORRIS, *Honorary Treasurer*

REPORT OF THE AUDITORS

In our opinion, the Accounts set out above give a true and fair view of the state of the Prize Trust Fund at 30 June 1970.

4/7 Chiswell Street, London EC1
30 September 1970

EDWARD MOORE & SONS
Chartered Accountants

LAMBDA INVESTMENT COMPANY LIMITED

35 DOUGHTY STREET, LONDON WC1N 2AE

Directors : L. E. Newnham *(Chairman)*, R. F. Stevens, E. W. Yeomanson, A. C. Morris, J. O. Brown *(Secretary)*.

REPORT OF THE DIRECTORS

The Directors have pleasure in submitting their Report for the year ended 30 June 1970.

The company is a wholly owned subsidiary of the Radio Society of Great Britain and was formed for the purpose of dealing with the purchase of a property which was to be leased to the Radio Society of Great Britain for their use as Headquarters. This property is 35 Doughty Street, London, and the Headquarters were moved to this address on 1 November 1968.

The Directors consider that the market value of this property is at least equal to the Book Value.

The balance standing on the Accumulated Fund is a deficit of £57 after payment of the Debenture interest for the year ended 30 June 1970 and the balance is being carried forward to the current year.

The Directors report with regret that during the year Mr J. F. Shepherd died, and Mr N. Caws resigned due to ill health. Their places were taken by Messrs A. C. Morris and J. O. Brown. No other change has taken place in the Board of Directors.

The Share and Debenture stock holdings of past and present Directors are given below. The Shares of all the Members of the Company are held as nominees of the Radio Society of Great Britain but the Debenture stock has been entirely subscribed for in cash by the holders.

	Holdings			
	Shares		Debenture Stock	
	1969	1970	1969	1970
L. E. Newnham	1	1	£100	£100
R. F. Stevens	1	1	—	—
E. W. Yeomanson	1	1	—	—
A. C. Morris	—	—	—	—
J. O. Brown	—	—	—	—
N. Caws	1	1	£100	£100
J. F. Shepherd, deceased	1	1	£100	£100

The Auditors, Messrs Edward Moore & Sons, have intimated that they are willing to continue in office in accordance with Section 159 of the Companies Act, 1948.

By Order of the Board
J. O. BROWN
Secretary

30 September 1970

INCOME AND EXPENDITURE ACCOUNT

for the year ended 30 June 1970

1969				*1970*
		INCOME		
1,250		Rent—Radio Society of Great Britain		1,500
—		Donations		68
1,250		**Total Income**		1,568
		EXPENDITURE		
1,127		Debenture Interest	1,141	
292		Bank Interest and Charges	490	
50		Sundry Expenses	6	
21		Audit Fee	25	
1,490		**Total Expenditure**		1,662
240		Excess of Expenditure over Income		94
—		*Deduct:* Corporation Tax Adjustments		25
£240		Balance carried to BALANCE SHEET		£69

LAMBDA INVESTMENT COMPANY LIMITED

BALANCE SHEET, as at 30 June 1970

1969 £	1969 £		1970 £	1970 £
		FIXED ASSETS		
40,721		Freehold Property (35 Doughty Street, London. Charged to Bankers) at cost ..		40,966
834		Sinking Fund Policy—Premiums Paid .. .. (Surrender Value of Policy = £1,074)		1,251
	41,555			42,217
		CURRENT ASSETS		
10		Sundry Debtors		57
		PRELIMINARY EXPENSES		
722		Preliminary and Debenture Stock Issue Expenses		722
	42,287			42,996
		CURRENT LIABILITIES		
21		Sundry Creditors	53	
465		Tax Deducted from Debenture Interest	468	
25		Corporation Tax due 1 January 1969	—	
4,194		Bank Overdraft	4,158	
4,705			4,679	
		RADIO SOCIETY OF GREAT BRITAIN		
18,495		Amount owing to the Society	19,249	
		LONG TERM LIABILITY		
18,975		6% Debenture Stock .. .. (redeemable on or before 30 June 1997. Secured on the freehold property of the Company)	19,025	
	42,175			42,953
	£112	**NET ASSETS** (including Preliminary Expenses shown above)		£43
		REPRESENTED BY:		
		SHARE CAPITAL		
100		Authorised and Issued .. .. 100 Shares of £1 each fully paid		100
		ACCUMULATED FUND		
252		Balance at 1 July 1969	12	
240		Deficit for Year	69	
12				(57)
	£112			£43

L. E. Newnham
J. O. Brown } *Directors*

REPORT OF THE AUDITORS TO THE MEMBERS OF LAMBDA INVESTMENT COMPANY LIMITED

In our opinion, the Accounts set out above give a true and fair view of the state of the Company's affairs at 30 June 1970 and of its deficit for the year ended on that date and comply with the Companies Acts 1948 and 1967.

4/7 Chiswell Street, London EC1
30 September 1970.

EDWARD MOORE & SONS
Chartered Accountants

RSGB PUBLICATIONS

RSGB

Amateur Radio Circuits Book	13/4
Amateur Radio Techniques *(New edition)*	22/-
Guide to Amateur Radio	8/10
Morse Code for the Radio Amateur	2/6
RSGB Countries List	1/4
RSGB Amateur Radio Call Book, 1971	10/-
RSGB Planner Diary, 1971	5/9
Radio Amateurs' Examination Manual	5/9
Radio Communication Handbook (4th ed.)	63/-
postage	6/- *extra*
Radio Data Reference Book	14/6
SSB Equipment	3/6
Service Valve and Semiconductor Equivalents	5/6
VHF/UHF Manual	23/-
World at their Fingertips(Paperback)	14/6
(De-Luxe)	50/-

MORSE

RSGB Morse Instruction Tape (900 ft)	36/-
RSGB Morse Practice Tape (450 ft)	13/-
G3HSC Rhythm Method of Morse Tuition—	
Complete Course (two 3-speed LP records and one EP record plus books)	88/-
Beginner's Course (one 3-speed) LP record and one EP record plus books)	63/6
Beginner's LP (0-15 wpm) plus book	52/6
Advance LP (9-42 wpm) plus book	52/6
Three speed simulated GPO test 7 in. d.s. EP record	15/9

ARRL

Antenna Book	27/-
Course in Radio Fundamentals	11/9
Hints and Kinks	11/9
Mobile Manual	27/-
Radio Amateur's Handbook	57/-
Radio Amateur's Operating Manual	14/-
Single Sideband for the Radio Amateur	27/-
Understanding Amateur Radio	27/-
VHF Manual	27/3

CQ

Amateur Radio DX Handbook	44/6
Antenna Handbook Vol. 1	35/3
Antenna Roundup Vol. 1	28/-
Antenna Roundup Vol. 2	36/-
Mobile Handbook	27/9
Sideband Handbook	26/-
RTTY A-Z	43/9
RTTY Handbook	32/6
Shop and Shack Shortcuts	37/-

USA MAGAZINE SUBSCRIPTIONS (pa)

QST (including ARRL membership)	58/6
QST (Societies and organizations)	65/6
CQ	50/-
73	50/-
Ham Radio	50/-
Braille Technical Press	60/-

RADIO PUBLICATIONS INC.

Beam Antenna Handbook	35/3
Better Short Wave Reception	28/6
Cubical Quad Antennas	34/-
S-9 Signals	9/6

MISCELLANEOUS

Basic Electricity	31/
Basic Theory and Application of Transistors	19/-
Dictionary of Electronics	9/-
Foundations of Wireless	24/6
Guide to Broadcasting Stations	6/6
How to Listen to the World	28/-
Ham's Interpreter	14/6
Improve your Short Wave Reception	23/-
Mullard Data Book	3/10
Radio Amateur Operator's Handbook	6/6
Short Wave Antennas	13/-
Transistor Audio and Radio Circuits (Mullard)	32/-
Transistors in Practice	36/4
Wireless World Radio Valve Data	13/-
World Radio TV Handbook	48/-

LOG BOOKS

RSGB Standard Log	10/-
RSGB Receiving Station Log	7/3
RSGB VHF Contest Log	7/9
Mobile Mini-Log	4/-
RSGB De-Luxe Log	25/-

73

Simplified Maths for the Hamshack	4/9
VHF Antenna Handbook	25/9

MAPS

Admiralty Great Circle Map *(In tube)*	11/-
Counties	8/2
QRA Locator Map (Western Europe) *(In tube)*	9/-
QRA Locator Map (Western Europe) *(on card)*	1/7
VHF/UHF band plans *(on card)*	1/7

MEMBERS ONLY

Lapel Badge (RSGB or RAEN emblem, pin fitting)	2/6
Call-sign lapel badge (RSGB or RAEN pin or stud fitting)*	10/-
Car badge (RSGB or RAEN)	10/-
Call-sign car badge (RSGB)*	22/-
Call-sign car badge, de-luxe (RSGB or RAEN)*	37/6
Ties (Maroon or Blue)	19/6
Tie bar (RSGB emblem)	5/-
Radio Communication Easi-binders	20/-
Car window sticker (RSGB or RAEN. No adhesive required)	1/4
Member's headed notepaper (100 sheets) quarto	12/-
octavo	5/9

*delivery 4 to 6 weeks.

Prices include postage and packing except where stated.
Stamps and book tokens cannot be accepted.

35 DOUGHTY ST., LONDON, WC1N 2AE

Printed in Great Britain for the RADIO SOCIETY OF GREAT BRITAIN, 35 Doughty Street, London WC1N 2AE
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