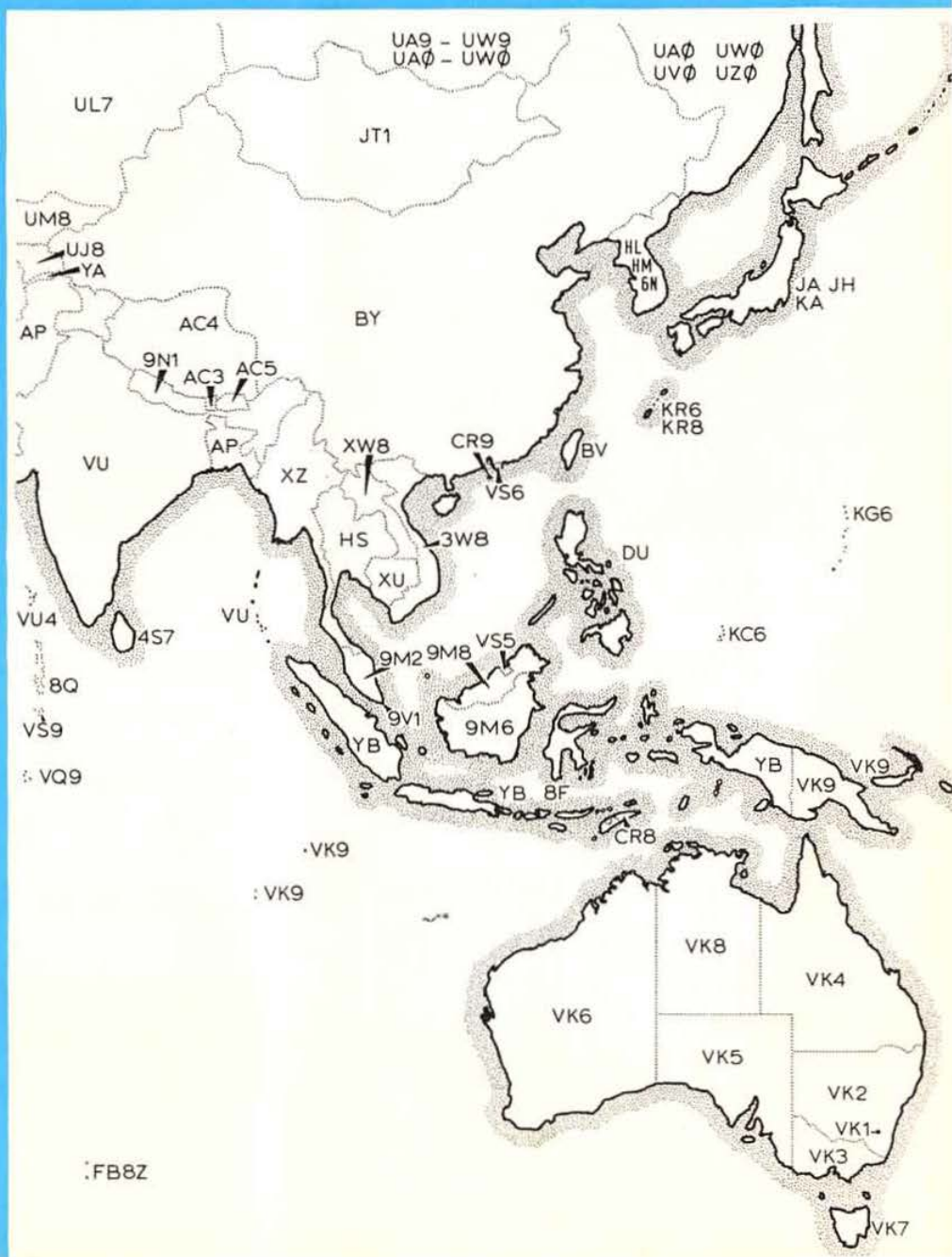
radio communication

July 1970

Journal of the Radio Society of Great Britain



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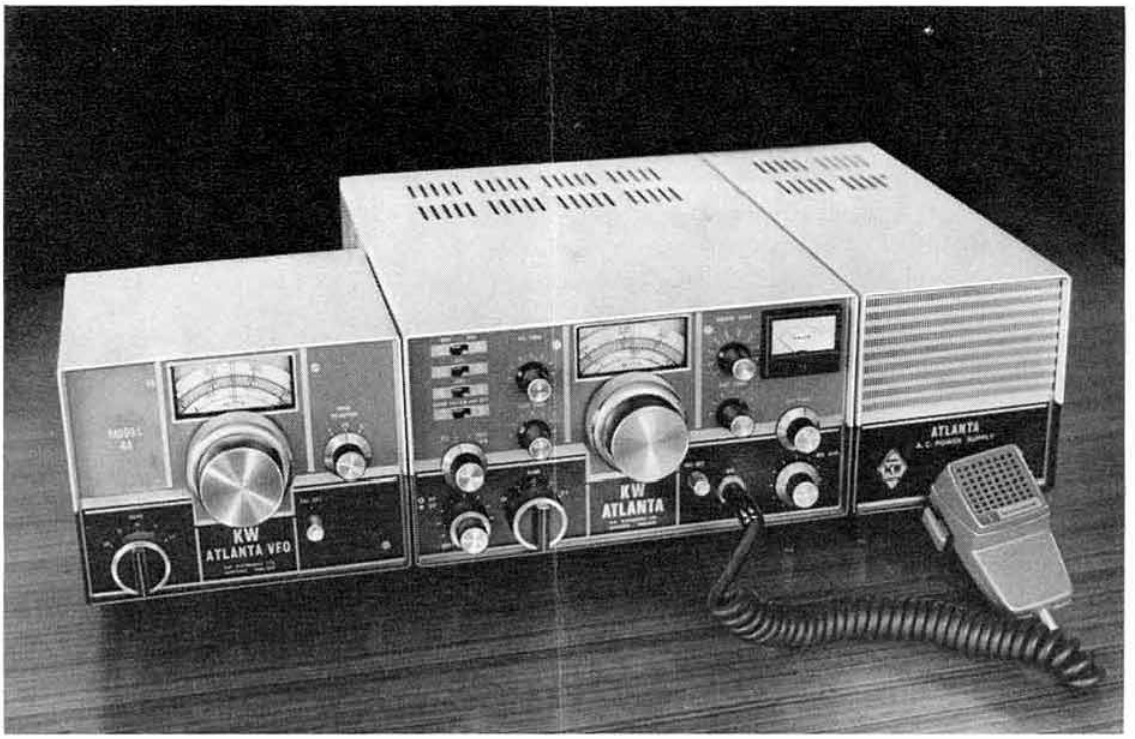

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July 1970

radio communication

Volume 46 No 7 Price 4s

CONTENTS

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**

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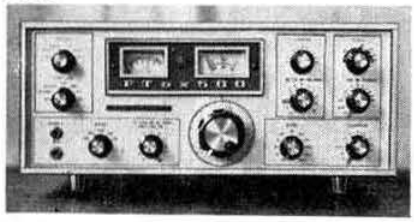
FT 500



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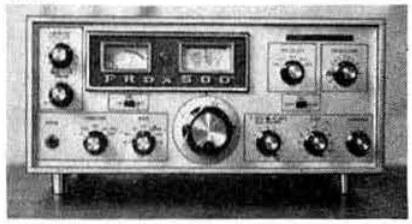

Top band to 2m.
The no compromise AM, FM, SSB and CW receiver for the man who wants the best. £160.

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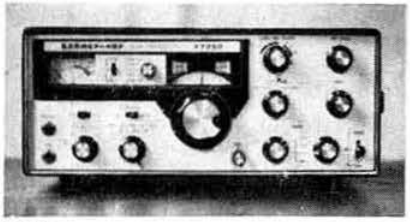

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VOX, PTT, MOX. 100kHz marker. RIT Metered ALC. Again, usual extras are standard. £160. psu £45.

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CN2 CN1 with power supply in attractive case. Mains lead, pilot lamp, on/off switch, etc.
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GEC BRT 400 Receiver. General Coverage	65	0	0
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HALLICRAFTERS HT-46 SSB Transmitter	95	0	0
HALLICRAFTERS SX-117 Receiver. Amateur Bands	95	0	0
HEATHKIT HD-10 Electronic Keyer	15	0	0
HEATHKIT AV-3U Valve Millivoltmeter	10	0	0
HEATHKIT SB100 Transceiver. With CW Filter & SP600psu	165	0	0
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HEATHKIT 10-12U 'Scope	30	0	0
HUDSON 4m Base Station FM	35	0	0
J-BEAM 4 element 10m Yagi, unused, as new	10	0	0
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KW Vespa Mk2 Transceiver	100	0	0
KW 2000A Transceiver with AC psu	175	0	0
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PYE 4m Base Station with Crystal	17	10	0
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"... or such lesser sums ..."

MEMBERS receive with this issue a copy of the notice convening the Extraordinary General Meeting called to authorize Council to increase the *maximum* subscription which can be levied on members. This figure appears in the Society's Articles of Association, and whatever the members approve *cannot* be exceeded. The new maximum is set at £6 for corporate members and £3 for associates, but Council would like to make it quite clear that it has *no intention* of introducing these rates in the foreseeable future. Indeed, if we were to enter a period of stabilized prices and costs, we could expect to prosper on much lesser sums—say £4 for corporate members and £2 for associates. But if such amounts were to be fixed as maxima we might well be forced in the years ahead to repeat the "Extraordinary General Meeting" operation with its accompanying expense and administrative arrangements. The intention is to provide leeway within which Council members, as *your* representatives, can fix a subscription point which will maintain a viable and progressive Society.

The date of the coming EGM has been timed to coincide with our annual exhibition, so that members can take part in both. We want you to come along, not only to hear Council's assessment of our financial position, but also to state your own views, to put questions and to receive answers which, Council believes, will satisfy you that the proposed increase is fully justified and vitally necessary. The financial year just ended is the first complete year which we have spent in the new headquarters; it shows, therefore, a new pattern of income and expenditure. The first full year's sales of the *Radio Communication Handbook* have boosted receipts, but higher production costs of *Radio Communication* coupled with higher postage rates have led to a sharp increase in expenditure. Preliminary figures suggest that once again our expenditure has exceeded our income, and this situation cannot exist for ever.

At the same time, we do not want to have to run faster to stay in the same position: we want to *improve* our service to members whenever and wherever possible. Our editorial panel presses Council for more space for the first-rate articles which the prestige of our journal now commands, but extra pages cost money, while wages in the printing industry continue to rise. Our Society has outgrown its membership record system, and we cannot wear a 'seventies look on a 'sixties subscription: we want to give immediate and up-to-date lists to our local representatives, and we want to issue a *Call Book* combined with a membership list and with alphabetical listings. We would like to afford first class postal delivery of *Radio Communication* to every member. We want to keep the QSL Bureau "on the Rates".

If *you* are a corporate member and feel that these are worthwhile aims, and will come to the EGM and show your support, then these aims may well be realized by those "lesser sums" of £4 and £2. We ask you to think—discuss—argue—but above all translate your considered opinion into your *vote*. If you cannot come you can vote by proxy—a reply paid form is enclosed in this issue—but returning this does not prevent you from attending and voting in person if you so wish.

QTC AMATEUR RADIO NEWS

The RSGB's new Honorary Treasurer

Mr A. C. Morris, AACCA, G3SWT, who was recently appointed Honorary Treasurer of the Society, is a native of the Vale of Evesham who now lives in Hertfordshire.

His interest in amateur radio dates back to his school days but he did not become closely involved with the hobby until he joined the Radio Society of Harrow, of which he was a committee member and treasurer for many years and is still a member. He was licensed and joined the RSGB in 1964 and found amateur radio an escape from an excess of accountancy work (!).

He has been connected with the plastics industry in Birmingham and London throughout his working life and is at present the pensions and insurance manager of a large plastics company.

Because his work entails quite a bit of travelling his amateur radio activities have been limited, but he is active on the mobile bands, particularly Top Band, and visits many mobile rallies where members can frequently contact him.

At the start of the illness which eventually led to the resignation of Mr N. Caws, FCA, G3BVG, Mr Morris was one of those members who offered their assistance to the Society. He and Mr J. O. Brown, FCA, G3DVV, have advised the Society on financial matters for some time and they will continue to do so together in the future.

Mr Brown has now been appointed the secretary and a director of Lambda Investment Co Ltd, appointments previously held by Mr N. Caws.

Mr A. C. Morris

Beware!

It has been brought to the attention of the Society that a contract of sale for houses comprising a modern development in Staffordshire contains the following restriction:

Not to instal affix or place any wireless transmitting aerial or set on the land hereby conveyed and not to use the same for the purpose of a wireless transmitting station whether for professional or amateur purposes.

An intending purchaser of property should ensure that the terms of a contract of sale are carefully scrutinized for restrictive terms by his representative before contracts are exchanged.

RSGB certificates and awards

A complete review of the Society's hf operating awards has been made and a copy of the revised certificates and awards leaflet will be enclosed in the August issue of *Radio Communication*. Claims made under the existing conditions must be postmarked not later than 31 December 1970.

Awards may be claimed under the new rules with effect from 1 August 1970.

RSGB Amateur Radio Call Book

Will secretaries of affiliated societies please advise G2BVN of any alteration to the information which appeared in the 1970 edition of the *RSGB Amateur Radio Call Book*. No amendment can be accepted after 30 July for publication in the 1971 edition.

RADIOCOM 70. 19-22 August

One of the features of the International Radio Engineering and Communications Exhibition (RSGB Show) this year will be the encouragement of radio mobiles with a contest on hf and vhf. Outdoor licensed users from cars and boats, including users of walkie-talkies, can contact the RSGB stations at the exhibition on 2m, 4m and 80m, and win prizes of up to £50, in the form of vouchers for equipment on show at the exhibition, for the most outstanding performance of portable equipment. Commercial contestants will be awarded certificates of merit. The contest is being organized by P. A. Thorogood, G4KD, the exhibition organizer, whose decision on all matters connected with it will be final. Application forms for the contest must be obtained in advance from G4KD, c/o RSGB HQ, 35 Doughty Street, London WC1N 2AE.

There will also be a competition for the best **club-constructed** equipment, and a voucher for £10 will be presented to the winner.

A new feature of this year's exhibition will be mini-stands for non-trade RSGB members on which their own equipment can be shown on a bring and buy basis. These 4ft by 2ft table-top cubicle stands, with electricity supply and a season ticket for the exhibition, will cost 10s per hour. Not more than three pieces of good equipment can be

shown at one time, and members must book stand space in advance with G4KD before the week of the show stating day and time it will be required and enclosing the appropriate remittance.

The prize in this year's lucky draw for the world's latest £250 communications receiver will be a Hammarlund HQ215 all-band transistor set, believed to be the only one in this country at present. If the winner is a licensed amateur it can be exchanged for a KW2000B ssb transceiver.

Another "first" at the exhibition this year, and one which should prove popular, will be the Communications Bar on the ground floor in the main hall where refreshments of all kinds will be available.

Once again the RSGB Bookshop will be a prominent feature. It will be manned by a willing band of volunteers under the management of Ron Broadbent. Also present will be our "W" friend "Skip" Tenney of *Ham Radio Magazine*.

Preliminary notice

RSGB REGION 10 ORM

An Official Regional Meeting for Region 10 will be held at University College, Park Place, Cardiff, on Saturday 26 September 1970.

Full details will be published in the August issue of *Radio Communication*. The ORM will follow traditional lines, with an afternoon business session, meal and evening lecture, together with various competitions. There will be Council representation to ensure that all questions of policy can be dealt with at the highest level.

Please keep this date open in order that we can make the event its usual success.

THE RSGB SHOW, 1970

All the usual Exhibition attractions will be present and correct, but in particular we should like to draw members' attention to the display of Home Constructed Equipment. The Society invites items for display, subject to the following conditions:

i All items submitted for exhibition will be subject to acceptance by the Exhibition Committee.

ii Entries will be accepted (*a*) as items which have been the subject of published articles in the *RSGB Bulletin* or *Radio Communication* during the period January 1968 to date. It should be made clear that only the member writing the original article will be allowed to enter; (*b*) from members who are prepared, if required, to write a constructional article for publication in *Radio Communication* featuring their entry, this article to be paid for at the normal rates.

iii Entrants will be required to certify that their entries were constructed entirely by themselves from commonly available materials and components.

iv RSGB members only will be eligible.

v The Horace Freeman Trophy will be awarded for the most original piece of equipment on show.

vi Additional prizes may be awarded at the discretion of the judging committee.

The John Rouse Memorial Trophy will be awarded for the best piece of equipment submitted by a member aged 16 years and under; the rules in (ii) above will not apply in respect of entries for this trophy.

Members wishing to exhibit should write to the organizer of the Home Constructed Equipment Exhibit, M. Elliot, G3VWS, 23 Filbert Crescent, Gossops Green, Crawley, Sussex.

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Sunday 9 August 1970

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Car parking in a specially reserved car park.

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

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A 160m linear using high-voltage transistors

by JOHN STEVENS, G3UFW*

Introduction

This top band linear was designed to work with the transistor ssb rig described in *Radio Communication* January 1970. The design aim was to have a peak dc input of about 25W, and the rf output achieved is in excess of 10W before flat-topping starts.

The amplifier uses a pair of high-voltage power transistors, and operates near Class B. The ht supply used is 70-80V and is not therefore suitable for mobile operation without an inverter or dc-dc converter.

Choice of high (72V) vs low (12V) voltage operation

Transistor data sheets can be misleading. For example, a transistor might be listed as having a cut-off frequency of 95MHz and a dissipation of 45W (BD121). This does not mean that it can be used in a 45W dc input transmitter at 95MHz.

Most transistors are limited in their application to transmitter circuits since as the collector current goes up, current gain and cut-off frequency come tumbling down; and it is just at the moment of maximum collector current that we would like the other parameters to stay up.

The most important characteristic of a transistor for transmitter service is (assuming adequate voltage and power handling capability) the gain-bandwidth product at high collector currents. If this figure is 5-10 times higher than the operating frequency at the maximum current level, then the transistor can be considered as useful. Not many cheap transistors meet this requirement and transistors specifically designed for transmitter service are mostly expensive.

Very roughly, the maximum current reached in an rf power amplifier is:

$$I\ max = N \times \frac{\text{dc input power}}{\text{dc supply voltage}}$$

where N = about 4 for Class C
about 3 for Class B
about 2 for Class AB (220° conduction).

Thus for a 25W amplifier in Class B the approximate maximum current is:

6A	..	..	..	12V supply
3A	..	..	..	24V supply
1·5A	..	..	..	48V supply
1A	..	..	..	72V supply
0·3A	..	..	..	250V supply

For the particular application of amplifying signals from the ssb rig mentioned above, a fair amount of drive power was available (1—2W rf) and the prospect of running with an untuned resistive base circuit was attractive. This would provide a peak rf base current of about 200mA and therefore the chosen transistors would have to give:

Current gain × 5 at 72V/1A peak current
or Current gain × 30 at 12V/6A peak current.

The high voltage (72V) circuit could be expected to give rather better output efficiency due to the high ratio of supply voltage to collector saturation voltage. The lower currents flowing also ease the problem of preventing resistive losses around the output circuit.

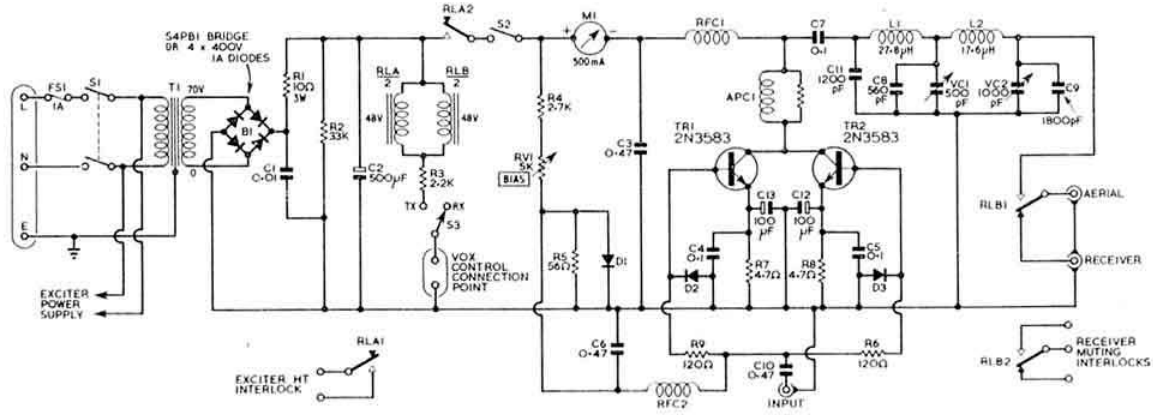

Fig 1. Circuit diagram

* "Langenhoe", Rowde, Devizes, Wilts.

These factors, together with transistor prices, led the author to try the high voltage circuit. This has resulted in a unit with quite pleasing performance.

Circuit operation

The circuit is shown in Fig 1.

The power supply nominally generates 70V dc, although this rises to 80V at low drain currents.

Input signals pass through the blocking capacitor C10 and the input terminating resistors R9 and R6 to the transistor base circuits. The parallel combination of the 120Ω resistors plus the transistor base—emitter resistances provides an adequate approximation to a 70Ω load for the exciter. By-passed emitter sharing resistors are included, (R7. R8.).

The bias circuit uses the voltage drop across a diode to control the zero signal base current and hence the quiescent collector current. It is desirable to provide thermal coupling between the transistors and the diode, then as the transistor temperature rises so also does the diode temperature. Since the diode forward voltage and the transistor base-emitter voltages reduce similarly with temperature; then the bias current split between diodes and transistors should stay constant, as should the quiescent collector currents.

Quiescent collector current is set to between 30 and 50mA to achieve a compromise between low quiescent dissipation and linearity.

The output matching circuit has been changed several times during its development. Initially it was designed as a straightforward Pi-coupler, using the *Radio Communication Handbook* equations. A low Q of about 5 was used in an attempt to reduce possibly damaging high voltages if the circuit was off-tune. This circuit provided output power quite happily. There was, however, little or no sign of tuning, either by output or by a dip in collector current!

At this point G2HIF suggested higher Q output circuits and recommended G8CGA's approach to designing Pi-couplers at low transformation ratios. Since the transformation ratio in this case is close to unity (ie 100 : 70), G8CGA's procedure was followed and a Pi-circuit with a Q of 15 designed. This gave signs of tuning much better. Unfortunately the large tuning capacitor required was rather unwieldy and therefore the G2HIF procedure was taken a step further and an L-Pi circuit designed. This, at last, worked well, giving a definite tuning point of satisfactory sharpness. One drawback, however, was that the full harmonic rejection capability of the L-Pi was not being realized as it was not possible to achieve a high Q in the L-section. This was due to the ratio of collector output resistance to stray capacitive reactance. This was, therefore, improved by adding capacitance across the collector circuit and thus making the matching circuit a Pi-Pi!

The first Pi operates at a Q of 10 and converts the output impedance at the collectors (about 100Ω) up to 2,500Ω. The second Pi circuit converts back from 2,500Ω to 70Ω.

While other circuits, particularly a high-Q series circuit, have been made to work quite well, the Pi-Pi circuit has the advantages of:

(i) using "valve-type" components; and

(ii) having very good harmonic rejection due to the extra tuned circuit.

The technique used to design the Pi-Pi is expanded in the appendices.

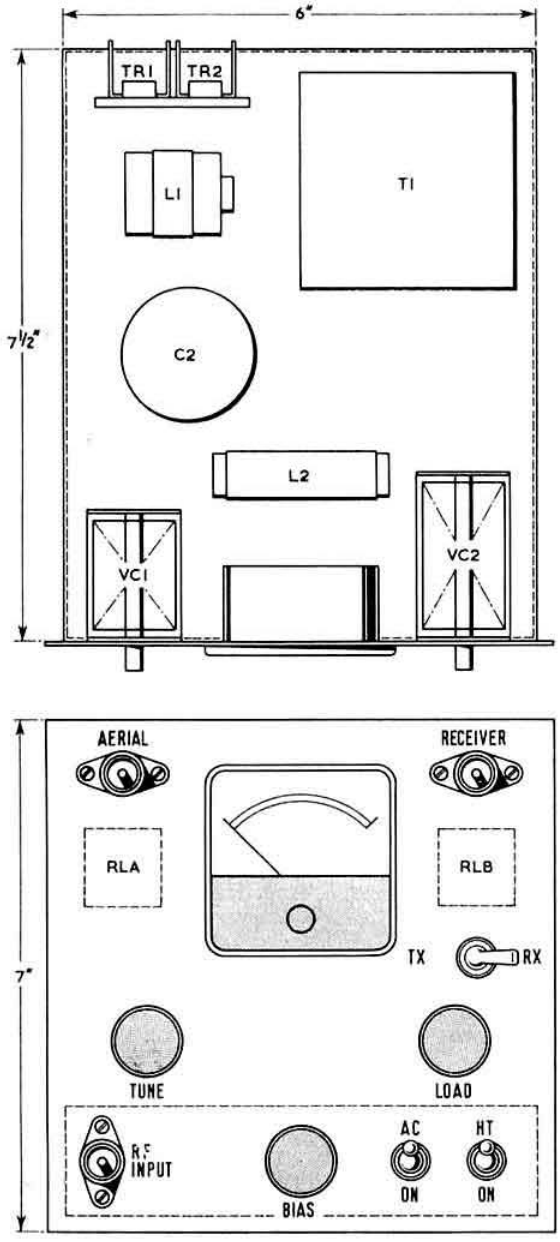

Fig 2. Layout

Construction

The construction was carried out on an old chassis and no particular precautions were taken to keep leads short.

Fig 2 shows the layout as used. The author's rig used type 40374 transistors with attached heat-fins. These were mounted on an insulated bracket and hung with the heat-fins projecting slightly over the back of the chassis to catch the breeze!

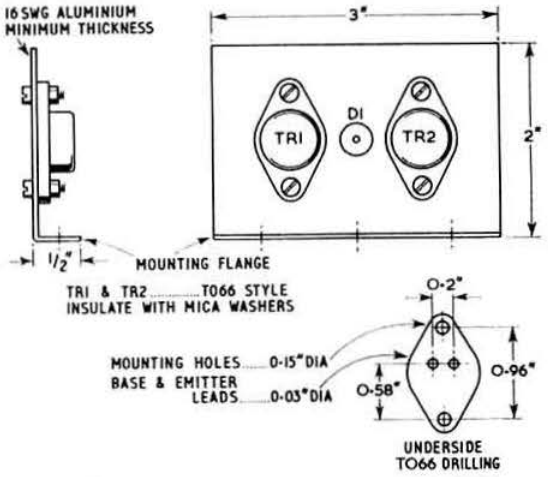

Fig 3. Alternative transistor mounting

A potentially better arrangement is indicated in Fig 3 suitable for type 2N3583 or 2N4240 transistors. These are very similar in performance to each other and the 40374, but have no heat-fins. They can be mounted on an aluminium heat-sink as shown, with mica washers to insulate. These should be new ones since they have to stand peak voltages up to at least 150V. (They are usually supplied, together with fixing washers, with the transistors).

The smaller components were placed under the chassis, ie power supply rectifiers and resistors and the bias chain components. The rf-carrying components in the transistor base circuits and the sharing resistors and decoupling were built in close to the transistors, and the collector circuit components and the Pi-Pi circuit built across the top of the chassis as shown. The input signal was fed to the transistor position in coaxial cable.

The relays were mounted high on the front panel but are omitted from the "Top" view to prevent confusion.

Performance and setting up

Setting up is quite straight-forward. Check the dc voltage supply, which will rise to about 80-90V with S2 open, close S2 and S3 and check the standing current with no rf input; this should be about 30–50mA. (If not, adjust RV1.)

Put a dummy load on the aerial socket and feed a little rf power to the input socket. Some increase in collector current on meter (M1) should be observed. Now adjust VC1 and VC2 for maximum rf output. (The meter indication is not a particularly good indication of optimum setting although a dip does occur near to maximum output power.)

Now bring the rf input up until the meter current stops rising. This should be in excess of 200mA. Make a *quick* check that at least 50 per cent efficiency is being achieved. That is, slightly more aerial current than with the 10W a.m. rig at that frequency; or about 60V peak to peak on an oscilloscope; or about 20V rms on a valve voltmeter. If all is well, try some ssb into the linear.

Results on the air have been quite good. Reports indicate that the signal has the requisite punch and compares well with equivalent power valve rigs.

One problem which does arise is slight degradation of the carrier rejection. Well over 50dB rejection can be achieved in the exciter but it is difficult to maintain better than 40dB out of the linear. This is because the linear, despite its name, has a slightly curved self-limiting characteristic. This is due to the current gain reduction in the transistors at higher collector currents.

In practice, the 40dB carrier rejection seems adequate and no reports of distortion have been received.

The effect could be reduced either by using more transistors in parallel or better transistors. The only better transistor known is the 2N3584. This is rather more expensive than the 2N3583 and has a higher current gain at high collector currents and a higher voltage rating. It has not been tried at G3UFW but it is an interesting alternative.

When mounted in a frame together with the exciter a screen was required between the two units to avoid interaction.

Conclusions

The transmitter as described has worked out well for 160m. It is not believed possible to extend the technique to higher frequencies with cheap transistors known to the author. However, there seems to be considerable development in new high-voltage and high-dissipation transistors and the situation might change at any time.

On the other hand, low voltage transistors are also improving and are certainly more attractive for higher frequencies.

Thanks are due to many amateurs for on-the-air comments, and particularly to Cliff Sharpe, G2HIF, for putting the writer straight on high-Q tank circuits for solid-state power amplifiers.

Appendix 1

Design of a linear using 40374/2N3583 transistors

Peak dc input required	= 25W
Supply voltage	= 70V
∴ Peak dc input current	= 0·36A
∴ Peak rf wave current under approximate Class B conditions is 3 × Idc	= 1·07A

ie with two transistors in parallel approximately 0·5A each.

Transistor characteristics at 2MHz, 0·5A nominal

f_T = 15MHz at 0·2A. Current gain degradation from 0·2 to 0·5A is typically $\frac{110}{75}$ at dc, ie 1·47 : 1 (f_T is the frequency at which the grounded-emitter current gain falls to unity.)

∴ Current gain at 2MHz and 0·5A is estimated as

$$\frac{15}{2} \times \frac{1}{1{\cdot}47} = 5{\cdot}1$$

∴ Peak rf base current $\frac{1{\cdot}07}{5{\cdot}1} = 0{\cdot}210\text{A}$

This is a maximum figure since the current gain calculation is pessimistic. Rf drive power required therefore for

$$\text{full output} = I^2R = \left(\frac{0{\cdot}21}{\sqrt{2}}\right)^2 \times 70 = 1{\cdot}55W$$

This is comfortably within the 2W exciter output. Thus two transistors in parallel should be adequate.

Output circuit

The output impedance should be:

$$2 \times \frac{\text{Peak collector voltage swing}}{\text{Peak current in the collector}} = \frac{2 \times (70 - \text{Vsat})}{1{\cdot}07}$$

$$= \frac{134}{1{\cdot}07} = 124\Omega$$

where Vsat is the voltage across the transistors at peak collector current and is equal to about 3V in this instance.

This expression for output impedance is rather unusual and is explained in Appendix 2.

In parallel with this is the collector slope resistance which is rather vaguely estimated at about 1,000Ω per transistor. In order to make some allowance for this the output impedance has been taken at 100Ω, and this value has been used for Rout in the calculation below.

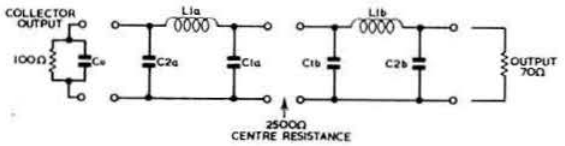

Fig 4. The Pi-Pi circuit.

Referring to G8CGA's article and Fig 4.

For Pi cct A

The value of Q_2 obtained taking C_{out} = 120pF as typical is

$$Q_2 = \frac{Rout}{X_{Cout}} = 0{\cdot}144$$

This value is very low and if the centre resistance is to be kept between 1kΩ and 10kΩ as a reasonable level, then the Q of Pi cct A must be kept low, which is undesirable since the aim is to design a high Q circuit!

For this reason the output reactance was artificially lowered by a factor of 10 by adding a 1,200pF capacitor across the collector circuit.

With this change $Q_2 = 1{\cdot}44$ and Q = 10 for

$$\frac{R_1}{R_2} = 25 \text{ and R centre} = 2{,}500\Omega$$

For Pi cct B

$$\frac{R_1}{R_2} = \frac{2500}{70} = 36$$

Thus for a Q of 15, $Q_2 = 2$

Now the values of all sections of the Pi–Pi circuit can be calculated from

$$X_L = \frac{R_2 Q}{1 + Q_2^2}$$

$$X_{C1} = \frac{R_1}{Q - Q_2}$$

$$X_{C2} = \frac{R_2}{Q_2}$$

Hence values at 1·9MHz are as follows:

		Reactance	Component
A	X_{C2}	70Ω	1,200pF
A	X_{C1}	291Ω	289pF
A	X_{L1}	329Ω	27·8μH
B	X_{C2}	35Ω	2390pF
B	X_{C1}	192Ω	436pF
B	X_{L1}	210Ω	17·6μH

Since C_{1A} and C_{1B} are in parallel they can be added, ie

$$289 + 436 = 725\text{pF}$$

C_{out} of the transistors is thought to be quite small under large signal conditions and therefore no allowance is made. However, with a heatsink mounting on a mica washer it might be wise to allow about 100pF for collector capacity, ie reduce the 1,200pF capacitor to 1,100pF.

The eventual circuit chosen is as shown in Fig 1. The 500pF tuning capacitor peaks up over the whole of Top Band.

Appendix 2

The output resistance of a Class B rf power amplifier transistor

The usual expression for the output resistance of an rf power amplifier transistor driving a matched load and tuned tank circuit is:

$$\text{Rout} = \frac{(\text{Collector voltage swing})^2}{2 \times \text{Output power}}$$

$$\text{or} = \frac{(\text{Vc} - \text{Vsat})^2}{2\text{Po}} \qquad \ldots [1]$$

where Vc = dc supply voltage
Vsat = collector saturation voltage
Po = rf output power

The equation [1] does not introduce collector current directly, nor can it be introduced without making assumptions about efficiency. The author feels that collector current is of major importance in defining probable transistor performance and, therefore, equation [1] is not very satisfactory unless the power output rating of the transistor is quoted in the manufacturer's data sheet. An alternative approach is described below.

First, a subsidiary result must be obtained—the relationship between the peak and the dc collector currents.

For a Class B amplifier, current only flows for half of each rf sinewave.

Therefore,

$$I_{DC} = f\hat{I}\int_0^{\frac{1}{2}T} \text{Sin}\,\Omega t\,dt$$

$$I_{DC} = -\frac{f\hat{I}}{\Omega}(-2) = \frac{\hat{I}}{\pi} \qquad \ldots [2]$$

where $\hat{I}$ is the peak current flowing in the transistor at the peak of the rf drive current wave. We can use result [2] to calculate the dissipation in a perfect transistor (ie one where Vsat = 0).

Since current only flows during the half cycle, we need only consider this time to analyse the dissipation. During the other half cycle the transistor has voltage across it but no current through it, and therefore no dissipation.

During the conducting half cycle:

Collector voltage = Vc (1— Sin Ωt)

Collector current = $\hat{I}$ Sin Ωt

Multiplying these together and integrating, the mean dissipation is: $P_D = f\int_0^{\frac{1}{2}r} V_c\hat{I}\ (1-\text{Sin}\ \Omega t).\ \text{Sin}\ \Omega t.dt.$

which after manipulation reduces to:

$$P_D = V_c\,\hat{I}\,(\frac{1}{\pi} - \frac{1}{4}) \qquad \ldots [3]$$

but $\hat{I} = \pi I_{DC}$ (from [2]

$$\therefore P_D = V_c\,I_{DC}\,(1-\frac{\pi}{4})$$

If we assume a perfect matching resistor across the tuned tank circuit and collector-emitter circuit; then

$V_c = V_{DC} - Vsat$

(since we have assumed Vsat = 0)

$$\therefore P_D = P_{DC}\,(1-\frac{\pi}{4}) \qquad \ldots [4]$$

where $P_{DC} = V_{DC}\,I_{DC}$ = dc input power.

Also, the rf output power must be

$$P_o = P_{DC} - P_D = P_{DC}.\frac{\pi}{4} \qquad \ldots [5]$$

But the rf power delivered to the load must also equal

$$P_o = \frac{V_c}{\sqrt{2}} \cdot \frac{\hat{I}_L}{\sqrt{2}} = \frac{V_c\,\hat{I}_L}{2} \qquad \ldots [6]$$

where $\hat{I}_L$ is the peak rf current in the load resistance R_L.

Hence from [5] and [6]:

$$P_{DC}\,\frac{\pi}{4} = \frac{V_c\,\hat{I}_L}{2}$$

but working back,

$$P_{DC} = V_c\,I_{DC} = \frac{V_c\,\hat{I}}{\pi}$$

and hence

$$\frac{\hat{I}}{4} = \frac{\hat{I}_L}{2}$$

$$\text{or } \hat{I} = 2\hat{I}_L \qquad \ldots [7]$$

ie the peak collector current is equal to double the peak load current in a Class B rf amplifier with a tuned and matched load.

Also, $$R_{out} = R_L = \frac{V_c}{\hat{I}_L} = \frac{2V_{DC}}{\hat{I}} \qquad \ldots [8]$$

and $$R_{out} = R_L = \frac{V_c^2}{V_c\,\hat{I}_L} = \frac{V^2_{DC}}{2P_o} \qquad \ldots [9]$$

showing that the above results reduce to the standard expression.

R_{out} is, of course the resistance to which the matching circuit must be added to convert to the usually required 50 or 70Ω.

Finally, the assumptions must be checked. The assumption of correct matching is reasonable and requires no modification to the results.

The effect of Vsat is more important and may change the equation for dissipation quite significantly. However, for high voltage circuits the errors in using

$$R_{out} = \frac{2.\,(V_{DC} - Vsat)}{\hat{I}} \qquad \ldots [10]$$

are thought to be small.

The above is a particular case of more general mathematics covering various transistor conduction angles and collector saturation voltages. This would appear to be much more complex and has not been attempted by the author. Recalculation for specific conduction angles should be possible, however, using the general principles above.

Components list

Resistors

R1	10Ω	3W w/w	10%
R2	33kΩ	1W	20%
R3	2·2kΩ	1W	20%
R4	2·7kΩ	3W w/w	10%
R5	56Ω	½W	20%
R6	120Ω	1W	20%
R7	4·7Ω	1W	20%
R8	4·7Ω	1W	20%
R9	120Ω	1W	20%
RV1	5kΩ	Wirewound potentiometer	

Capacitors

MF = Metallized film—polyester or polycarbonate.

C1	0·01μF	250V dc	Metallized film
C2	500μF (Old tv electrolytic used)	120V dc	
C3	0·47μF	250V dc	MF
C4	0·1μF	50V dc	MF
C5	0·1μF	50V dc	MF
C6	0·47μF	50V dc	MF
C7	0·1μF	250V dc	MF
C8	560pF	250V dc	Ceramic/polystyrene
C9	1,800pF	250V dc	Ceramic/polystyrene
C10	0·47μF	50V dc	MF
C11	1,200pF	250V dc	Ceramic/polystyrene
C12, C13	100μF	6V dc	Electrolytic

Wound components

T1	230V 50c/s input ~70V ½A output
APC1	4 turns on 100Ω resistor. (ie Erie Type 8 size)
RFC1	2·5mH. Not more than 10Ω dc resistance
RFC2	5mH
L1	27·8μH 33 turns 30swg, closewound ½in long on 1in diameter former
L2	17·6μH 80 turns 24swg, closewound, on ½in diameter former 2½in long

Semiconductors

TR1, TR2	2 by 2N3583 or 2N4240 on small heatsink, say 2in by 3in aluminium or Type 40374 mounted to allow some air circulation
B1	S4PBI bridge or 4 by 400V, 1A diodes connected as shown
D1	Stud mounting, low voltage 1A diode
D2	Low voltage 1A diode S2M1 or equivalent.
D3	Low voltage 1A diode, S2M1 or equivalent.

Miscellaneous

FS1	Fuseholder with 1A fuse
RL1, RL2	48V coil double c/o relay
M1	500mA dc milliameter
S1	2-pole on/off toggle switch
S2, S3	Single-pole on/off toggle switch
VC1	Variable capacitor—airspaced 500pF
VC2	Variable capacitor—airspaced 1,000pF

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1. "A Transistor SSB Transmitter for Top Band", J. Stevens, G3UFW,—*Radio Communication*, January 1970.
2. "A Semiconductor VHF Power Amplifier using a Pi-tank circuit", C. Sharpe, G2HIF,—*Radio Communication*, November 1968.
3. "An Improved Design Method for Pi and L-Pi Network Couplers", H. L. Gibson, G8CGA,—*Radio Communication*, June 1969.
4. Silicon High Voltage Transistor 2N3583, 40374, 2N4240. RCA Data File No 138.

A narrow-band fm exciter for vhf bands

by P. D. MORRIS, G3ISZ*

Before building this equipment, the attention of readers wishing to read-up on fm theory is drawn to the article "The FM system" in the May issue of *Radio Communication*.

NARROW band frequency modulation (nbfm) can be produced in many ways, some extremely simple and others exceedingly complicated. It is up to the individual, when making his decision on which method to use, to inquire whether certain requirements are covered.

These are:

(1) The frequency range of the audio system should be restricted to a band of frequencies that will accommodate the speech range only;
(2) The average amplitude of the audio system should have the highest average power that can be obtained without introducing distortion;
(3) The mean carrier frequency should have the highest possible stability;
(4) There should be adequate control over the amount of deviation, or equivalent frequency variations in the system.

If the system being employed covers these points, it will be capable of producing a signal that will be acceptable to most communications receivers.

The question of cost inevitably crops up when one is deciding upon new equipment. Usually you get only what you are prepared to pay for, but this does not mean that it is expensive to produce a good nbfm signal. On the contrary, it is doubtful whether the cost of a good fm system would be as great as the average low power modulator as used for a.m. transmissions, and this estimate does not include the cost of the power supply needed to run the a.m. modulator.

Circuit description

A circuit of an nbfm unit that can be used with most a.m. transmitters is shown in Fig 1. It contains all the requirements as outlined above, and will work with any crystals within the range of 6 to 8MHz.

The circuit used is a simple one and performs all the functions necessary to produce a really good signal on the vhf wavebands.

V1 is a normal crystal oscillator. Its only function is to generate a stable reference frequency from which the fixed carrier is derived.

V2 is a straight-forward buffer amplifier which is tuned to the same frequency as the oscillator. It enables the output of the oscillator to be raised to a level suitable for phase shift operation. It also isolates the oscillator itself from any adverse effects during this operation which could lower its stability in any way. The actual phase shift takes place in its plate circuit by the action of the reactance valve V3.

The circuit associated with V3 is one that causes the valve to behave as a variable inductance by the action of the phase shift component R8, which is connected between its plate and grid circuits. The capacitor C11 plays no part in this operation, and is only used to isolate the grid from the dc component of the plate circuit. The full action of the circuit is explained in any good text book on fm and requires no further examination for our purposes.

V4 is a cathode follower and is used to isolate the buffer and reactance valve from any effects that might be caused by the external circuit. The output of the cathode follower is arranged to limit the level of the frequency modulated output in such a way that excitation provided will be roughly the same as that when a crystal is used in the grid circuit of the oscillator valve. This facility enables the crystal normally used in the transmitter to be used in the nbfm unit. All that is required is to take out the crystal from the transmitter and place it in the nbfm unit. The output of the unit is then plugged into the crystal socket. When this is carried out, the available drive will be approximately the same as if the original crystal were used.

V5 is a high-gain speech amplifier. Adequate smoothing and decoupling of the dc supply has been included to minimize the chances of hum appearing in the circuit. R17 and C17 form an effective filter for any rf voltages that may appear on the microphone cable.

V6a is a further audio amplifier. It is used to build up the signal to a level that is sufficient to ensure proper clipping action when applied to the clipper valves V7a and V7b. The amount of clipping is governed by the volume control R23.

During the clipping action of V7a and V7b a high order of harmonics is produced, and these are effectively attenuated by the three-section low-pass filter between the anode of V7b and the grid of V6b. There is a considerable loss of audio in the filter, and to compensate for this a further audio amplifier, V6b, is used. The output of this valve is now fed via C30 to the inverse frequency network in the grid circuit of the reactance valve V3.

The potential divider R5, R6 and R7 provides the dc path for the grid circuit. R5 and C10 form the inverse network proper. R7 also behaves as a grid stopper and minimizes the effect of C10 on the input capacity of the reactance valve.

The unit as shown works at maximum efficiency when the multiplier used to reach the output frequency is 24. This means the use of crystals in the 6MHz range. This does not mean that it must be used in this way. Tests were carried out on the 144MHz band using a multiplier of 18 when using 8MHz crystals, and all reports received were very complimentary. Tests were also carried out on the 4m band using a multiplier of only nine when using crystals in the 7·8MHz range. In this case, although the initial phase shift had to be increased slightly to produce the required amount of indirect fm no reports were ever received of any distortion being present, and in every instance absolutely no trouble was experienced in resolving sufficient audio power in the receiver.

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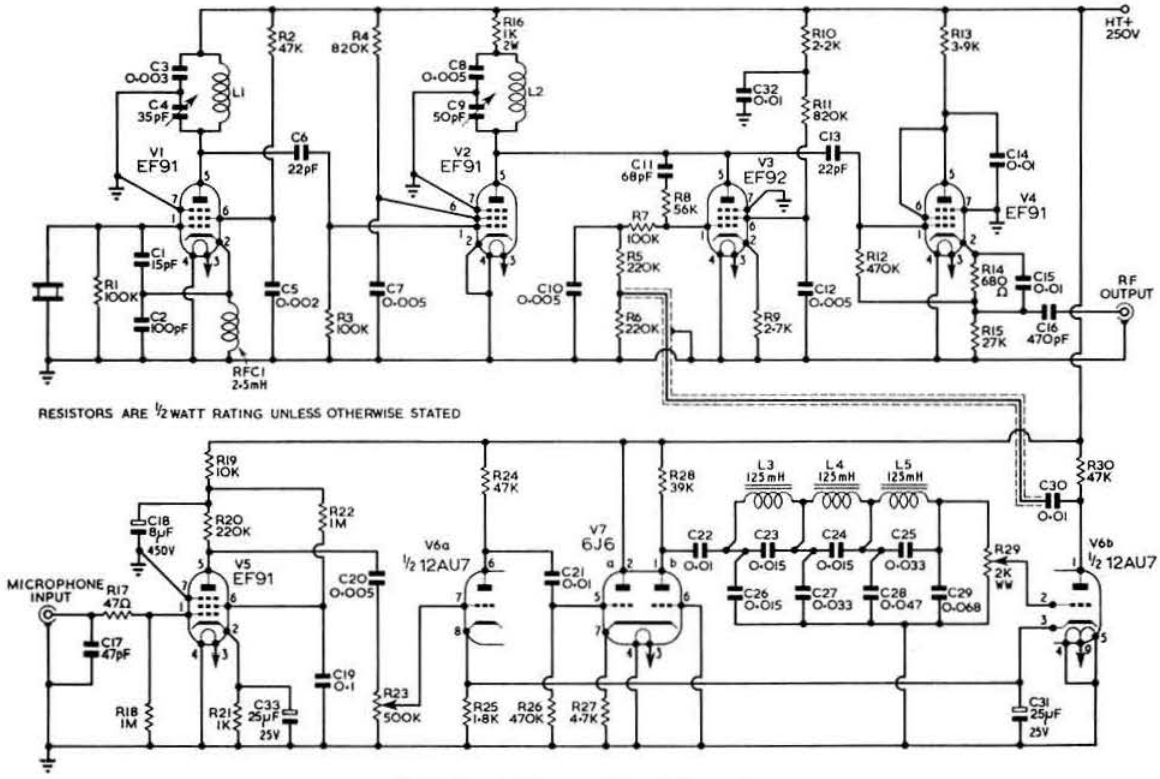


Fig 1. Circuit diagram of the nbfm exciter

Where using lower orders of multiplier, it is advisable to use a speech filter having a slightly higher frequency cut-off. A frequency range of 300 to 3,000Hz would suffice. No other alteration to the circuit will be necessary, and the component changes required are given in the appropriate list.

Construction

The original model was built on a chassis 10in by 7in by 2½in. The layout of the main components was decided upon after long experience with this type of circuit. If the would-be constructor considers this size of chassis to be rather large and decides to use a smaller one, it is suggested that the general layout shown in Fig 2 and Fig 3 should be adhered to. Instability may be experienced if the general layout is altered to any great extent. All valves should have screening cans, and the screens fitted below chassis should be placed so as to isolate the audio section from both the rf section and that containing the reactance valve and the cathode follower circuits. The purpose of the other screen is to isolate the components in the reactance valve and cathode follower circuits from the effects of any stray rf fields from the oscillator and buffer stages.

No power pack is shown as it was considered most likely that spare power packs would be available in most amateur shacks. The power requirements are 250V at about 30mA minimum, and 6·3V at 2·5A maximum.

Tests

When the unit is built and the usual tests on the circuitry have been completed, the equipment itself can be tested. A metering unit such as that shown in Fig 4 will be of great help in the initial tests.

A crystal within the range 6 to 8MHz should be plugged into the holder of the unit, the supply to the heaters only connected, and the ht switched off. Connect the meter to the rf coaxial output socket. Set both of the tuning controls at a position which corresponds to about half capacity, and set the clipper control (volume control) and the deviation control to the minimum, or off, position. After the heaters have warmed up, switch on the ht voltage and keep an eye on the meter. This should now show a reading. If there is no reading, try adjusting the oscillator tuning capacitor until the maximum reading is obtained. Now tune the buffer stage for maximum signal, and when this is done the rf section can be left as it is.

Tune in the signal on a communications receiver, taking care that no overloading occurs, and check the signal at the fundamental frequency in order to confirm whether the carrier is in fact clean and does not contain any spurious responses. From this point onwards the tests must be carried out with the receiver tuned to the band on which the unit is being used. Whether or not a converter is being used for receiving the vhf signals, the same set-up must be used for the following tests. Tune in the harmonic of the unit in the normal way on the communications receiver. Connect a

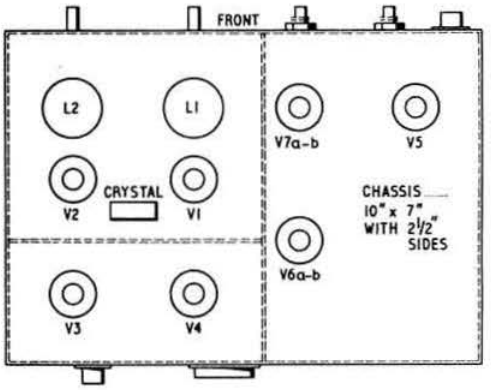


Fig 2. Above chassis layout (not to scale)

microphone to the appropriate socket on the unit, and connect a pair of phones to the receiver. The loudspeaker must be inoperative to avoid feedback.

If the usual numbered dials are being used with the clipper and deviation controls (these are usually numbered 0–10), set the deviation control at No 2, at the same time listening-in on the phones.

When the carrier noise is heard, gradually advance the clipper control and at the same time speak into the microphone. A signal should now be heard in the phones and, if the receiver is tuned into the centre of the carrier, may appear to be distorted. The receiver should now be slowly tuned to a position slightly lower or higher in frequency to a point at which the speech is received clearly. The volume control on the receiver may require some adjustment to bring the signal to a comfortable level, and when this is done the clipper control can be further advanced to a point at which some distortion of the signal begins to appear. The number on the clipper control dial at which the distortion appears should be noted, and must not be turned up any higher. In fact, the working position will always be lower than this to ensure clear and easily readable signals.

In general, the setting of the clipper and deviation controls would be to keep the deviation control as low as possible, and the clipper control as high as possible consistent with clean readable speech.

When carrying out these tests, the selectivity position on the receiver, if this is variable, should be set at the position normally employed for the reception of a.m. signals. The signal as received on the phones will now be of the same characteristic as the transmitted carrier. Obviously air tests must be carried out, and in this respect any adjustments made should be governed by the previous remarks covering the adjustments of the deviation and clipper controls.

In use

The unit can be used with the majority of existing a.m. transmitters with no alteration whatever. If the fundamental oscillator is of a type that could be fed with a vfo in place of the original crystal, it is safe to use the unit. The transmitter should be set up as for cw, making certain that the winding of the modulation transformer is not accidently left in circuit. The crystal is now taken from the transmitter and fitted to the phase modulation exciter, and the output of it fed via coaxial cable to the crystal socket in the transmitter. The output from the unit will take the place of the crystal, and the resultant drive power, if everything is working correctly, will be the same as if the crystals were used. The output signal from the unit will be phase modulated; will have a frequency response highly suited to speech waveforms with the very high and very low frequencies severely attenuated, and will have a high average sideband power available for amplification in the transmitter itself.

The unit assures adequate carrier stability and, apart from the three other essentials required to produce an effective easily readable nbfm signal, no other claims are made. In this respect, reports over all distances, whether local or dx, have been entirely satisfactory in terms of quality of speech and readability. On the other hand there have been one or two reports of low audio development where certain of the surplus commercial wideband receivers have been used for reception. In spite of this the signals have always been fully intelligible.

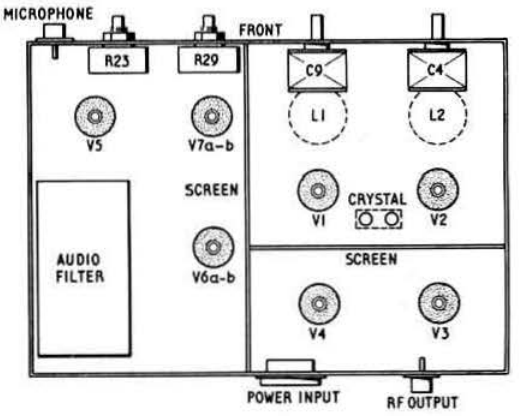


Fig 3. Under chassis layout (not to scale)

One of the main considerations leading to the design of this nbfm exciter as a separate unit was the flexibility when used in this way.

It is possible that where a completely new transmitter is being built, the constructor may decide to incorporate the circuit in place of the normal front end. If this is the case there is now no need to include the cathode follower circuit, as the loading will be substantially constant. In the absence of the cathode follower the rf voltage for the following stage will be taken direct from C13 in the normal manner.

Where the circuit is used in this manner, some means should be employed to enable the exciter section alone to be checked as outlined earlier.

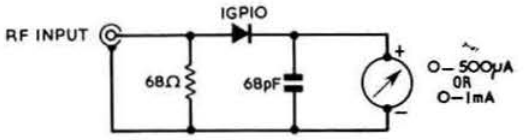


Fig 4. RF indicating meter

Component list

All resistances are ¼W unless otherwise stated.

R1, R3, R7	100k	R16	1k 2W
R2, R24, R30	47k	R17	47Ω
R4, R11	820k	R18, R22	1MΩ
R5, R6, R20	220k	R19	10k
R8	56k	R21	1k
R9	2·7k	R23	500k potentiometer
R10	2·2k		
R12, R26	470k	R25	1·8k
R13	3·9k	R27	4·7k
R14	680Ω	R28	39k
R15	27k	R29	2k w/w potentiometer

C1	15pF silver mica
C2	100pF silver mica
C3	0·003μF disc ceramic
C4	35pF air-spaced variable
C5	0·002μF disc ceramic
C6, C13, C7, C8, C10, C12, C20	22pF silver mica
	0·005μF disc ceramic
C9	50pF air-spaced variable
C11	68pF silver mica
C14, C15, C21, C22, C30, C32	0·01μF disc ceramic
C16	470pF disc ceramic
C17	47pF silver mica
C18	8μF 450V electrolytic
C19	0·1μF polyester
C23, C24, C26	0·015μF polyester
C25	0·0033μF polyester
C27	0·033μF polyester
C28	0·047μF polyester
C29	0·068μF polyester
C31, C33,	25μF 25V electrolytic
RFC1	2·5mH
L3, L4, L5	125mH

These chokes are for a range of 250 to 2,500Hz.

The tuning coils are wound on ⅜in paxolin formers and enclosed in 1¼in diameter screening cans.

L1 40 turns of 26swg enamelled wire close wound. Tuning range 5·7 to 8·9MHz approximately.

L2 30 turns of 26swg enamelled wire close wound. Tuning range 5·76 to 8·66MHz approximately.

Where it is decided to build the audio filter with the higher cut-off, the following values should be used.

C23, C24	0·01μF polyester
C25, C27	0·022μF polyester
C26	0·015μF polyester
C28	0·033μF polyester
C29	0·047μF polyester
L3, L4, L5,	220mH iron cored chokes.

If difficulty is experienced in obtaining this value of choke, use may be made of the Radiospares T/T2 transistor output transformer which has a primary inductance of this value. Test filters made up using the primary winding have proved completely successful in operation.

The inductive portion of the speech filter should be enclosed in a screening box. There should also be a screen between each section and the axis of the inductances should be opposed to each other to minimize coupling between each section.

The capacitive components can be conveniently mounted on a group board fixed to the screening box.

Put a transistor in your cathode! (3)

A hybrid driver stage for an ssb transmitter

by R. C. Marshall, MA, CEng, MIEE, G3SBA*

ONE difficulty with transmitters using transistors in the earlier stages is that of developing sufficient power to drive a full-sized valve power amplifier. The author's ssb transmitter uses two TT21s in parallel. Although these are operated in Class AB1 so that in theory no drive power is necessary, in practice losses mean that several watts are required. Tuned circuit losses are aggravated by the high input capacitance of the parallel output valves and a basic layout in which the driver valve is four inches away. Thus lead lengths were considerable, and minimum tuning capacitance above the optimum for a parallel tuned circuit at 30MHz.

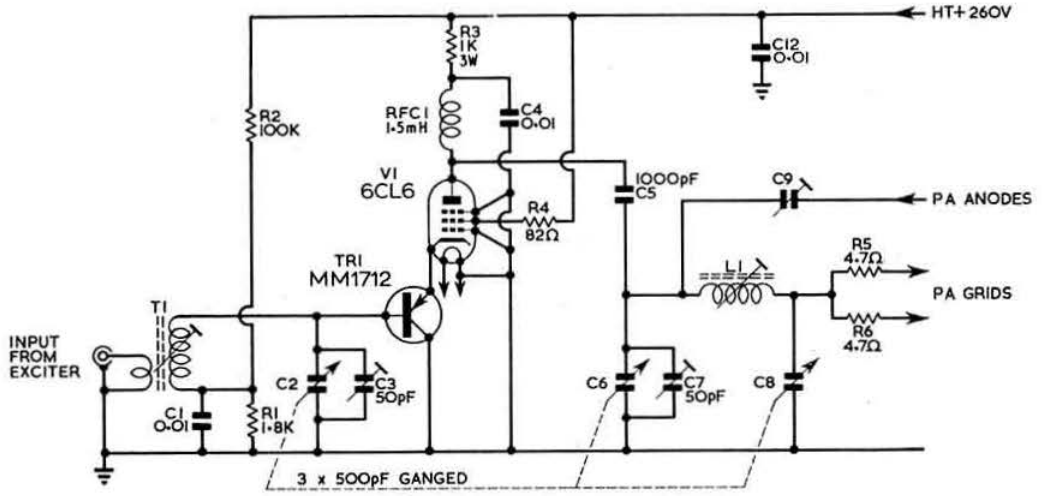
Therefore a Pi coupler with equal input and output capacitances was used between the driver and the pa. This reduces the effective capacitances by splitting it between the two ends of the coupler, allowing a lower loaded Q. At the same time the larger tuning inductance swamps lead inductance, giving a higher unloaded Q. These effects both reduce circuit losses, and together with the lower than usual pa grid stoppers enable a relatively low power valve to drive the pa fully. The Pi coupler also allows neutralization without the tapped inductor or "hot" capacitor rotor required with the customary tuned circuit.

The transistor exciter was capable of producing only 0·5V peak into 75Ω, and detuning due to Miller effect defeated attempts to apply this to the driver grid via a tuned circuit. Consequently, a circuit with very low Miller feedback was indicated, and over a period of years several transistor-valve hybrids have been used.

Originally (in 1966) only a pnp transistor of suitable performance could be found, so this was arranged as an emitter follower and directly coupled to the grounded-grid valve amplifier so that the valve provided the dc power for the transistor, which appears in the place of the normal cathode bias resistor. The arrangement is shown in Fig 1. The actual bias for the valve is 0·7V more than the base potential of the transistor, which is fixed by the potential

* 30 Ox Lane, Harpenden, Herts.

Fig 1.



divider R1 and R2. The rf input impedance at the base is quite high, and is matched to the 75Ω input by the tuned circuit. Miller feedback is minimized by the very low rf impedance at the cathode, just as in a conventional cascode circuit. The transistor operates at the same current (50mA) as the valve, consequently a medium power device is required.

In 1969 the "double cascode" circuit of Fig 2 was adopted. This uses two npn transistors and has a low impedance input. The stage itself is very stable, but it is unwise to try to feed it from a cable of appreciable length, for rf pickup from the aerial may then cause oscillation.

In this circuit the valve supplies the supply voltage for TR3 but the current through all three devices is defined by R7, R8 and R10. The gain can be adjusted by choice of the emitter feedback resistor R9. TR2 derives its power from the

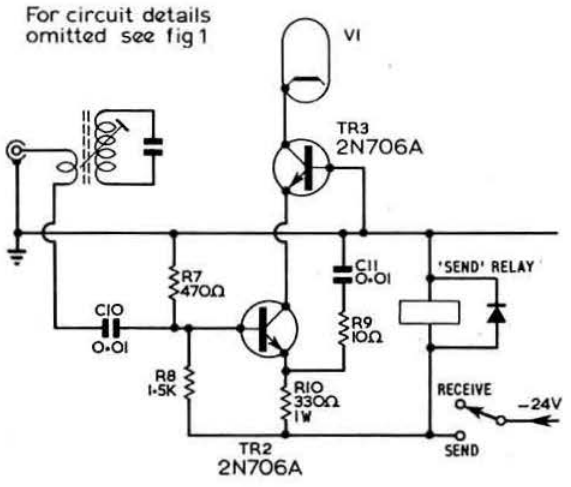


Fig 2.

−24V "send relay" supply. Removal of this supply on "receive" mutes the driver stage. The relay must have a transient suppression diode as shown.

Now that high-current rf transistors are available, this type of circuit should be practical at a higher power level, where the valve is the pa itself. It would still provide the advantages of good stability and high power gain that were needed in my driver stage.

Component list

C1, 4, 10, 11, 12	10,000pF ceramic.
C2, 6, 8	500pF 3-gang variable.
C3, 7	50pF trimmer.
C5	1,000pF ceramic.
C9	High-voltage neutralizing capacitor, as required.
R1	1·8kΩ ⅛W, 10 per cent.
R2	100kΩ ⅛W, 10 per cent.
R3	1kΩ 3W, 10 per cent.
R4	82Ω ⅛W, 10 per cent.
R5, 6	4·7Ω ⅛W, 20 per cent, must be composition.
R7	470Ω ⅛W, 10 per cent.
R8	1·5kΩ ⅛W, 10 per cent.
R9	10Ω ⅛W, 20 per cent, must be composition.
R10	330Ω 1W, 10 per cent.
RFC1	1·5mH.
TR1	MM1712 Motorola.
TR2, 3	2N706A with heat sinks.
V1	6CL6.

Coil details (all wound on Denco ¼ in polystyrene formers with iron dust cores.)

	10/15/20 metres		40/80 metres	
T1 primary	2 turns 18swg	spaced	6 turns 24swg	close
T1 secondary	5 turns 16swg	to	26 turns 24swg	wound
L1	6 turns 18swg	¼in long	30 turns 28swg	

* * *

Correction

In the first of these three articles, published in the May issue, the valve specified was EF91—it should have been EL91. Sorry—G3SBA

TECHNICAL TOPICS

A monthly feature by PAT HAWKER, G3VA

THERE are two divergent but equally interesting ways of regarding amateur radio experimentation. One may be trying to develop techniques which carry forward the currently accepted state of the communications art; the frontiersmen of amateur radio are likely these days to be concerned with fairly complex equipment, with high-gain aerial systems and with new components and devices. This is the world that seems to be reflected in the majority of articles in the journals; and in the costs which some people associate with amateur radio.

But this, as we often try to indicate in *TT*, is not the whole story. There has always been, and remains, useful and rewarding work to be done in developing simple equipment and aerials which allow satisfactory, if not spectacular, communication to be achieved from restricted environments and within limited budgets. Amateur radio is fortunate in being one of the few activities which can be carried on at absolute costs well below those ruling in the early 'thirties, when one might pay £5 5s for a DO/40A 40W dissipation transmitting triode.

The newcomer, looking through the advertisements or reading many of the articles, might well be led into thinking that if he wants to engage, for example, in hf dx activity then he must equip himself immediately with several hundreds of pounds worth of transceiver, lots of test equipment, factory-made beam aerials and the like. And that such essential equipment is far too ambitious for him to build himself.

A letter from Kjell Ström, SM6CPI, secretary of the Swedish society SSA, makes the point that there is need in amateur publications for more emphasis to be put on less complicated matters (and pays *TT* a nice compliment in suggesting that this is what we try to do—indeed it is, even if, at times, in trying to describe something new one has to plunge into some deep water). He mentions that a recent survey among Swedish amateurs has shown that there are many who are rather daunted to start on the bigger projects and that "many are scared of the new components, not even daring to pick up a transistor". But, he adds, if they can come to see that one can often make something usable, even from a single integrated circuit, they may soon gather the courage needed for the bigger projects.

One cannot stress too often that it still remains true that low-cost stations, using the traditionally simple aerial systems which readily fit into urban and suburban homes, are capable of effective world-wide communication on hf, and good results on vhf.

The vertical-Tee or inverted ground-plane

For some years a simple 300Ω feeder type of 14MHz folded dipole only about 20-25ft high has been in use at G3VA. This has always brought plenty of contacts, although there have been some blind areas due to the dipole radiation pattern, screening from buildings, and the high-angle of radiation to be expected from a dipole little more than quarter-wave above earth.

We have often suggested in *TT* that it is a fallacy to believe that a vertically polarized aerial will automatically provide a much lower angle of radiation than a horizontal dipole; much depends upon the reflection coefficient resulting from the conductivity of the earth. Most tests have indicated that where a dipole can be at a good height it will have as effective a low-angle radiation as the average vertical. But the fact remains that, where aerial support height is extremely limited, vertical polarization has considerable attractions, even in "hostile" sites.

The quarter-wave (or 113°) ground plane aerial has for long upheld its reputation as an effective long-range aerial. But the physical requirements for putting up a ground plane can sometimes be daunting—and for this reason the quarter-wave vertical fed against ground has found considerable acceptance. This is fine, provided that the amateur is prepared to put in a really effective earth connection. I would strongly disagree with G3SAA's suggestion in the June issue that this is "not a dx transmitting aerial".

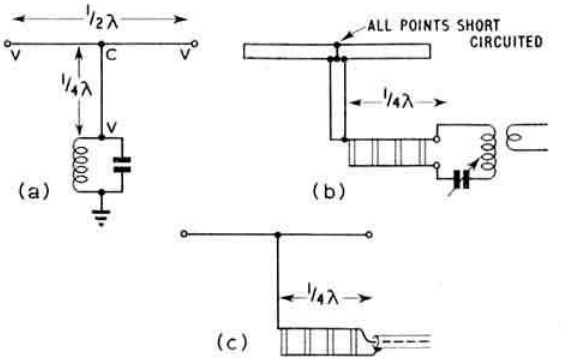


Fig 1. The basic arrangement of the vertical-Tee aerial. V are points of high voltage, C of high current. (b) Showing how the G3VA 300Ω feeder-type folded dipole has been converted by shorting across the two feeder wires to the mid-point of the dipole and adding a Zepp matching section. The use of feeder for the vertical section should help increase bandwidth. (c) Modified arrangements used by G3HQX eliminating the separate aerial tuner. Other possible feeder arrangements are suggested in the *ART* notes on vertical Zepp aerials. Typically for 14MHz vertical element 16ft 11in. Top section two times 17ft 2in

Looking around for a lazy man's way of simplifying the erection of a vertically polarized aerial suitable for use with the available 20-25ft supports, I began to ponder on the various ways in which verticals can be operated without good earth connections. One of the most effective (though today often overlooked) is the $\frac{1}{2}\lambda$ Zepp (see *ART*, section 8). But this requires a vertical height of some 35ft-plus. Why not top-load such a system, as in G6XN's centre-fed 7MHz aerial (*TT*, May 1970) or in the bobtail array (see later)? This would result in a T aerial (Fig 1(a)), which seems to have been virtually forgotten for amateur applications, though various systems of this type were explored by C. A. Heathcote, G3JR, before the war (*T & R Bulletin*, March 1939). The T aerial has always been one of the classic mf broadcasting and marine aerials, and used to be popular for mf reception. Some extremely simple alterations to the existing folded dipole resulted in the arrangement shown in Fig 1 (b). Here, at least in theory, was an aerial in which radiation from the two top sections would approximately cancel out, leaving a voltage-fed $\frac{1}{4}\lambda$ vertical radiator, but not dependent upon any earth connection, and requiring a minimum height of only about 20ft.

Tests with this system, which appears to be usefully non-critical in dimensions, have brought a pleasant improvement in 14MHz dx-effectiveness. During the month following its erection on 2 May (if the simple changes merit such a term) the 125 or so dx contacts represent a gratifying increase on the usual bag: plenty of west coast Americans and Canadians, JA, KL7, KH6, VU5, VU2, JT1 and a UA0 in zone 23, XE, ZE, ZS, ZM, AX, PY, YV, YA, 7Q7 etc. While some of these probably reflect the well-known "new aerial improvement factor", it remains a firm conviction that at distances over about 3,500 miles the aerial is laying down a more consistent signal than in its horizontal dipole form, and is omnidirectional.

This view is supported by John Brodzky, G3HQX, who has been trying some modified versions of the aerial with rather more care in comparison and swr checking than my own slapdash approach. He finds, for instance, that while east coast Americans are no better than with a low dipole, the advantage is clearly with the vertical-Tee as one goes towards the west coast; the vertical also brings in many weak extended ground-wave signals which are not audible on the dipole. He has also used a 28MHz version. Interestingly enough, he also finds his 14MHz vertical-Tee an improvement on 3·5MHz, although for that band we both agree that it must be acting as an "aog" aerial (and newcomers who do not know what an aog aerial is should enquire at their local club!). By adopting the established technique of joining a Zepp feeder directly to coaxial cable he eliminates the need for a separate aerial tuner. Like any other vertical aerial, the system needs to be erected clear of other aerials and can lose power to fencing etc—it also produces a strong ground wave which may not be advisable in tv fringe areas. Tvi should not be a problem in areas of BBC and ITA main uhf stations, however, all of which use horizontal polarization. G3HQX has also found that a 25ft top (ie two times 12·5ft) gives a good match, though we are not sure why.

Although it is always risky to attempt to assess a new hf aerial over a matter of a few weeks, it does already appear that this aerial (which is an amalgam of a number of well-established techniques) has a useful place in the amateur field. It may be noted that it is virtually a ground-plane aerial with two radials, but upside down and far easier for most amateurs to put up than the conventional ground-plane. The impedance matching also seems much less critical. We do not suggest that the vertical-Tee will outperform a good ground plane, but rather that one can achieve much the same results far more easily.

Switched polarization?

The ease with which a dipole aerial can be converted to a vertical-Tee suggests that it should be relatively easy to develop an aerial which could be switched from horizontal to vertical polarization and vice versa. Indeed such a system, with many features in common with the vertical-Tee, forms the subject of the Telefunken British patent No 1,164,048. This patent describes an aerial intended for mf broadcasting which can at will be made to give predominantly ground-wave reception (vertical polarization) or mainly high-angle sky-wave radiation (horizontal polarization).

Basically the Telefunken system comprises two crossed folded dipoles fed by means of four vertical wires. By providing remotely-controlled switches at the top of the four feeder wires, so that these can all be short-circuited, the system becomes a top-loaded vertical cage aerial. No details are given in the patent documents as to the type of switches proposed, and it is not known if such an aerial has actually been used—although several European broadcasting organizations (including the BBC) have been considering how mutual interference on mf could be reduced by changing at night to horizontal polarization *in order to limit the range*.

In the BBC Research Report No 1970/7 it is suggested that if a vertical mf aerial is replaced by a horizontal aerial of similar size radiating the same power, the field strength at distances over 1000km may be reduced by as much as 20dB. This is a further indication that for 1·8MHz and 3·5MHz dx, aerials capable of providing vertical polarization have much in their favour—although it must be appreciated that the BBC work presupposes an effective ground system.

The bobtail curtain

For those amateurs who want to put out a more dominating signal than is likely to be achieved with a simple vertical-Tee omnidirectional aerial, it has already been hinted that there is the bobtail. Although I cannot recall this being described

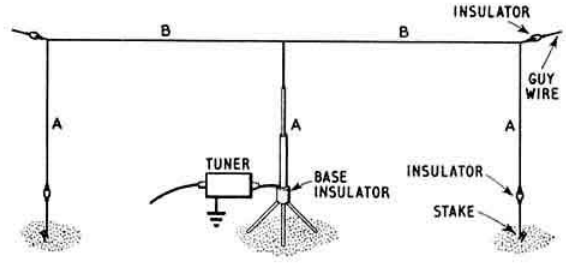


Fig 2. The bobtail-curtain aerial as described in *Radio Handbook* and by VE1TG. Dimensions:

	3·5MHz	7MHz	14MHz
A	66ft	33ft	16·5ft
B	132ft	66ft	33ft

in any RSGB publication, it has been included (as a low-frequency aerial) in many editions of the *Radio Handbook* and other "Editors and Engineers" publications; it also received attention in an article by George Cousins, VE1TG, "A 40-metre Bobtail Curtain Array" (*Ham Radio*, July 1969) who also included dimensions for 3·5 and 14MHz operation. He was enthusiastic about the results achieved on 7MHz contacts over distances exceeding 2,500 miles, though he warned that it is no use expecting much improvement in local signal reports. In all the accounts of the bobtail this is shown with an aerial tuner located at the base of the centre element to provide voltage feed, but it would seem possible to use one of the techniques already suggested for the vertical-Tee, without excessively distorting the radiation pattern.

The *Radio Handbook* points out that the array can provide a practical signal gain averaging from 7 to 10dB over a horizontal half-wave dipole using the same pole height where the path length exceeds 2,500 miles. The horizontal directivity is only moderate, since the two outer radiators carry only about half as much current as the centre, driven element. It is noted that a moderate amount of sag can be tolerated at the centre of the flat top, but the vertical elements should be approximately vertical. Some high-angle radiation results from imperfect cancellation in the top section; it is also important to note that the lower ends of the vertical elements will be quite "hot" where appreciable power is involved.

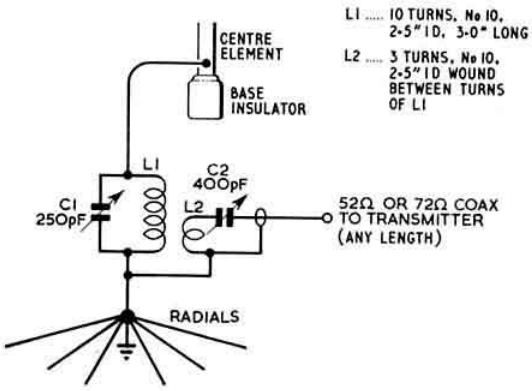


Fig 3. VE1TG's tuner for 7MHz bobtail. For 14MHz, L1 and C1 should be about one-half values shown, C2 about the same. L1 10 turns No 10, 2·5in inner diameter by 3in long. L2 3 turns No 10, 2·5in inner diameter wound between turns of L1

VE1TG considers that the only major disadvantages of this aerial (which is an offshoot of the classical three-element vertical broadside array) are height and area requirements and the need for an aerial tuner: for 7MHz the aerial needs a 132ft span and about 35ft height—but on 14MHz this would reduce to 66ft and about 20ft height. Although he uses quite a good earth connection, it will be appreciated that with the voltage feed, earth currents will be relatively low compared with aerials tuned against earth.

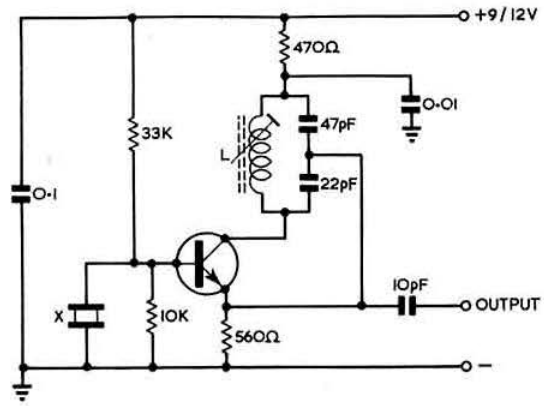


Fig 4. Overtone oscillator as recommended by G2NH. L is tuned to overtone frequency. X 15 to 50MHz overtone crystal or 5 to 8·9MHz FT243 crystal. Transistor 2N706 or equivalent

Overtone crystal oscillator

Ernie Dedman, G2NH, whom most amateurs will associate with the Quartz Crystal Company (QCC), may have retired but retains his interest in crystal oscillator circuits. In a recent note he points out that while overtone crystal oscillator circuits for use with transistors may be legion, surprisingly enough little publicity has been given in amateur literature to the circuit that is recommended by at least two of the main crystal firms in the UK—STC and QCC: see Fig 4.

Although the circuit is designed for use with true overtone crystals, G2NH notes that it also functions satisfactorily with at least 99 per cent of surplus FT243 crystals in the 5 to 8MHz range. Feedback is provided by means of a capacitance tap, thus avoiding the need for any awkward tap on the coil. The resistor values recommended by the two firms differ slightly,

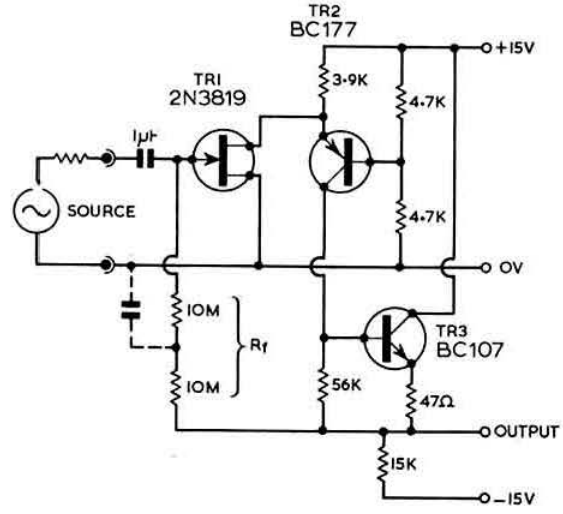


Fig 5. Low-noise high-gain audio pre-amplifier

but the values shown in Fig 4 have proved suitable in a number of different oscillators made by G2NH during the past five years. True overtone crystals will almost always operate as high as their fifth overtone when used in conjunction with this oscillator.

Low-noise high-gain audio amplifier

The interest in homodyne (direct-conversion) receivers has focused attention on high-gain, low-noise af amplification. A novel low-noise circuit—developed to provide low distortion rather than high-gain—has been described by R. H. Frater in *Proc IREE Australia*, Vol 30, No 11 (November 1969). This uses a 2N3819 field effect transistor to drive a common base transistor amplifier which in turn drives a load "bootstrapped" by a transistor emitter follower (TR3). The complete amplifier is stated to have an open loop gain of the order of 2,500, though for high-fidelity applications this is likely to be reduced to about 60 by reducing the value(s) of R_f the feedback resistor. The noise referred to input with 47Ω source resistance is quoted as about 0·7μV rms, and with 47k source resistance and bypass capacitor as about 1·4μV. With some adjustment of values and limitation of audio bandwidth, it would seem likely that this system might prove a useful circuit for incorporation into a direct-conversion receiver, as well as for other audio pre-amplifier applications.

Signal processing conference

A recent three-day conference at the IEE was devoted to the subject "Signal processing methods for radiotelephony" and covered some very sophisticated communications techniques, splattered by such vogue words as "digital", "pseudo-noise" and "adaptive" systems. Many of the ideas being discussed are not likely to have application to amateur radio for at least the next few years, despite the fact that such signal processing techniques as "lincompex" (now in use on more than 500 international hf circuits) can claim to have "revolutionized the hf radiotelephone field" since we first drew attention to this work in 1963.

On the other hand a review of ssb generation techniques indicated that combinations of field effect devices and digital integrated circuits could revive interest in low-cost phasing-type ssb generation, particularly for systems where sideband suppression of the order of 40 to 45dB is sufficient.

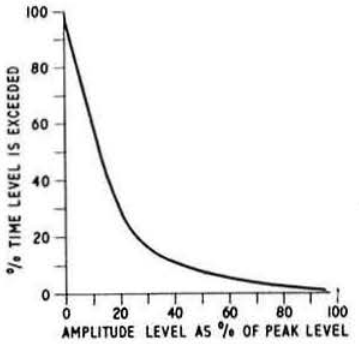


Fig 6. Analysis of the instantaneous amplitude of a short burst of speech

Then again a novel and interesting technique being developed at the Royal Military College of Science indicated a way in which the voice distortion associated with "infinite clipping" systems (see the useful note on sideband limiting by G. M. Ward, G3BOB, in the September 1969 issue) could be avoided. This is done by dominating the speech signal with a large amplitude audio tone which may be within or on the higher boundary of the speech band. At the receiving end the tone can be nulled out. With a 4kHz tone to speech power of about 7 to 10dB it is suggested that good speech reproduction can be achieved. Although the conference paper, by Lt Col R. A. King and Dr J. R. James, is heavily loaded with mathematics, it seems that this might well be a subject worth keeping an eye on.

But the main interest for amateurs was almost certainly in a group of papers describing some preliminary work being done into the possibility of using double-sideband-suppressed (or diminished) carrier systems for police and other vhf mobile and hand-portable equipments. I was able to attend this session and was soon convinced that some account of this work and its aims deserves a section to itself.

DSB for vhf?

The immediate reaction of many amateurs to the suggestion of making widespread use of dsb on vhf and uhf is likely to be one of puzzlement. Some will say if you are going to get rid of the carrier why not go the whole hog and remove one sideband, so conserving frequency space? Others may consider that it is difficult enough to achieve receiver stability for vhf ssb, let alone meeting the phase coherence requirement of dsb.

These views are based on some deep-rooted misconceptions which over many years *TT* has been trying to counteract. As long ago as April 1960 attention was drawn in this column to the implications of the classic article "Poisson, Shannon and the Radio Amateur", by J. P. Costas, W2CRR, (*Proc IRE*, December 1959) which delivered an almighty broadside at the then prevalent idea that ssb must always be more effective than dsb. Both ssb and dsb have the important power gain which comes from avoiding wasting power in radiating a non-information-carrying carrier; if you can utilize both sidebands of a dsb signal then you have an important advantage in combating interference.

Similarly the question of receiver stability is an interesting one. For ssb one cannot avoid the need for the locally generated re-inserted carrier to be accurate to within, say, 25Hz of the original carrier; further there is no easy way of controlling the local oscillator from the incoming signal.

On dsb, the re-inserted carrier has to be phase coherent with the original (if one is to gain the advantage of the presence of both sidebands), a much more demanding requirement—*but* the incoming signal contains all the information needed to recover the suppressed carrier. Once we have introduced into the receiver a method for recovering this information then the need for a high order of stability vanishes, and receiver stability requirements become comparable with conventional a.m. reception.

Why then, if all this has been recognized for over a decade, has so little use been made by amateurs and professionals of dsb communication with synchronous demodulation? The answer is that a fair degree of complexity is involved in developing effective and economical methods of reconstituting the synchronous carrier in the receiver.

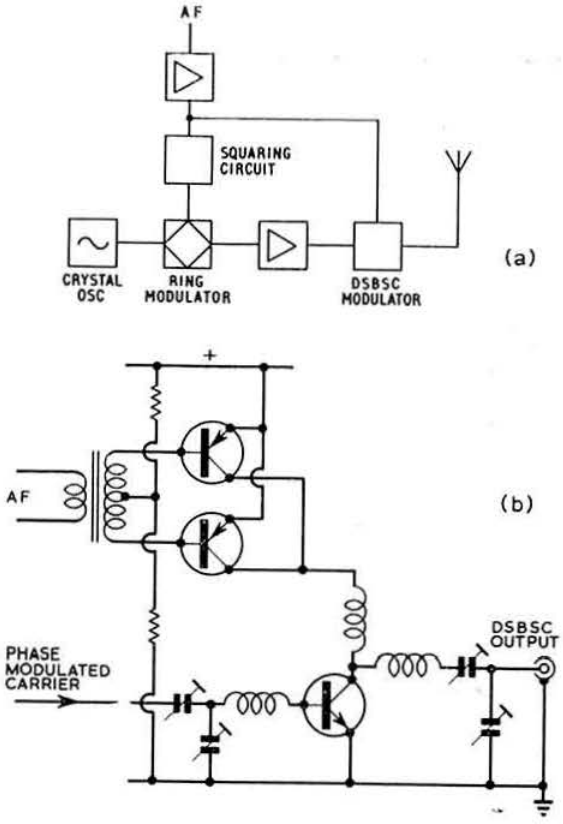


Fig 7. (a) Block diagram of low-power transistorized dsbsc transmitter. (b) One possible arrangement for dsbsc modulator. The power for the rf output stage in Class C is derived from the Class B modulator directly coupled to the output stage

Clearly the Home Office Telecommunications Branch and the Electricity Council (who are also carrying out parallel work in this field) are pinning their hopes on the idea that the coming of integrated circuits makes this much more practicable. Much of the present work on vhf dsb receiver techniques is being carried out at the University College of Swansea by a group working with Dr R. C. V. Macario (whose attempts to develop new exalted carrier and synchronous demodulation techniques for hf have been reported in *TT* and *ART*). It is too soon to say whether or not this work will be successful, but recordings played at the conference indicated that a considerable degree of success has been achieved in the laboratory. Even if fully successful, one should not assume that dsb will ever come into extensive use since there is likely to be some commercial as well as technical opposition.

Two main techniques have been proposed for recovering the carrier: the Costas loop and the so-called "2F" system originally put forward by Apthrope ("Correspondence concerning homodyne reception", *Electronic Engineering*, July 1947). In practice, a form of 2F using an n-path tracking filter appears to have proved most successful to date. One of the most valuable features of the system seems to stem from self-muting of noise in the absence of speech; in rough terms, dsb with 6W (peak) appears to provide better results than a 20W output a.m. system. In essence a 2F system is one using a second harmonic of the received signal to lock an oscillator at the fundamental frequency.

There are clearly a number of reasons why dsb could be of particular value for police radio which do not apply to amateur operation (eg the degree of privacy, its value for multiple base station operation, etc). And amateurs have shown that it is possible to achieve sufficient *short-term* stability in receivers to permit ssb operation on 144 and 432MHz. But it is important to recognize that if this present investigation into dsb proves successful, and simple synchronous demodulators become available, then it could have very significant influence on amateur thinking.

The diagrams used to illustrate this section come from the paper "The use of double sideband suppressed carrier modulation for portable vhf radiotelephones", by P. F. Raven of the Electricity Council Research Centre. In this paper he suggests that it would be possible to develop portable radiotelephones having a performance comparable with a 20W conventional mobile unit. He also stresses that if coherent receivers can be developed then these will be fully compatible between a.m. and dsb. At last it seems as though the important pioneering work of W2CRR in this field is becoming widely recognized.

From time to time there has been amateur interest shown in vhf synchronous detection, though mostly based on Costas loop techniques. Such a detector was described in *CQ* in June 1957, and there was a "flying-lock synchronous detector" for cw in *73* (date unknown), as David Lloyd, ZL4PG, points out in a useful summary on the benefits and problems of synchronous detection (*Break-in*, October 1969).

Dr Macario's work on 2F dsb demodulation techniques has been at a centre frequency of 100kHz as he believes it easier to develop the system at low frequency; for a comparison Costas loop he uses 1·65MHz. The following brief notes on the principles of the 2F system are taken from his conference paper:

"The 2F system module (attached at the end of the receiver i.f. strip) may be of two forms. In both forms the incoming dsb signal is doubled to produce a 100 per cent amplitude modulated signal at twice the carrier frequency. This 2F carrier is then selected from this signal by means of (1) an n-path tracking filter, or (2) a fixed tuned LCR circuit. In both systems the selected carrier is amplitude limited, divided by two, and then used to product detect the dsb signal. System (1) is the more complicated but gives perfect demodulation above the noise threshold. System (2) is a much simpler system, but one has to accept some phase distortion. Both have a frequency tolerance exceeding 500Hz and both are entirely compatible with a.m. With entirely suppressed carrier dsb, system (1) has to learn synchronism at each word pause, but the acquisition is sufficiently fast that on a single word intelligibility test the score averages typically 95 per cent." The system is thus related to his proposed hf detector (*TT* January 1968, or *ART*).

Triple-gang potentiometers

There is some doubt (as G3JGO has pointed out) whether the circuit diagram of the W2EEY tunable af filter (*TT* May 1970) is entirely correct in the biasing arrangements, although the diagram is reproduced exactly as in the original source.

However, this item did highlight the need for three-gang potentiometers, and the problems that this can cause. Bill Thompson, G3MQT, passes along a means of overcoming this difficulty.

Some time ago he needed a 10k/10k/5k three-gang pot for the bridged-T network of a distortion factor meter and found that although there are UK sources of supply, the prices and delivery dates were somewhat off-putting. So he purchased from Electrovalue Ltd (28 St Judes Road, Englefield Green, Egham, Surrey) a type JP20 10k/10k twin pot (8s 6d) and a type P20 5k pot (2s 6d). At the back of these the shaft peeps through the metal cover and there is a form of screwdriver slot in the ends of the shafts, possibly intended to provide preset adjustment from the rear. G3MQT mounted the twin-gang on the front-panel in the usual way, together with a bracket allowing the 5k pot to be mounted behind the twin-gang. The shaft of the 5k pot was shortened and a slot cut in its end. Into this he fixed a small piece of aluminium sheet (16 gauge), clamping it with a 6BA screw and half-nut. The protruding end of the piece of aluminium was then filed to fit into the slot in the twin-gang shaft. The 5k pot was rotated before clamping it to the bracket so that it ganged correctly with the twin-gang. The result was a three-gang pot at reasonable cost from standard components: Fig 8.

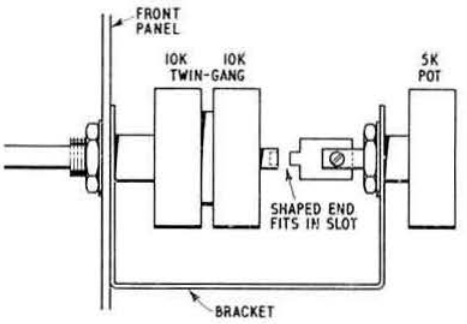


Fig 8. G3MQT's method of making a three-gang potentiometer

Cutting aluminium

Another workshop hint comes from Dick Halls (G3EIW/ON8KM and 9V1LK last time he wrote into *TT*). He finds, as so many do, that when cutting aluminium or any sheet metal with ordinary tin snips, this results in a permanent wave in the sheet which can spoil the appearance of the finished product. He has a Black & Decker electric drill attachment for a 5-inch circular saw, but the usual blade is for cutting wood. A few months ago in London he came across a fine-toothed 5-inch blade made by "Picador", intended for cutting Formica. He has found that this "works like a charm" for cutting sheet aluminium; has taken many of the problems out of making sheet metal constructions, and so far has not shown any signs of wear.

Here and there

Dr A. C. Carr, G3OSU, (Royal United Hospital, Bath, Somerset) has located a cheap and almost ideal power source for small transistorized units such as a vfo, microphone pre-amp and the like. This consists of used but re-chargeable mercury/cadmium cells (RM401) each of which provides 1·4V at a current rating of about 10 to 20mA maximum (more in short bursts) and a capacity of about 800mA-hours. The cells are small and neat, and have long shelf life. G3OSU says he would be happy to send four of these cells, with charging instructions, for a very nominal charge of say 1s 6d pp—or four charged units for 3s. I only hope he is not overwhelmed with requests, as this sounds a most generous and attractive offer!

David Gibson, G3JDG, draws attention to a recent series of Fairchild vhf power transistors designed for 12V operation. Intended for use around 175MHz, a three-stage amplifier with one device of each type will provide 25W output from 0·1W input: the MSA8508 (£3 1s) takes the 0·1W input up to 1W output; the MSA8507 (£4 14s) lifts this to a useful 8W output, while the more costly MSA8506 (£14 8s) boosts this to 25W output. It is claimed that all these devices are capable of withstanding any non-oscillatory load from an open- to a short-circuit at full rated power. Not a cheap approach to a 25W transmitter, but useful-sounding devices for all that.

The ZL1UI audio peak limiter (*TT*, May 1970) was presented exactly as in the original Break-in article, but Barry Priestley, G3JGO, suggests that it would probably provide a more useful control of the limiting if the 10k audio limiting control pot was connected in the conventional manner, rather than used as a variable resistor: the change would be just a matter of connecting the TR2 base coupling capacitor to the slider instead of the "top" of the track.

Apologies for a slip of the symbols in the April *TT* item on the Aerialite "Supreme" aerial—in suggesting that high-quality coaxial cable could bring a 1,000mV signal down to 730μV. This would represent an attenuation of some 62·7dB and Flt Lt V. J. Ludlow, G3JLZ, in picking this one up, reckons he could do a lot better with ordinary parcel string moistened in brine! We should have said 1,000μV down to 730μV (or, if you live alongside the station, perhaps 1,000mV down to 730mV!). There are some other points on this item that I will refer to next month.

TVI GROUP LEADERS

Bristol	G3XPJ	Ken George
Echelford	G3TDR	R. S. Hewes
Gravesend	G3WAP	A. P. Philp
Northampton	G3XJJ	Bill Stratton
Peterborough	G3KPO	Douglas Byrne
Swindon	G3SIR	Dave Durham
Scotland	GM3HGA	J. McCall
South Wales	GW3RWX	Dave Thomas
Wirral	G2AMV	Basil O'Brien

These people will help you with your tvi problem if they can.

If you do not live in any of these places get yourselves a tvi group and sign in so that you can receive tvi information as it becomes available.

Technical problems from places without a group may be sent to the TVI Clinic. Non-technical problems should go to the TVI Committee at headquarters.

Group leaders please let us have your comments and suggestions.

Oscillator noise and its effect on receiver performance

by B. PRIESTLEY, BSc, G3JGO*

Introduction

Any sort of modulation of a receiver local oscillator will degrade receiver performance. 50Hz hum modulation will appear as hum in the audio output while a sideband at, say, 10kHz would mix with an unwanted signal 10kHz away from a desired one and result in serious interference with a weak signal.

Obviously, one does not deliberately modulate the local oscillator or let it squegg at 10kHz while supply frequency hum can be removed by adequate smoothing of the supplies. However, when these obvious sources have been removed there remain noise sidebands which are inherent in any oscillator and are now becoming the limiting factor in receiving weak signals.

Noise spectrum

Any oscillator is basically a selective amplifier with positive feedback, ie a Q multiplier. If the gain is sufficient the noise voltages at the centre frequency build up into a continuous sine wave till limiting or agc reduces the gain to maintain a constant level. Noise voltages near the centre frequency also build up, but the limiting level depends on how near the frequency is to the circuit centre frequency. The result is that the oscillation is accompanied by a roughly triangular spectrum of noise (see Fig 1) rising from the flat noise spectrum present in any device. The width of the spectrum depends on the tuned circuit bandwidth and the level on the operating conditions. These are factors which the designer can choose, and so will be examined in some detail.

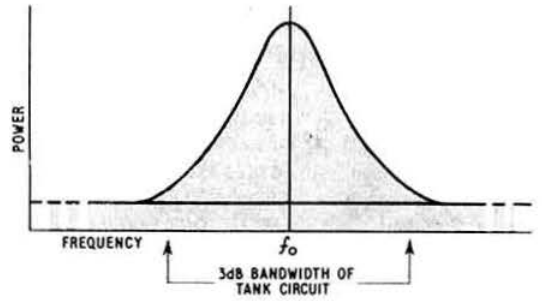


Fig 1. Noise sidebands around a carrier at fo. It can be shown that the power in a 1Hz band relative to the carrier at a frequency δf from fo is given by 174 −F + Pin (dBm) + 20log2Qδf/fo dB/Hz provided 2δf is less than the 3dB bandwidth of the resonator and by simply 174 −F + Pin (dBm) outside this region. Pin is the power driving the base emitter of the oscillator transistor in dB with respect to 1mW

* 43 Raymond Road, Langley, Slough, Bucks.

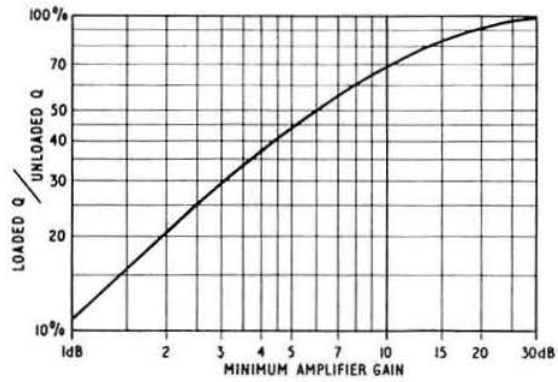


Fig 2. Minimum Qo degradation v working amplifier gain. If the tank circuit has to be loaded unequally by Rin and Rout then more gain is required to preserve the same percentage of Qo

Bandwidth

Obviously it is most important to go for a high Q, and a crystal with a Q of, say, 20,000 scores heavily when compared with a tuned circuit with maybe 200. However, there is a little more to it than simply choosing a high Q resonator. Unless the amplifier (valve, transistor or fet) is very lightly coupled to the circuit, the working Q can be very much less than that of the tuned circuit alone because of damping by the amplifier's input and output resistances. (One vfo circuit published in the *Bulletin* degraded the Q by about 90 per cent!) This means that only a small fraction of the power present in the tank circuit can be extracted to drive the amplifier so that a high gain is necessary. Fig 2 shows the best trade off between Q degradation and amplifier gain. As any device which cannot realize 10–20dB gain at the working frequency probably has too much internal phase shift to be stable anyway, there is no problem in preserving 80–90 per cent of the unloaded Q, provided we design with this end in view.

Fig 3a shows the essentials of a Clapp oscillator. Suppose the coil has an inductance of 5μH and a Q of 250 at 7MHz, then it has a resistance of 0·88Ω. Suppose we aim to add 10 per cent to this, then the transistor input and output resistance must be transformed to 0·044Ω each by C1 and C2.

$$Q_1^2 + 1 = \frac{Rin}{0{\cdot}044} \qquad Rin = \frac{f_T}{fo} \times \frac{25}{Ic} = 145\Omega$$

Rout = 1,000Ω from the data sheet

$$\text{so} \qquad Q_1^2 + 1 = \frac{145}{0{\cdot}044} = 3{,}300 \quad \text{so} \quad Q_1 = 57{\cdot}5$$

$$\text{so } X_1 = \frac{145}{57{\cdot}5} = 2{\cdot}5\Omega \text{ and similarly } X_2 = 6{\cdot}7\Omega$$

Checking to see if this allows oscillation

$$gm\ min = \frac{r}{X_1 X_2} = \frac{0{\cdot}968}{2{\cdot}5 \times 6{\cdot}7} \times 1{,}000mA/V = 58{\cdot}5mA/V.$$

In theory the gm of a transistor is 38mA/V per milliamp of emitter current, so there should be a reasonable margin, but in practice internal phase shifts reduce the gm and the design will not quite oscillate. If we allow a 20 per cent reduction in Q, then X_1 and X_2 become 3·5 and 9·5Ω, respectively. Translating these reactances into capacitances at

7MHz, the practical circuit of Fig 3b results. Note that there are many combinations of C1 and C2 for which the circuit would oscillate, but too low a value of C1 and C2 would reduce the Q and also make the frequency excessively dependent on the transistor parameters which are not stable with temperature or supply voltage. The gain could be raised to use the original values by employing two transistors in cascode when Rout becomes very large indeed and contributes negligible damping at any reasonable value of C2.

Level of oscillation

The minimum level of noise at the input of any amplifier is kTB watts. This can be expressed as −174dB down with respect to 1mW/hertz of bandwidth, or simply −174dBm/Hz. In practice this is further degraded by the amplifier noise figure F, so this sets the noise plateau (Fig 1). At the frequency corresponding to the tank circuit's 3dB points, the spectrum starts to rise out of this plateau. It rises at a rate of 6dB/octave, ie the power per hertz increases four times, every time the offset from the carrier is halved. Since this is independent of the level of oscillation, the signal/noise ratio can be improved by raising the level of oscillation —exactly as in a receiver where the received signal/noise ratio can be improved with a bigger aerial or more transmitter power even when the limit of improving the noise figure has been reached.

Unfortunately, and for similar reasons, there is a practical limit. If the signal level is increased beyond a certain point the amplifier ceases to be even approximately linear. This results in modulation of the oscillator by low frequency "flicker noise", which is concentrated below 1kHz, and intermodulation of existing noise sidebands. The outcome is a more rapid rise in the noise sidebands within about 1kHz of the carrier, so that a compromise level is necessary, say 100mV rms across the base emitter of a transistor. Fig 4 shows how the level can be predicted. In a self-limiting transistor oscillator the amplitude builds up until the average gm is only just sufficient to maintain oscillation. The ratio of small signal gm to minimum requirement for oscillation determines how far the base emitter swing rises.

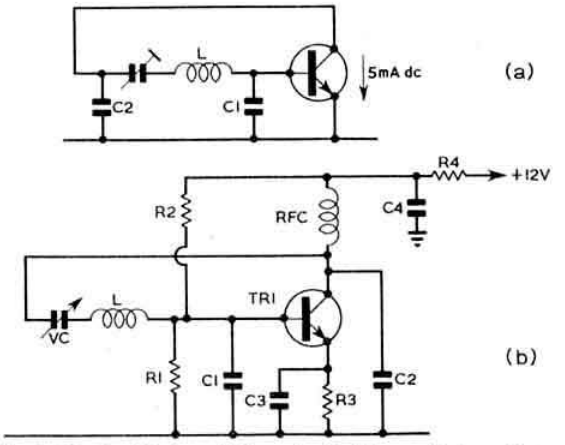


Fig 3. (a) simplified oscillator circuit. (b) practical oscillator circuit. C1 = 6500pF, C2 = 2400pF, C3 = 0·1μF, C4 = 0·1μF, R1 = 8·2kΩ, R2 = 15kΩ, R3 = 680Ω, R4 = 100Ω, RFC = 100μH, L see text, VC = 120pF, TR1 = 2N3904

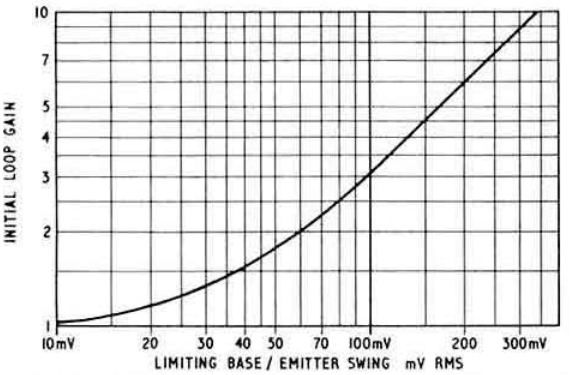


Fig 4. The limiting base emitter voltage swing v initial loop gain for a transistor oscillator, assuming that bottoming does not take place.

Using the oscillator

The foregoing deals with noise voltages being associated with a carrier like a multitude of ssb signals. It is possible to show mathematically that a carrier and one sideband is equivalent to simultaneous amplitude and frequency modulation of the carrier. Limiting tends to remove the amplitude modulation, but has no effect on the frequency modulation. However, if the limiter is in fact a frequency multiplier then the fm sidebands increase by the multiplication factor exactly as in the Armstrong system of producing fm. Consequently the oscillator which is going to be multiplied up for 435MHz needs much more care in design. As an example, a "stable" crystal oscillator at 8MHz could have a noise level of, say, −120dB/Hz. When multiplied up to 432MHz this is degraded by 54 times, ie 34·6dB. Taking the total noise in a 10kHz telephony channel, which is 40dB (ie 10,000 times) more than in a 1Hz bandwidth, there is noise at −(120 − 34·6 − 40)dB = − 45·4dB.

Using this as a local oscillator means that the best signal/noise ratio with a strong signal is 45dB; also a strong signal, say 100kHz up the band, will heterodyne noise 45dB down into the passband. If the desired signal is 45dB weaker then it would be below this noise. Re-designing the crystal oscillator for a noise level of −150dB/Hz and/or using an overtone crystal needing less multiplication would make a marked improvement, probably more than a high Q break, although this also serves to reduce unwanted oscillator harmonics.

On the hf bands the received noise level is such that degradation of the noise figure is not so serious, but efforts to produce a receiver capable of withstanding an interfering signal of 100mV 10kHz away from a 1μV signal (a ratio of 100dB) can be frustrated by the noise from a poorly designed vfo or synthesizer.

Conclusion

Oscillator noise is becoming the limiting factor in receiver design due to interference in the hf bands and improvement in amplifier noise figures at vhf and uhf. Amateurs can apply with advantage the basic principles of low noise oscillator design even though the actual measurement of oscillator noise is rather difficult.

EQUIPMENT REVIEW

Solid State Modules' 2m converter

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

A two-metre converter is normally a simple piece of equipment which even the least adventurous are prepared to make. However, a spirit of adventure is not the only prerequisite; any assembly takes time which not everyone has available. It is for these people that the manufacturer makes equipment. For this review **The Amateur Radio Shop**, 13 Chapel Hill, Huddersfield, Yorkshire, provided Solid State Modules' two-metre converter which sells at £12 10s, including postage.

General description

The converter is totally enclosed in a 16swg aluminium box measuring 3in by 2½in finished in grey hammer-tone. Chassis mounted Belling Lee style input and output connectors are on opposite ends and very short lt leads are trapped between lid and body at the input end. The lid is retained by two self-tap screws.

The circuit is mounted on a double-sided glass-fibre board 2½in square retained with a central 4BA screw.

No circuit diagram was provided, and the following notes were assembled from inspection. The single rf stage used is an RCA 40603. This is inductively coupled to an RCA 40603 mixer. The i.f. output circuit is series capacitively tuned with low impedance output link coupling. For the 28—30MHz i.f. supplied, a 58MHz miniature wire-in crystal is used. Two plastic transistors are used in the oscillator multiplier chain with inductive coupling throughout.

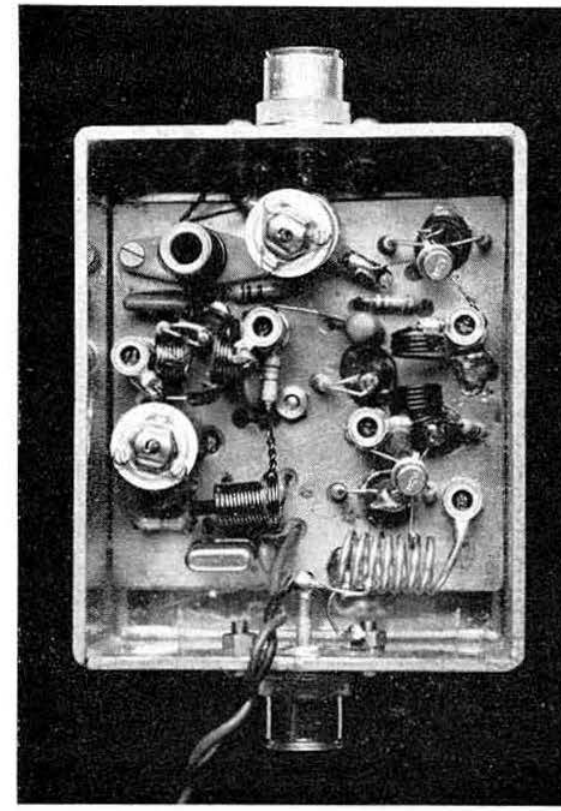
Manufacturer's specification

Noise factor—better than 2dB.
Overall gain—35dB.
DC supply—12 to 18V.
IFs available—4–6MHz or 28–30MHz.

Tests

NOISE FACTOR

Checking the noise factor of a receiver is not an easy test to do accurately, but it is about impossible to make an optimistic measurement. An additional problem in these days of excellent noise factors is that most professional noise generators have a tolerance of ±0·5dB which represents a large percentage of the measurement in the 1–3dB region. Noise generators with better accuracy are very expensive. The noise generator in this test was an American instrument, the Key Meganode, which gave a figure of 2·5dB. No input-impedance was stated in the manufacturer's specification and all measurements were made assuming 50Ω.



OVERALL GAIN

This is a measurement which can give widely different results depending on the method used. For this test the vhf input voltage for a given S meter reading was compared with the i.f. input voltage necessary for the same S meter reading. The results varied between 28–30dB over the band.

CROSS MODULATION

One of the problems of this measurement is that putting gain in the front of a sensitive communications receiver degrades the unwanted signal handling of the receiver and can limit the measurement of converter performance. Using a wanted signal of 2μV pd from one generator, a second signal generator was fed in 100kHz off and the level increased until its modulation started to appear on the unmodulated low level signal. Noticeable interference occurred when the unwanted signal was 70dB above the wanted. This is a very good performance. Out of curiosity, the same test was carried out on a top class valve converter using EC88s and it was found to be only marginally better than the converter under test.

General observations

During the tests an odd effect was observed in which, if the dc supply voltage was increased to 18V the converter sensitivity suddenly dropped by 30dB. The sensitivity returned to normal if the voltage was reduced.

The general presentation and construction of the converter lacked a professional touch, but was nevertheless quite sound.

Handbook

A handbook is not expected for this type of equipment, but it would have been nice to have a circuit,* tuning instructions and voltage analysis for fault finding.

Guarantee

The unit is guaranteed, assuming fair wear and tear, for six months.

* SSM now supply a simple circuit.

Conclusions

The Solid State Modules converter works well, and if all perform as well as the model supplied for review a purchaser will have no cause to criticize. The fact that the noise factor measured is not that claimed is almost academic even allowing for measurement error. In the reviewers' opinion, a noise factor of less than 4dB is of no practical advantage for terrestrial two-metre communication. A low noise factor does, however, provide self satisfaction.

The decibel

by H. K. HADLEY, CEng, MIERE, MBCS, G8BEO*

The decibel (dB) is commonly used in electronics where power ratios are concerned, and the implications relating to the use of this unit are not always appreciated, particularly when it is used to express voltage and current gains. It is hoped, therefore, that the following derivations may be of interest.

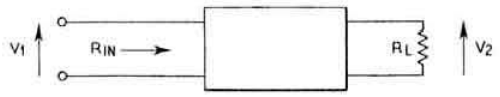


Fig 1. Basic amplifier diagram

Referring to Fig 1.

Input power $= \frac{V_1^2}{R_{IN}}$

Output power $= \frac{V_2^2}{R_L}$

} V_1 and V_2 are rms voltages.

$$\text{Power gain } K_p = \frac{\text{Output power}}{\text{Input power}} = \frac{V_2^2}{R_L} \times \frac{R_{IN}}{V_1^2} = K_V^2 \times \frac{R_{IN}}{R_L}$$

Where K_V = voltage gain $= \frac{V_2}{V_1}$

$$\text{Power gain in dB} = 10 \log_{10} K_p = 10 \log_{10} \left(K_V^2 \frac{R_{IN}}{R_L} \right)$$

$$= 10 \log_{10} (K_V^2) + 10 \log_{10} \left(\frac{R_{IN}}{R_L} \right)$$

$$\therefore \text{Power gain in dB} = 20 \log_{10} K_V + 10 \log_{10} \left(\frac{R_{IN}}{R_L} \right)$$

A special case exists when $R_{IN} = R_L$, since under this condition the second term on the right-hand side of the equation becomes zero, and the equation reduces to:
Power gain in dB $= 20 \log_{10} K_V$, this giving rise to the apparently peculiar state of affairs whereby a voltage gain is expressed as a power gain in dB.

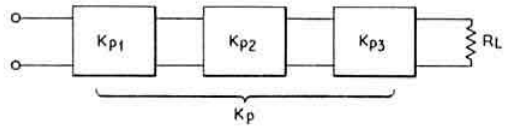


Fig 2. Power gain in three-stage amplifier

Referring to Fig 2, if K_p = overall power gain then,

$$K_p = K_{p1} \times K_{p2} \times K_{p3} \text{ or}$$

$$10 \log_{10} K_p = 10 \log_{10} K_{p1} + 10 \log_{10} K_{p2} + 10 \log_{10} K_{p3}$$

* 120 Higham Lane, Nuneaton, Warwicks.

New Products

Towers and masts

The range of products offered by **Western Electronics** of 24 Hook Street, Hook, Swindon, Wilts, now includes equipment suitable for almost every requirement.

The **Hamtower** is a fixed unguyed tower capable of supporting hf band beams at a height of 30ft; beyond this, guying becomes necessary.

The wind-up **Teletowers** can be supplied in heights between 42 and 101ft and incorporate a wind-up safety winch as part of a fully galvanized structure.

Telomasts are available in heights of 30, 40 and 50ft and comprise a galvanized telescoping guyed unit. Incidentally, the price of the 50ft **Telomast** (without rigging kit) is £17.

The **Versatower** is a post or wall-mounted tower with telescopic and tilt over facilities and can be obtained in either painted or galvanized finish.

In addition to the basic aerial support, Western Electronics can supply aerials, rotators, rf cables, supply cables and all the various accessories. Savings can be effected when purchasing a tower, rotator and aerial at the same time. Full details, illustrations and prices are contained in a catalogue which can be obtained by sending 1s 3d in stamps to the address above.

FOUR METRES AND DOWN

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

High up in HB

Remembering the excitement caused by the appearance during the last stages of the May 144MHz Portable Contest of HB9AEN-HB9ADJ/P, members will like to have further details of the set-up which the Swiss team uses at its 5,000ft site at Le Chasseron. These have been forwarded by Mike Bowman, G3PSA/HB9AKY, once of Cambridge and now operating for "that well-known firm" from his office in Geneva. Mike went to the trouble of obtaining the following report from his good friends 'ADJ/AEN and translating it for *FMD*.

At the Chasseron site the two HBs took over an old met observatory as their shack for the May operations, and pumped 50W into an 11-element array, later to be improved to a 4 by 11 element aerial system for subsequent forays, of which there will be several over the coming months. For reception there was a fet converter feeding a Sommerkamp FR100B at 28–30MHz. The station was operated from a Honda 2kW petrol electric set. Seventeen British portables and 25 fixed were worked.

The operators report that during the time the band was open to the UK during the May portable event there was a visible temperature inversion to the north west, consisting of a red sky with a sharply defined black line to it. They offer their apologies for having to close down while the band was still lively and many stations were still calling them, as they did not wish to stay on the site after dark with a long ski descent down the mountain over frozen snow to be negotiated before the warmth of home was reached. There will be further opportunities to work them.

The QSL address for cards direct is Station Radio Amateur HB9AEN-HB9ADJ, 1451 Le Chasseron, Switzerland.

Multi-callsign owner

Numbered among the increasing band of multi-callsign holders is Richard Spencer of Woking in Surrey, who surprised many operators during the last 144MHz Portable Contest by appearing as F0PV/P, and did his best to disembarrass those who congratulated him on his English accent: he is G8CEA in normal circumstances. His third callsign is EI2VCB.

With Mrs G8CEA (Mrs F0PV/P for the duration) logging, he worked 58 stations from a spot near Cherbourg 158m or about 500ft asl. His most intriguing contact was with G5AMF of Edgware, who is F2LC—the situation in reverse.

The equipment which goes around with the Spencers in their Mini Traveller is an HW17A, a 4-element J Beam, and a Honda E300 which, in the words of the owner, " . . . was bought on the strength of the review in *Radio Communication* last year and is even better than reported".

While not wishing to venture into Egon Ronay territory, we do not mind passing on the following bit of advice from the Spencers: "If any radio amateur is looking for a good holiday hotel in Brittany try Bernard, F6AEV, by the Mont St Michel . . . spotlessly clean, cheap(ish) luxury, with cubical quad in evidence, and the Mont St M for wife interest. It is AA two-star".

Safari news

"What are them furriners doing on our territory?" People do not talk exactly like that, but the comment is worth bearing in mind by expeditions visiting apparently "rare" counties to activate them on vhf. The point has been made more than once in the past that visitors are often surprised at the level of activity that exists locally when they set up camp, and it is made again by G8CXN of Newcastle. Noting the forthcoming expedition to the north by the Verulam Club, he remarks whimsically that he is thinking of making a dxpedition to the south to put the Verulam city on the map!

More seriously, in the context of levels of local activity that may not always be apparent to the outside world, he tells us that in the first nine months after he obtained his licence he worked no less than 52 local stations on 2m. He is to be found on 145·9MHz every night beaming south and looking for contacts far or near.

The other side of the dxpedition penny, of course, is that radio-safari teams are generally able to choose exceptionally good sites for sustained periods of operation that lift a county well beyond the ranges normally obtainable from home locations.

* * *

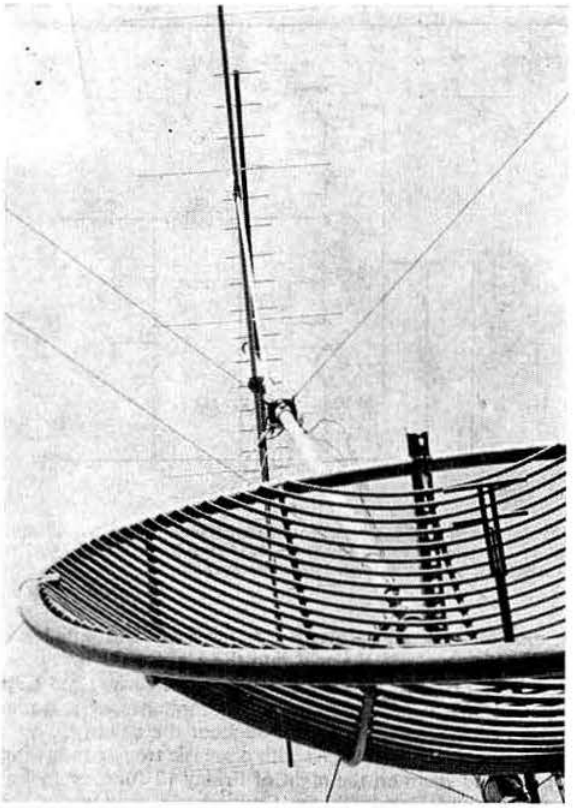
Geoff Barnes, G3AOS, tells us that a five-man team from Greater Manchester will operate from the summit of Snowdon during the 4–5 July contest, all modes on 2m with perhaps some activity on the higher frequencies as well. They will be up there again during VHF National Field Day.

More distantly, EI2VCL in Co Kerry, will be on 2m from 22 August until well into September. When at home he is G2DRT of High Wycombe.

* * *

Another "visitor to Ireland" callsign is EI3VCQ. It will be operated with the /P or /M suffix by Kentmen G8AOL and G8ARM, who will be visiting the Republic from 14 to 24 July. "As this is a holiday we shall not be keeping skeds," says G8AOL, "but weather permitting we'll be using the calling frequencies of 145·35 and 432·86MHz after 1900

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



This photograph shows the construction of the 23cm parabola used by the GD3TPF/P team during their recent expedition to the Isle of Man. It was stoutly built as a ribbed structure to withstand the windspeeds encountered at the exposed IOM site. Above the dish: the 10-element Yagi for 2m, and the 18-element 70cm talk-link array

gmt". This expedition will be particularly worthwhile by offering many in the UK the chance to add EI to the list of countries worked, not only on 70cm *but also on 23cm;* equipment for the latter band is being taken along.

After leaving Ireland the two plan to operate from North Wales in the 70cm contest of 26 July.

* * *

Still on the subject of the 26 July event, here are details of another expedition specially laid on for the occasion, with none other than G8AWS as one of the protagonists (there can be few people in the land who have as many 70cm mountain-top logging hours behind them as Arthur Russell). He, with Geoff Toulalan, GW8AAP, ably assisted by G3ATZ and son, and by G8AYW, will be signing GM8AWS/P from Lowther Hill in the county of Lanark. To give the signal maximum getaway on 70cm there will be a new Multibeam in operation.

But do not wait until the contest; look for them on the Saturday evening of 25 July, when GM8AWS/P will be in action on 70cm and GM3ATZ/P on "Two". Adds GW8AAP: "All the relevant permissions have been obtained, and GM3OWU, the Scottish co-ordinator, notified. Depending on conditions, not the least of them weather, I myself may stay on and operate both bands after the contest."

* * *

Another expedition to Scotland: Chris Towns, GM8BKE, will be in the far north from 8 to 21 July, operational every night /P between 2000–2230bst. Look for him on 145·8MHz.

And indigenous to Scotland itself, David Pearson, GM3TLA, intends to take 2m gear to that Cairn o' Mount site in Kincardineshire, where he went before, on Sunday mornings. He will be there several weekday evenings as well. When there is a 4m contest he will take a 70MHz station to the same site.

* * *

As for the G3BA–G3BHT expedition to the Republic of Ireland, this, as on previous occasions, gave to many operators their first chance to work EI on "Two". With EI2AX/P parking itself on some wonderfully elevated sites along the eastern seaboard of the Republic, the signal came romping across the sea "just like a local". From the many laudatory comments about the expedition which have reached *Four Metres and Down*, only a cross-section can be squeezed in, eg ". . . another example of the team's superb operating technique and ability to find good QTHs, and—what counts most of all—their ability to find the stations who are calling them": this from G8BCG (praise indeed from an operator of no mean contest experience, as you may have noticed from the 432MHz Open).

Says G3AOS: ". . . received endless pleasure in working Tom and Brian in each county mornings and evenings. Waterford, I am delighted to record, gave me my hundredth county on 2m."

With a crowded schedule list to work through, EI2AX/P had perforce to keep contacts short, but even in less strenuous times their operation would have been an example to all who overheard it, and might perhaps have gone some way to abolish from people's vocabularies such redundancies as "Tuning for any possible call. K please somebody", and "Over off and clear", to quote only a couple.

"Ultra" and "Super"

Exigencies of press deadlines prevent us from giving any kind of review of the Microwave Contest which was held on 14 June. Next time, perhaps. What has been quite evident from comments to be overheard on 70cm is that many people intended to have a go in the 23cm section; that interest in 13cm, especially after the G3BNL/G3EEZ "make it easy" session at Convention, is decidedly on the up and up; and that the possibilities of some surprises on the "super highs" could not be ruled out, remembering the increased activity which has been stirring up on, for example, 3cm in recent months.

Another spur to competition on uhf/shf is provided by the opportunities the contest gives for working new counties (even countries) in aid of Four Metres and Down Operating Awards. A companion or two for G3MCS in the lonely 23cm bracket would be welcomed most of all by Bill Hawthorne himself.

There has been some discussion about the abstracting of uhf/shf activity from VHF National Field Day and offering it up as the separate specialist microwave events of 14 June

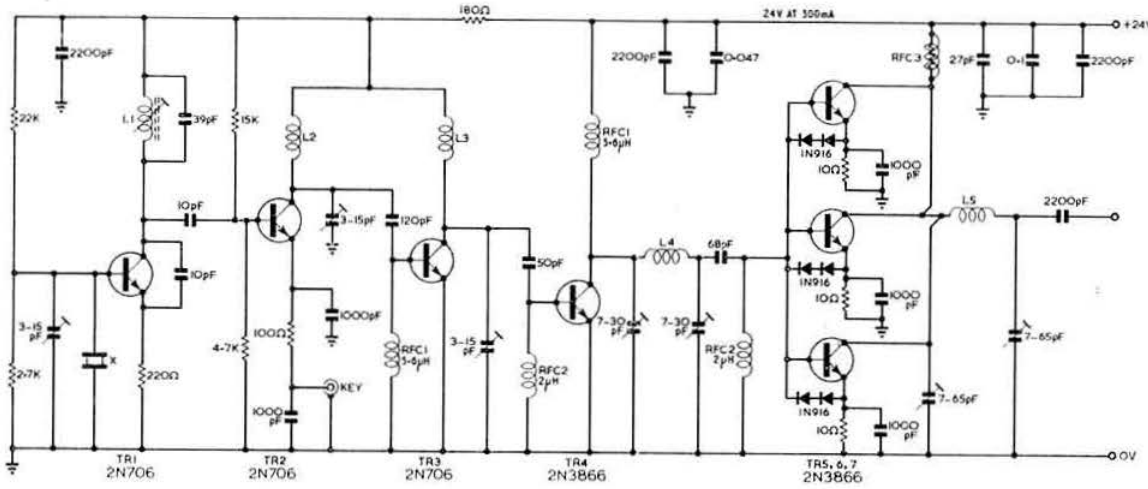


Fig 1. The G3UCM transistor transmitter. Inductance values: L1, 4t 22swg enam on 0·3in diam former with iron dust core, spaced one turn apart. L2, 5t as L1 but spread to ¼in long. L3 and L4, 4t as L1 but spread to ¼in long. L5, 4t 14s wg 0·3in diam spread to 0·4in. RFC1, Radiospares 1A choke. RFC2, 2mH. RFC3, 8t 24swg on 1000Ω resistor

and of next 3-4 October. Convincing cases have been made for combining uhf/shf with the national contest in September, and, by the VHF Contests Committee, for not doing so. Maybe after last month's contest, and even more so after October's, there will be further positive evidence to support one or other line of thinking. Then will be the time for a fresh dialogue to be started up, in the certain knowledge that what the customers want, if stated adequately and in good time, is what the VHF Contests Committee will try to give them.

Double event, Tone A?

Were there two auroral openings on 21 April? The few people who were around reported it as occurring mid evening. Says G3VSA: "Do I live on another planet or was I involved in a different Aurora?" For him in Manchester the batting opened at 1455-1503, when he worked GM3TFY on "Two", followed by GM3UAG plus several more locals on "Four", until at 1915gmt the Tone A signals from G3JHM and G3TDH way down south disappeared, then the beacons, and "Four" reverted to normal.

At the same time the predictable European dx, all Tone A, was pounding in on the 2m receiver.

From other reports received there is evidence that a second Ar opening may have occurred on 21 April, very much along the lines of the dual manifestation of 8 March. Detailed observations on the occurrences on both of these dates will be welcomed by the Scientific Studies Committee (see the note from G3FZL in the panel on page 248).

Lucky thirteen

"I've got a stop press for you. Listen to this," said Ron Ham, BRS15744, over the landline to *Four Metres and Down*. Clearly through the telephone from the 4m receiver at Storrington came the steady peep "TF3VHF". A big sporadic-E opening, solar-storm induced, had lifted the Iceland beacon's 2½W signal into the UK for the first time. Resolved first by G3JVL (he designed the device) and then by G3JHM, it was soon in the headphones of a dozen others of the 4m fraternity throughout the country.

This E-opening coincided with dramatic tropo conduction on 2m and 70cm on the night of Friday 12 June, extending well into the 13th, with the Continentals picking out the loudest signals from a solid wall of UK transmissions over the whole of "Two", while farther north a 2m "first" Scotland to the Faeroes was established by OY2BS and GM3EOJ.

On 432MHz the band was normal at 9pm that Friday. As if a tap had been turned on it opened as far north as Aberdeen and out to Germany. The GB3GEC beacon, usually 569 on a 14-element at 90 miles, was 569 on a 19in rod thrust into the converter aerial socket.

Those equipped for 23cm dived down there to work ranges rarely covered before. G3LQR was heard setting up an ssb circuit with a DJ on "23". New dx video paths were established on 70cm, "peak white" reaching out hundreds of miles.

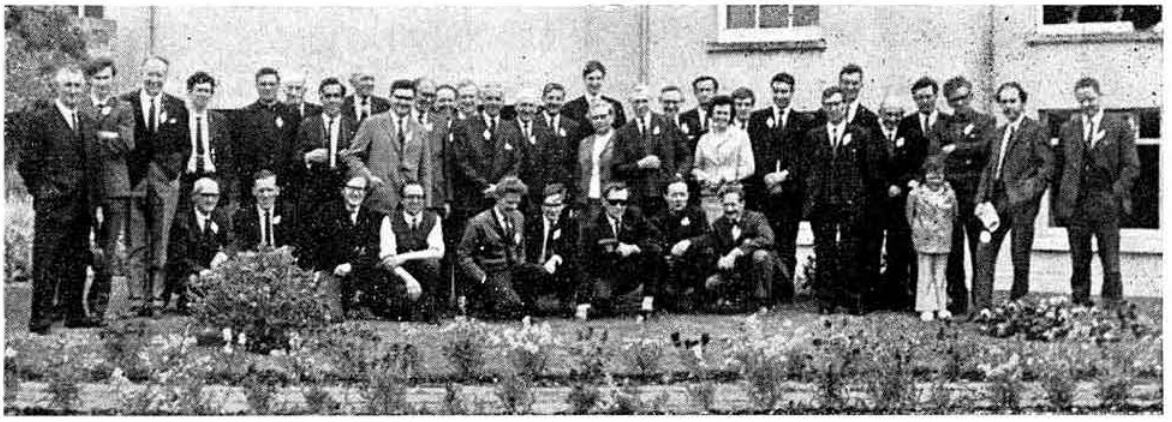
And true to Murphy's Law all this happened when *Four Metres and Down* should officially have closed for press. There should be much to report next time.

Tech corner

From G3UCM (Steve Gall of Coulsdon, Surrey)

The diagram shows an easy-to-make transistor transmitter for 2m which by delivering 5·5W into a 70Ω load can give a good account of itself, particularly under portable conditions where its compactness and light weight have a special appeal. The dc input to the final is about 8W and the overall consumption 320mA at 26V.

The first transistor is a straight crystal oscillator at 48MHz and the second one a tripler to 144MHz. The third 2N706 is a buffer amplifier which feeds the 2N3866 driver. This



Many vhf men travelled south of the border to attend the vhf convention organized by EI7AF at Birr, County Offaly. This group was photographed at the rear of the County Hotel, where the meeting was held

uses a form of pi-matching into the three strapped 2N3866s which are the final pa. It is desirable to provide heat sinks for all four 2N3866s. The diodes D1–D6 are 1N916 for protecting the output stage transistors.

Although designed for cw only, this transmitter functions well in the fm mode when a suitable drive unit is used. For cw purposes the emitter of TR2 may be broken. Use a keying filter as thought appropriate.

"SU" heard in Gib

Some strong sporadic E signals on 48MHz between 11 and 16 May, followed by a five-minute burst from the Sheffield beacon on 12 May, marked the opening for ZB2BO of the 4m dx season. On 24 May he worked G3JHM on the UK south coast for his first 4m contact of 1970, and next day G3OHH up in Staffordshire and Cornwall's G3TTG, with GB3SU very *obbligato*. On both days, adds ZB2BO, there were long openings from BBC Channel 1 on 48·25MHz. This frequency is regularly monitored to give notice of likely openings higher up the spectrum.

The ZB2BO equipment which produced 140 contacts on "Four" during the memorable openings of 1968 has been improved by the addition of a DL6SW fet converter. The transmitter runs 20W and the aerial is a 4-element. There is also 2m gear available, "if the chance occurs", as ZB2BO puts it.

And the next, please

Another event in metre-wave history was endorsed when the VHF Committee at its last meeting ratified Bill Hawthorne's application for G3MCS to be granted the Society's first Supreme VHF/UHF Transmitting Award. The presentation of the award was reported last month. It was won by dint of collecting two Seniors (70cm and 2m in that order) plus a 23cm—the one and only so far.

Other applications ratified at the last VHF Committee meeting were No 76 in the 4m transmitting bracket to G3VPF/P, and No 77 to G2WS, which makes it Bill Scarr's fifth FMD parchment. If Bill can secure one for 70cm portable work he will be in the remarkable category of a holder of fixed and portable certificates for 4m, 2m and 70cm.

Among the 2m applications which were cleared were two more portables, No 161 to G3SFV/P and No 162 to G8CEA/P, with No 163 going to G8BEW. And it was No 24 in the 2m Senior clip going to G3MCS that qualified him for the Supreme.

"In like assemblage . . ."

There is word from Bob Williams, EI7AF, that the vhf convention which he organized at Birr in County Offaly went off very well. He tells us that there were over 60 visitors from EI, GI, G, and even ZL—and of course W in the person of GI5ALP (also a welcome visitor at the London convention the month before). Talk-in callsign allotted for the day was EI2UHF. Highlight of the proceedings was the talk on amateur radio in general and portable work in particular from G3BA and G3BHT, who at the time of the convention were in mid-tour with the EI2AX expedition.

"Everything went off so well," adds EI7AF, "that the question being asked was: When will the next one be held?"

* * *

Right ahead is the Amateur Television Convention dated for 25 July at Churchill College, Cambridge, most happily organized to celebrate the 21st anniversary of the founding of the British Amateur Television Club, to which a very large number of 70cm video operators belong.

By now applications for tickets should have gone in, but in case anybody may have missed the earlier announcements we would advise quickly dropping a line for further info to Donald Reid, 71A Rose Valley, Brentwood, Essex.

There will be an afternoon technical session to be followed by the convention dinner at 7.45 for 8.15pm.

Skedspot

Early morning frequently sees metre-wave conditions at their best. "So what?" says the man too rushed during the week to take a pre-breakfast check of the bands, or disinclined to struggle out of bed extra early at the weekends. And in high summer the two hours after dawn when propagation perks up are very very disinclining.

Well, after all that, care to have a go? For a start, write to Peter Taylor, G8BCG, 2 Columbia Avenue, Gorton, Manchester 18, to tell him when you can come up on 70cm between 7am and 7.15am. Give him details of gear in use and day or days preferred.

Somebody else who is looking for 70cm schedules, being a bit out on a limb at the easterly tip of Kent, is Mike Perkins, G3PNI, who makes a point of activating the band regularly at 2000gmt every Monday. He can also offer 23cm and has worked G8AJC at Canterbury (noted as "the only 23cm-er this side of London"). Both 'AJC and 'PNI have 3ft dishes and 2C39A triplers.

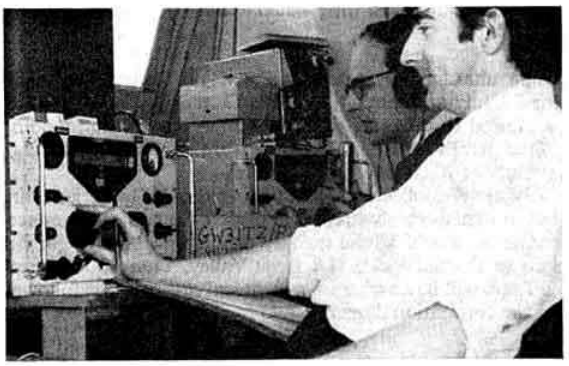
* * *

There are times when rare Rutland is not so rare, typically when a portable is operating in one part of England's smallest county, a mobile in another, while G3ALC puts in an appearance (not too frequently, regrettably, he tells us, through preoccupation with the motor business in Oakham). The rather larger county of Huntingdon has shown less activity on "Two" since G3KGR moved to Norfolk and G3TEJ has not been heard around for a while. Now G3VCV at RAF Wyton can offer 145·02 every night and 4m outside television hours, which means up to 10am and between 1 to 1.30pm Sundays. Schedules welcome (QTHR).

* * *

Two more items of 70cm interest: GM3TLA has returned to the band and has already worked as far south as Co Durham at 160 miles. He will willingly transfer to 432 if worked on 145. Skedwrite David Pearson, 23 Binghill Rd W, Milltimber, Aberdeen AB10 JB.

From NE London look (literally) for G6AFP/T. It belongs to the Silverthorn Radio Club (also known as G3SRA and G8CSA). There is a 70cm Parabeam at a well-elevated site, and a flying spot scanner has been successfully bench tested. Schedules at 405-line standard will be welcomed. Contact G2HR (01-529-2932).



Flashback to the 144MHz Portable Contest in May. Some of the men behind the voice of GW3ITZ/P, put into the contest by the RAF Amateur Radio Club at No 30 Maintenance Unit on Deeside, Cheshire. Nearer to camera: GW3UOO, with GW3LAI behind. Two Racal RA17 receivers were used, fed from a converter with two TIS88 at the essential end. The 30W transmitter fed an 8-over-8 at the top of a 1500ft Welsh mountain

BEACON STATIONS

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

* Not operational

Contest news

It may seem to be a barren exercise to start a piece in an "If only . . ." vein, but we are going to do so. If only everyone who was operative in the 30–31 May 432MHz Open Contest took the small trouble to put in a log, then the final table would have almost a hundred callsigns in it. This was the measure of what was a thoroughly interesting and enjoyable event that drew out the seventy-centimentals by the score. So let us hope that this month's repeat (26 July) will do likewise and, what is more, persuade even those who make but a few contacts to send in an entry.The size of the final table is as good an indicator as anyone will get as to the level of contemporary active on our 70cm band.

Back to the 30–31 May event. Determined to give the lie to grumps that there is nobody, *but nobody*, active on 70cm in Northern Ireland, GI8AYZ finally discovering that his much sworn-at 70cm converter had never worked since it was delivered from the manufacturers three years ago, kicked it into life, took it upstairs to a nearby Slieve (1,125 asl), and was rewarded to hear G8BBB, Cambridge, G8BBY, Rugby, G8AKE in Leicestershire and G3NEO near Sheffield. The hastily-built tripler did not register in any mainland 70cm receiver, and in any case flagging battery output compelled a close-down. But come the contest of 26 July a tripler-pa should be in commission, suggesting that the turning of beams towards GI-land may be rewarded.

Here and there

"I agree with G3PNI's comments pleading for more detailed shf info"—G3TTV.

* * *

"A 30 minutes' listen on 1 June in the sideband bit of 2m found G3BA, 3RND, GW8ASA, G8BGQ, GW8BIP and Gs 3AOS, MCS, POI and UFQ. It goes to show what a quiet ferret around 145·41 can find in the way of dx"—BRS15744 of Sussex.

* * *

Heard on the 70MHz band: "You are cutting up my contact. This is an exclusive amateur band." The man was talking to a military station. A pity, because we share "Four" with the military. They were there first. *We* are there as a privilege.

* * *

"We were married at York on 4 April. So many radio amateurs were there it looked like a convention! Now established at Cambridge. Susan has learned her morse, so no doubt I'll have trouble getting near the rig soon!"—G3TPW, late of Oldham, now at 96 Chesterton Rd, Cambridge (picture next month).

* * *

"I notice that GB3ANG is absent from the beacon list, and cannot be heard. A great pity. In my case its strong signal shows that the receiver works, and it also provides a known beam heading"—GM3TLA. Good news: transfer of 'ANG to its new and equally good site should be completed any moment now.

* * *

"We are receiving more entries for the VHF Listeners' Championship. Had almost twice as many as at the same time last year. Hope it keeps up"—G3JKY, hon sec of VHF Contests Committee.

VHF Personalities—No 16

G2AVC and G3GOX, Harold and Ann Crane of Hounslow

"Like father like son." Already this feature has invited attention to several instances where enthusiasm by the parent has fostered an interest in radio on the part of the son. Husband and wife radio transmitting partnerships, if less common, are by no means infrequent. One of the most well known is G3FZL-G3SGN.

Another, almost equally so, is G2AVC-G3GOX, their life partnership having been established as the result of QSOs over the air. Ann, in Cable and Wireless Ltd from 1944 to 1947, learned her radio there, passed the RAE and secured G3GOX in April 1950. Harold, now aged 60, built his first "battery-straight" in 1920 and secured 2AVC in 1936. There was no G prefix: those pre-war 3-letter callsigns were for closed circuit *ab initio* work. After the war their holders were given the right to use them on open-air complete with prefix, and Harold took his up in 1946.

What specially distinguishes the G2AVC-G3GOX partnership is an enthusiasm for the Radio Amateur Emergency Network. Says Ann: "Our interest in vhf was started by our connection with RAEN and the necessity for reliable communication. We first joined RAEN in 1957, becoming involved with the Surrey group on its formation in 1959. After a short period of combating conditions on 160m the group acquired some Pye Reporters and a few base stations so was able to move to the dignity and repose of 4m. A base station was installed in our house and we were designated as group control station as there is generally someone (usually the housewife and mother) available at all hours. Extension speakers all over the house ensure that few calls on the Surrey group channel are missed and a report is usually forthcoming even at the oddest hours."

Similar equipment has recently been installed for the group 2m channel, and when both G2AVC and G3GOX are at home they can operate simultaneously on different bands. Both Harold and Ann hold mobile licences and on 4m use a BCC69 set or B44, with a Pye Ranger for 2m. Whoever is out mobile may be heard passing messages to the other at home and vice-versa. They have found the 4m fixed channel to be the most consistent for mobile work; a flip of the switch and they are in instant communication.

"If we were really pushed," says G3GOX "I suppose we could operate three mobile channels at once, for we also have a home-built 160m rig with a loaded whip for that band, a ¼-wave vertical for 4m and a halo on 2m."

A virtually permanent watch on the RAEN channels is kept by G2AVC and G3GOX. Left, Pye base station as the basis for the 2m link. Right, below the Class D wavemeter is the remote control panel for the 4m base station housed upstairs. There is also a Hallicrafters SX27A for general coverage tuning

In the event of RAEN activity G3GOX operates the home station as mobile control while G2AVC/M is available to be out mobile.

To give all-round coverage from the home station on 4m a coaxial dipole is sited at the top of the mast; there is a 4-element Yagi at about 30ft, and below it a 2-element 2m slot beam. Outside of RAEN the Cranes maintain a joint station operative on all bands from 160m to 2m. They can operate simultaneously on different bands. Any vhf portable contest is seized upon as an opportunity to go out for a picnic with the three small boys and dish out tea and points at the same time. But it is RAEN that claims their primary attention. Again quoting G3GOX:

"There is terrific team spirit in our RAEN group and we feel we may be able to put the amateur service to worthwhile use should the need arise; in fact, we *have* been able to be of service in the past. Anyone sharing this feeling should either listen on his local RAEN group channel and get in touch with one of the members or write to the secretary of the RAEN Committee who will put him in touch with his area controller. We think membership of a properly organized and trained group is very necessary if one is not to be more of a hindrance than a help in an emergency."

THE MONTH ON THE AIR

A monthly feature by JOHN ALLAWAY, G3FKM*

THE problem of obtaining QSL cards for various award applications seems to have become more acute since the inception of the 5BDXCC Award, no doubt many of the rarer stations have found the demand quite insatiable and are just unable to cope. However, readers are finding difficulty in collecting cards from many non-dx stations in spite of the fact that SAEs and return postage (or more) have been supplied. It would surely be much better if those who do not wish to have anything to do with QSL cards would clearly state this over the air, thereby saving trouble for bureaux managers and the money of those they work. Perhaps some of the faintly dishonest amateurs who keep IRCs and steam stamps off envelopes do not realise that they do not need to go to the expense of having cards printed—any written confirmation of contacts will be accepted by most award sponsors, and some stations are already using a rubber stamp which they impress on the applicant's card to confirm the QSO. Your scribe is willing to publish a 'black list' of stations who confiscate postage and would be pleased to receive nominations—to qualify, offenders will have to be reported by at least six readers.

A letter from G5LF praises a most excellent listener report sent to him from Glasgow—this included a graph showing changes in the signal strength of his signal over a considerable period, and also gave a resumé of band conditions and details of other stations being heard with comparative signal strengths. This kind of report clearly deserves confirmation and it is proposed to start a section in *MOTA* for transmitting readers to use if they desire reports. Callsigns will be given, and also details of the particular transmissions on which reports are required, on the understanding that such reports will be confirmed.

G3AOW is being troubled by the receipt of QSL cards for alleged operation on 7MHz. He only operates on 144, 28 and 21MHz.

W. Schroeder, K1YZW, who is also licensed as G3DCU, reports that his callsign is being pirated on 160m.

G3JUB will be visiting Sweden and the Aaland Is during July and August and has applied for reciprocal licences. In Sweden he will be G3JUB/SM1, 2, 3 etc (depending on which call area he is in) between 12 July and 4 August, and he will be visiting OH0s NF and NI between 4 August and 8 August. He will also be staying with SM3s AKX, AVQ, DE and HR, and SM5CAK. UK QSOs will be particularly sought on 14MHz ssb.

News has just been received (via 5N2AAF) that Keith Bray, 5N2AAY, has been killed in a road accident in Nigeria. Keith was a founder member of NARS and the second member of the society to die tragically in the past six months. Our sympathy is extended to his wife and family who had already arrived in the UK on leave before the accident.

* 10 Knightlow Road, Birmingham 17

News from overseas

John Morris, G3VPM (and formerly 9V1NU and HS1GA), is now in Cyprus and on the air as ZC4IM. He is running very low power—630mW—and has so far worked 26 countries including the USA. This contact was with W8BT, and his report was 569 over a distance of about 6,000 miles! The aerial in use is a simple ground plane for 20m but John hopes to put up something for 15 and 10 also. So far a contact with the UK has not taken place and it would be greatly appreciated if readers would listen carefully around 14,050-kHz for the signal from ZC4IM's hard-driven pair of 2N706s.

M. E. Jackson, G3TSL, is now in Nairobi and using his new 5Z4MO call. He asks for QSL cards via G3YWP (see QTH Corner).

More encouraging news on the Nigerian licensing situation is suggested by the latest issue of *NARS News*—a licence has been issued to the Kaduna Polytechnic. Thus 5N2KPT becomes the first new 5N2 for several years and we all hope that this heralds the return of the situation in Nigeria to some degree of normality. 5N2KPT will be operated by G2FSK and at present the equipment consists of a KW2000A transceiver and a dipole aerial.

Jorge, CR6BX, advises your scribe that he has never been on 80m and that the station which was worked quite extensively by Europeans recently was a pirate.

VU2BEO, who has been putting a consistently good signal into the UK recently on all bands from 3·5 to 28MHz, is working for the USA State Department in New Delhi where he expects to remain for at least another year. He is using a TR4 transceiver, SB200 linear amplifier and Drake 2B receiver. His aerials include a Classic 33 three-band beam for 14, 21 and 28MHz, a 14AVQ for 7MHz, and an inverted vee for 3·5MHz. Doyle points out that the frequency allocation for the latter band in India is limited to the section 3,890 to 3,900kHz. Efforts are being made to get this extended to 40kHz covering the 3,500 to 3,520 and 3,780 to 3,900kHz sections. All QSLs for contacts with VU2BEO should be sent via W3BWZ.

Les Hickingbotham, VR2FT, reports a visit from W5NW, vice-president of ARRL, during January. He has made contact with a local village chief who owns some 'cubical quad trees'—bamboos growing to a height of 50ft—some of which 2FT hopes to liberate for the construction of a quad. It seems that VR2–G QSOs on 3·5MHz are rather unlikely as the power input on the band is only 10W in Fiji.

A recent Bulletin of the Society of Thai Amateur Radio, kindly forwarded by G2APN, says that the society has been asked to limit the number of non-Thai active members to 50. When this total is reached no more calls will be assigned until one of the existing licensees leaves. The names of seven Thai licence holders and 47 foreigners are listed, the latter all having been assigned three-letter calls. The nine call areas correspond with the Thai Government Ministry of Interior administrative regions, and the Region III frequency allocations are operative—these are the same as our own, except on 3·5MHz where the allocation is 3,500 to 3,900kHz. Top Band is included.

Contests

The Independence of Colombia Contest
0001 18 July to 2359 19 July
All bands 3·5 to 28MHz, all modes (but no cross-modes).

Contacts with HK stations count five points, a muliplier is arrived at by totalling the number of Colombian zones plus DXCC countries worked on each band. Entrants exhange report and serial QSO numbers (starting from 001), and HK stations will also indicate the zone in which they are located. HK0 counts as San Andres, Colombia, and HK0 zone. Logs should be sent (before 30 September) to Independence of Colombia Contest, c/o LCRA, Ap 584, Bogota, Colombia.

The 11th All Asian DX Contest
1000 22 August to 1600 23 August
All bands 1·8 to 28MHz, cw only.

Entries may be single-operator (single- or multi-band) or multi-operator multi-band single transmitter. Non-Asians work Asians and each QSO counts one point. Contest exchanges consist of RST plus two figures which denote the operator's age (YLs are allowed to send "00"!). The multiplier will be the number of Asian prefixes worked on each band. Note that JD1 (Ogasawara Is) counts as Asia, but that JD1 (Minamitorishima) is Oceania and therefore does not count. The total score will be the sum of prefix multipliers on each band multiplied by the sum of QSO points on each band. Logs should show date, time (gmt), station worked, number sent/received, multiplier (for first time worked), points, and separate logs should be sent for each band. A summary sheet should be sent showing how total has been arrived at and certifying that licence conditions and contest rules have been observed. All logs must be mailed to JARL Contest Committee, Central Post Office, Box 377, Tokyo, Japan, to arrive not later than 30 November.

The International Shortwave Championship of Rumania
1801 1 August to 2400 2 August
3·5 to 28MHz, all modes (but no cross-band or cross-mode QSOs allowed).

Entries may be single- or multi-operator, and single- or multi-band. Stations work as many YOs as possible exchanging RS/T and QSO number (starting from 001). Each QSO counts two points and each YO county (of which there are 40) counts as a multiplier on each band on each mode—therefore, possible maximum multiplier is 5 by 40 by 3 = 600. Incomplete QSOs count one point. Logs should show time, station worked, number sent/received, multiplier (if new) and points claimed. They should be accompanied by a summary sheet giving information on the final score and full details of operator and station with a declaration that the rules have been observed and that the log is true, and they should be posted to PO Box 1395, Bucharest 5, Rumania, no later than 1 September. YO stations will give a suffix denoting their county. The counties in each call area are as follows. YO2: AR, CS, HD, TM. YO3: BU. YO4: BR, CT, GL, TL, VN. YO5: AB, BH, BN, CJ, MR, SJ, SM. YO6: BV, CV, HR, SB, MS. YO7: AG, DJ, GJ, MH, OT, VL. YO8: BC, BT, IS, NT, SV, VS. YO9: BZ, DB, IF, IL, TR, PH. In the 1969 contest the UK entries were **G3HCL** (4,928 points), G2DC (2,759), G3TR (1,056) and G3OCA (8 points).

Signy Island Holiday Camp, home of VP8KO for over two years and rest home for antarctic explorers

Results of the **WAB** contests have now been received. Top scores in the **HF CW** contest were **GM3CFS** (7,320), **G3HZL** (5,170), SM3EWB (4,930) and DL1YA (4,060). In the **HF Phone** contest **G3OWH** (multi-operator) scored 37,975 points, and **5N2AAF** (22,080), **G6LD** (18,540) and DL2RR (18,300) led the single-operator category. The **LF CW** test top score was made by **G6LD** (60,630), followed by G3AAQ (45,000) and GM3CFS (38,850). The **LF Phone** test was led by **G3VLX** (multi-op), followed by **G3ILO** (118,140), G3ZBJ (115,290) and G3OIB (110,295). Top listener log belonged to **A6148** who acquired 158,730 points. The Top Band WAB net has been suspended for the four summer months, and the main Sunday net at 1400 now meets on 7,060kHz.

In last year's AA DX Contest, UK entrants' scores were as follows:

		Points			Points
G4CP	(Multi-band)	14,319	**GW3LAD**	(Multi-band)	135
G3TXF	,,	11,264	G3VDL	,,	108
G3FXB	,,	10,452	**G3TR**	28MHz	168
G3ESF	,,	4,680	**G3PJW**	21MHz	3,800
G3KMA	,,	4,551	**GM3CFS**	,,	2,608
G2DC	,,	4,136	GM3JDR	,,	504
G5WP	,,	735	G8KU	,,	504
G2AJB	,,	731	G3PVD	,,	64
G3OCA	,,	384	**G3XYV**	14MHz	225

Awards

The Mayflower '70 Certificate.

Will all readers please note a correction to this announcement in the June issue. All log extracts to be sent to the hon sec, I. Dawe, G3SPI, 345 Crownhill Road, Plymouth, PL5 2LL, Devon. Dates remain as before as do the qualifying QSOs. GB2USA, the Plymouth Mayflower station, will be operational from 19 July to 15 August 1970 on the hf bands, ssb.

The Worked Laen W Award

SWL Club Activity, PO Box 209, S-780 24 Idkerberget, Sweden.

Issued in four classes for working stations in Laen W. Class A-European applicants require 20; class B, 15; class C, 10; and class D, 5 (rest of world 15, 10, 6 and 3, respectively). All QSOs since 15 August 1967. Send certified list and 10 IRCs or $1 to the address above. Listeners may apply. Laen W is in the SM4 call area.

Worked all EI Counties (WAEIC)

Awards committee, c/o Donal Lonergan, EI2CC, 47 Hazelbrook Drive, Terenure, Dublin 6, Eire.

Issued in three classes for contacts since the second world war. Class 1 for working 26 counties, class 2 for 18 counties, and class 3 for eight counties.

Worked all EI Provinces (WAEIP)

Requires proof of contact with four stations in Leinster, four in Munster, one in Connacht and one in Ulster (counties Cavan, Donegal and Monaghan.). For either award a certified list of log entries and 8s, $1 or 10 IRCs should be sent to the address above. These awards may be endorsed for band or mode if requested, and are available to listeners.

Veteran BBC engineer Henry Hatch, G2CBB, shows programme secretary Marilyn Farthing and compere Doug Crawford how to assess when the World Radio Club programme can be heard in different parts of the world. Details of the World Radio Club Award were given in May *MOTA*

BBC photograph

The Blackwater Valley Award

Farnborough & District Radio Society.

Custodian: M. R. Crayton, 47 Lye Copse Ave, Hawley, Farnborough, Hants.

For confirmed contacts after 1 January 1967 with stations in Berkshire, Hampshire (including IOW) and Surrey. Class 1 requires 5, 10 and 10 (2, 5, 5); and class 2, 10, 20 and 20 (4, 10 and 10); class 3; 20, 40 and 40 (10, 20 and 20) and class 4, 40, 80 and 80 (15, 30 and 40) points for contacts with each county, respectively—the figures in brackets refer to extra-European applicants. Contacts with any station are worth one point, with members of the club in their own county five points, and double points for working CHC/FHC members. QSOs with G3XCH and/or G8DIZ are worth 15 points AOMB/M endorsements are available and a certified list of QSLs should be sent to the address above accompanied by 5s, 8 IRCs or $1. There is no charge to blind or disabled applicants and the award is also available to listeners on a "heard" basis. Membership lists may be obtained from the custodian.

The Winnipeg DX Club Award

VE4AE, 22 Sweetwood Bay, Winnipeg 17, Manitoba, Canada.

This award consists of a personalized presentation case containing a genuine Canadian silver dollar issued by the Royal Canadian Mint in honour of Manitoba's Centennial. It may be obtained by making confirmed contact with 31 stations since 1 January 1970. This total must be represented by five QSOs with each continent (Africa, Asia, Europe, South America, North America and Oceania), and one contact with a station in Antarctica. The five North American QSOs must have been with members of the Winnipeg DX Club. Any band/mode may be used but a station may only be counted once. Members of the Winnipeg DX Club are: VE4s AA, AE, AS, BJ, CJ, IM, MP, TJ, RP, SA, SD, SK, XJ and ZX. QSL cards must be in applicant's possession, but need not be submitted if a verified list is sent. The fee for the award is 15 IRCs.

In future all enquiries concerning the **"G300" Award** should be directed to Ruth Uwins, G3TNN, 18 Clarendon Road North. Lytham St Annes, Lancs.

DX news

According to *DXpress* the USSR Antarctic bases are situated as follows: UA1KAE Mirny Base, UA1KAE/1 Dengrosky Base, UA1KAE/2 Oaza Base, UA1KAE/3 Pionierskaja Base, UA1KAE/4 Komsomolskaja Base, UA1KAE/6 Vostok Base, and UA1KAE/7 Sovietskaya Base. USA visitors to Vostok Base may (and, in fact, already do) operate using the callsign KC4VOS.

VQ9CD is reported to be on regularly from Chagos Is. He is said to be on 14,200 and 14,250kHz ssb and 14,030kHz cw from 1400, with lists prepared by 5Z4KL.

Thor Heyerdahl, aboard the reed boat *Ra II*, commenced his second attempt at crossing the Atlantic on 17 May. He will be using the call LI2B on the amateur bands if there is sufficient fuel available to run a generator.

Roy, ZM1AAT/K, has now erected a six-element Sterba curtain aerial 85ft high and 350ft long. This beams north–south and should result in a big increase in his signals in the UK. He is on 14,035 or 14,125kHz at 0630 (for Europe), and 21,035 or 21,350kHz at 0900. 28,035 and 28,550kHz have also produced European contacts.

The Pacific DX Net now meets on Tuesdays and Fridays between 0600 and 1000 on 14,265kHz, on Saturdays at the same time on 14,295kHz and on Sundays between 0500 and 0700 on 21,370kHz. It has 135 regular and 160 associate members.

W2GHK, of *DOTM* fame, now has replacements for the missing parts of CR5SP's logs from September 1967 to January 1969.

Readers will be sorry to learn of the death of VE6AO, and that XW8CS has had to return to the USA because of a heart attack.

5VZDB will be leaving Togo during the first week in July. He will be on the air again in September from Tchad (TT).

ON5SJ was unable to obtain permission to operate from Guinea as 3X1SJ; he is said to have made such permission a condition of his working there and has therefore returned to Belgium.

PJ7RR and 601AG are both pirates. PJ7JC and PJ7VL are legitimate. PJ4PS/P was due on the air for NFD and the week following. TJ1QQ is on the air again from Cameroun on cw and is on all bands 10 to 80m. FL8SR, at present in France, expects to go to Dahomey shortly.

Dxpeditions

According to the Royal Signals ARS publication *Mercury*, three areas are under consideration as possible dxpedition sites during this, the Golden Jubilee Year of the Corps. These are Nepal, Brunei and Qatar. The possibility of a visit to Rockall Is has been discussed but so far no firm arrangements have been made.

The VS6 group will once again be visiting Macao (CR9) and hopes to have a multi-band multi-transmitter station on the air around 1 August. The callsign will be CR9AK.

The *DXers Magazine* reports that HS1ABO will be visiting the HS7 call area—the area of the well-known "Bridge over the River Kwai"—later this summer. A special QSL card will be issued which will give the history of the bridge.

The group of Finnish amateurs who have expressed interest in visiting Albania are hoping to leave Copenhagen on 10 July and start a six-day operation from Tirana on about 17 July using a HW32 transceiver. No information has been received by the writer to say that they have been given the go ahead by the Albanian authorities.

At the time of writing, Gus, W4BPD, had just finished operating from the Comoro Is with his FH0VP callsign. Aerial difficulties caused his signal to be below its expected quality at times, and what appeared to be extremely irregular operating hours and frequencies have not so far helped European stations. No itinerary has been published but it is believed that Juan de Nova, Geyser Reef, the Glorieuse Is, and other rare locations will be visited.

G3UOL will be operating as C31CZ, F0JA, ON8IT, G3UOL/LX and possibly G3UOL/CT during the period 25 July to 31 August. He will be crystal controlled on 14,047kHz. QSLs should be sent to the address in QTH Corner and Bill draws attention to the fact that contacts will count as credits for the Royal Signals Award.

Vlad, UA1CK, passes along the news that his trip to Franz Josef Land did not take place because of transport difficulties. He will try again later.

WB4LWX hopes to be on the air from the New Hebrides during August.

G3WKV and seven others will be on the air from Switzerland between 2 and 13 August, and for a spell from Liechtenstein towards the end of the period. Activity will mostly take place during the evenings and will be concentrated on 160m ssb. However, some 80, 20 and 2m contacts may be made—probably on ssb with a.m. on 2m.

The European Band Plan

Your scribe's attention has been drawn to the fact that a number of UK phone stations have recently been found operating between 7,000 and 7,040kHz, apparently in ignorance of the existence of the "gentleman's agreement" by which the hf bands have been split up into separate phone and cw bands by mutual consent of all European IARU societies. For the benefit of readers the allocations are as follows:

3,500–3,600kHz,	**telegraphy only.**
3,600–3,800kHz,	telephony only.
7,000–7,040kHz,	**telegraphy only.**
7,040–7,100kHz,	telegraphy and telephony.
14,000–14,100kHz,	**telegraphy only.**
14,090kHz,	rtty.
14,100–14,350kHz,	telegraphy and telephony.
21,000–21,150kHz,	**telegraphy only.**
21,150–21,450kHz,	telegraphy and telephony.
28,000–28,200kHz,	**telegraphy only.**
28,200–29,700kHz,	telegraphy and telephony.

Top Band news

Ken McDermott, GM3SSB, reports that GM3YRK and himself will be mounting an expedition during the first two weeks of August. They will leave Glasgow on 1 August and visit Stirling, Perth, Angus, Kincardine, Aberdeen, Banff, Moray, Nairn, Inverness and Argyll, returning to Glasgow on 6 August. They will then travel south to the Woburn rally and spend a further week on the return journey via the Lake District. They will visit particular counties or WAB

As mentioned in an earlier *MOTA*, 7P8AB will soon be leaving Lesotho. "Doc" has given many dxers their only contact with 7P8

areas if these are made known to them (22 Fettercairn Ave, Glasgow). Operation will be on or near 1,830-1,840kHz (cw) and 1,865-1,885kHz (phone). It is also hoped to use 70-26MHz a.m. Daytime operation will take place on 7MHz. GM3YRK/M will use a KW2000A and G-whip, and GM3SSB/P a KW2000A and inverted vee or dipole.

Band reports

Conditions generally were extremely good during the earlier part of the period under review, but were followed by a sudden and expected dropping off, especially on the hf bands. The summer weather has not prevented the following loyal supporters from sending in logs and information and many thanks are due to them for their efforts: G2HKU, G3AAE, GW3AX, G3JKY, G3KWK, G3WNT, G3YWX, GM4QK, G5JL, G8VG, BRS2098, BRS17567, BRS27880, BRS30386, A3766, A6148, A6248, A6265, A6553, A6658, A6904 and A6947. All calls listed were ssb except those in italics which were cw.

1·8MHz. 2100 GB3FI (Flatholm Is) *EI0AO* (Bere Is).

3·5MHz. 0600 *ZM3IS*. **2100** 4X4YM, 9H1s. **2200** AX6HD, CR6s *GO*, IV, CT3s AC, AK, JX8IL, PYs, 5Z4JB, **2300** CE6DP, VU2BEO. **2400** *CR6AI*, LU2ECO.

7MHz. 0000 *FH0VP*. **0400** CR4BC, 6Y5RM. **0600** *HR2HH*, *PY7AWD/O*, VK3HW. **2000** *VQ8CW*. **2100** CR6GA, TR8MC. **2200** TR8DG, VU2BEO. **2300** *TJ1QQ*.

14MHz. 0500 *CN8DW* (QSL via W6GZI). **0600** FO8s BH, BV, BW, KC6CT, W0BWY/KS6, VR6TC, YJ8BW, ZM1AAT/K. **0700** F0RT/FC/P (G3BID), ZK1AJ. **0800** FO8BO, *K4II/KS6*. **0900** AX0LD. **1000** LI2B (raft *Ra II*). **1200** *OY7JDK*. **1800** ZB2BY, 9G1GD. **1900** HSs, M1A, VUs. **2000** M1B (QSL via I1MKN), TC0TS, TR8MC, 7X2AL. **2100** FY7AA, *HZ3TY*, VE0NEF (HMCS *Saskatchewan*). **2200** JY1, KM6AA, UW0IE. **2300** *PY7AWD/0 VP1VR*.

21MHz. JAs all day 0800—2200 or later. W6/W7 1600—2300. **0500** FO8BW. **0600** KZ5MP. **0800** KH6s, *K4II/KS6*, *TJ1AW*, *ZM1AAT/K*. **0900** *KH6IF*, KS6DH, VR1L, VR2FT. **1000** KJ6CF, VR2EK, YJ8BW. **1200** *AX9AC*, *FB8XX*, KM6DQ, KX6II, MP4TDA, ZD8JK, 3V8AL, *8P6AE*. **1400** *FL8BE*, JY1, K6UMT/KL7, *SU1IM*, TU2CW, VQ8CR, *4U7ITU*, 5R8AP. **1600** *HH2G*, *HS5ABD*, KH6BB, *VS5JK*, VQ8CZ, ZD9s BM, BN. **1700** G3LEO/MA (at VS6 "maritime at anchor"), *TU2CX* (QSL to home call W4SUS), 5V4JS. **1800** *5H3KA*. **1900** YB0BY (QSL arrived in four days), 5T5BG. **2000** *SU1IM*, VP2VI, VQ9RK, ZD8JK (QSL via WA3FNK), ZS3HX, 5Z4CK. **2100** *FY7YQ*, *PZ3ITU*, *ST2SA*, VKs, *VP2LF*. **2200** CE0AE, *5T5BG*. **2400** *KM6DQ/KH6*.

28MHz. 0800 TR8DG. **1000** VK9XI. **1100** DU1FH, *FB8XX*, VR2DK, 6W8UIT, *9J3ITU*. **1200** *UA1KAE* (Franz Josef Land). **1500** CR9AK, TJ1AW. **1600** HB0LL, JY1. **1700** VP5NB (Turks & Caicos), 9M2VI. **1800** CP5AD, CX2CN, FG7XL, *FH0VP*, VP8KD, YB0AAE (QSL via DJ10J), 9G1GT. **1900** KZ5AA, LU3AQ, ZP0SR.

Many thanks to all correspondents, and especially to the following for items obtained from their publications: the **DX'ers Magazine** (*W4BPD*), the **Florida DX Report** (*W4FRO*), the **DX'er** (*K6YGS*). **NARS Newsletter** (*5N2AAF*), **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*), and **International Communications** (*Euradio*). Please send all items for the **August** issue **to reach G3FKM** by **13 July**, for **September** issue by **10 August**, and for **October** issue by **2 September—please note this is an abnormally early date.**

QTH Corner

AP2KS	via K6TWT, 643 Cedar Street, Vallejo, Calif, USA 94593.
CE0AZ	via CE3RR, Casilla 13630, Santiago, Chile.
C21JW	22 Berry Street, Cronulla, NSW, Australia.
EA8HA	(after 17/2/70) via DL1CF, Mellingerstrasse 13, 32 Hildesheim, Germany.
FH0VP	via W2MZV, Hermann Bohning, PO Box 102, Yonkers, NY, 10702, USA.
FO8BW	via W6JFM, 1715 Griffith Park Blvd, Los Angeles, Calif, 90026, USA.
G3UOL	Bill Hahn, 28 Kenilworth Court, Coventry, CV3 6HZ.
GC5AJE	via K8CFU, A. C. Doty, 8360 Rushton Rd, South Lyon, Mich, 48178, USA.
GC5ANX	G5ANX, L. Wilson, 50 Hastoe Park Estate, Aylesbury, Bucks.
HS1AA	Suradet Visesurakarn, Vocational Teacher Training College, Bangkok, Thailand.
HS1CB	Chankij Boonyaratvej, 1439 Sarapee 2, Ladya Rd, Dhonburee, Thailand.
HS1JN	Jamnong Suwanna, 64/36 Isarapan Rd, Dhonburee, Thailand.
HS1KB	Kusol Boonyaratvej, 40/1 Soi Near Sattree-Woranart School, Paholyot Rd, Bangkok, Thailand.
HS1SD	Eddy Jonas, G. Simon Radio, Patpong Rd, Bangkok, Thailand.
HS1WR	Kamchai Chotikul, c/o STAR, PO Box 2008, Bangkok, Thailand.
HS3NT	Sawasd Chaikuna, Northern Technical College, Chieng Mai, Thailand.
JW8MI	via LA8FI, Kvarsnes Gunnar, Bodo Radio, Bodo, Norway.
KJ6CF	Box 436, 24th ADS, APO San Francisco, Calif, 96305, USA.
KL7AJQ	via K6TIB, 5735 San Pedro Av, Atascadero, Calif, USA.
VP1VR	via W4VPD, 8254 SW 37th Street, Miami, Fla, USA.
VP2LP	via VE3DLC, R. J. Kreger, 30 Zenith Drive, Scarborough, Ont, Canada.
VP2MB	PO Box 16, Plymouth, Montserrat.
VQ8CZ	43 Hillcrest, Curepipe, Mauritius.
VQ9RK	via W9VNG, Dolores Leiser, 364 Normandy Lane, Grayside, Ill, USA 60030.
VR4EE	Box 9, Honiara, Guadalcanal, British Solomon Is.
VS5JK	G3KPV, 20 Makepiece Rd, Bracknell, Berks.
YB9AAJ	via W7VRO, 2935 Plymouth Drive, Bellingham, Wash 98225, USA.
ZD9BO	via ZS2RM, Box 5181, Port Elizabeth, Republic of South Africa.
5H3JL	via W9NNC, 58582 Elm Road, Mishawaka, Ind, 46544, USA.
5N2KPT	via G2FSS, J. Caley, 37 Mardon Rd, Birmingham 26.
5Z4MO	via G3YWP, "Sycamore", Lower Lane, Freckleton, Nr. Preston, Lancs. PR4 1HJ.
9H1BL	via G3VPS (new address) 20 Salternes Drive, Hailsham, Sussex.

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

Propagation Predictions

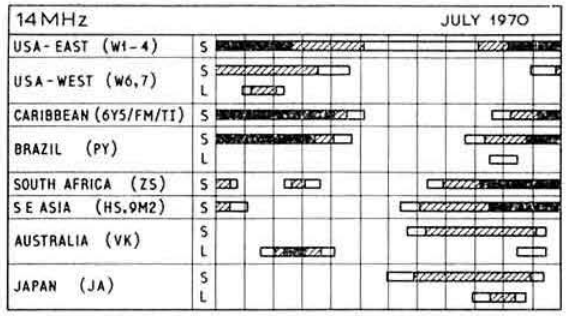
Propagation conditions this month will differ little from those given last month. DX conditions on the high frequency bands are still not favourable, particularly on **28** and **21MHz**. A small compensation will be the more frequent short-skip conditions over distances of about 500–2,000km.

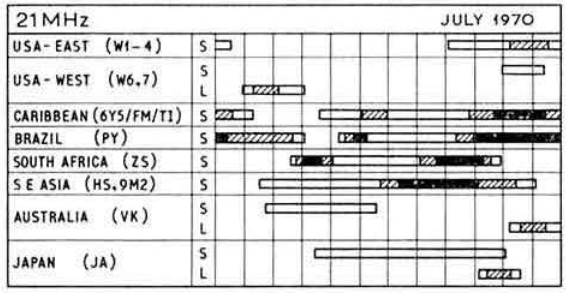
14MHz will remain the main dx band, especially at night. The possibility of dx contacts via the indirect path is again indicated, for both 21MHz and 14MHz.

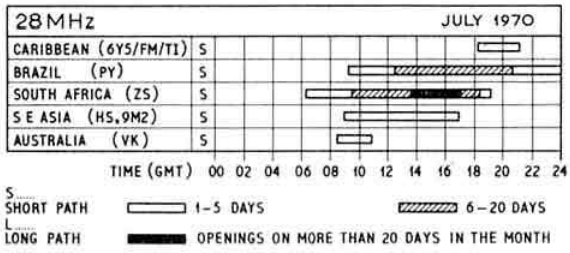
As it is now winter in the southern hemisphere, traffic with South Africa (ZS) will cease early. Central African stations, such as those in Tanzania and Rhodesia, will be heard longer than ZS. The same goes for conditions on 21MHz.

On **7** and **3·5MHz** there will be no noticeable change compared with the previous month.

The provisional sunspot number from the Swiss Federal Observatory for May 1970 was 131, with solar activity distributed evenly throughout the month. During the period 17 to 19 May the daily number exceeded 170. The predicted smoothed sunspot numbers for September, October and November are 92, 90 and 88, respectively.







1970 Countries Table

	1·8 MHz	3·5 MHz	7 MHz	14 MHz	21 MHz	28 MHz	Total
G8VG	3	21	27	30	45	42	168
G3JVJ	4	66	18	37	23	26	174
G3VPS	9	12	10	60	18	10	119
A7006	15	32	28	180	179	137	571
A6265	3	79	72	174	150	126	604
A6904	11	36	47	149	145	95	483
A6248	4	59	68	160	116	105	512
ORS31427	—	9	11	179	109	108	416
BRS25429	3	96	74	119	111	104	507
A5489	—	70	17	89	60	122	358
BRS27880	4	51	37	106	82	55	335
A6553	1	16	14	41	72	53	197
A6148	5	84	19	49	46	68	271
BRS30694	6	24	29	70	61	44	234
A6098	4	21	12	26	37	25	125
A6242	2	19	7	38	26	29	121
A6278	3	44	36	76	24	29	212
A6023	5	32	31	59	21	15	163

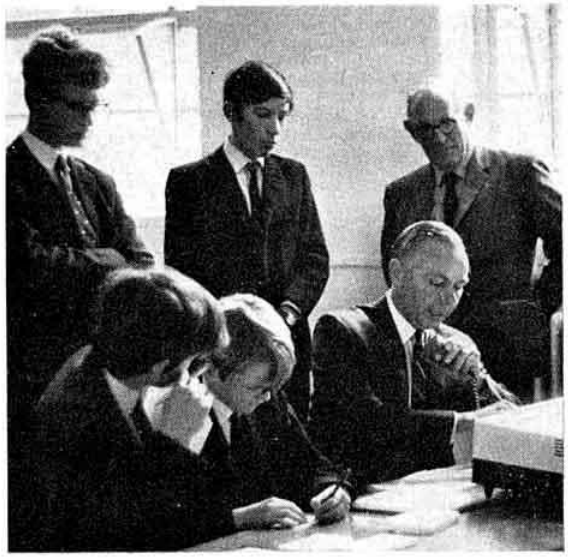
(This month's table is in order of 21 plus 28MHz scores)

WORLD TELECOMMUNICATION DAY

GB3ITU, operating on the 7, 14 and 21MHz bands using cw and ssb, made some 240 contacts with stations in all continents and more than 30 different countries. A number of contacts were made with special activity stations overseas using the ITU suffix.

All contacts will be acknowledged by a special QSL despatched through the Bureau.

GB2ITU was active on 80m and had ssb QSOs with over 120 stations in the British Isles, France, Holland and Belgium. It was located at Tonbridge School, Kent, and was activated by the school's radio society; operators were G3GVV (a member of the staff) and G2AJS (formerly senior physics master at Caterham School). Boys acted as log-keepers, QSL writers, and map-board markers, while others explained the functioning of the system to the many visitors. Equipment in use was all KW: the school's KW Atlanta alternated with a KW2000A (kindly loaned by KW), while an E-Z Match, low-pass filter, and swr bridge, were used to couple the transceivers to the 40ft-high dipole.



G3GVV operating GB2ITU at Tonbridge School ▶

SOCIETY AFFAIRS

A brief report on the Council meeting held at Society HQ on 15 May 1970.

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

Messrs J. O. Brown and A. C. Morris attended by invitation to advise Council on financial matters.

Apologies for absence were received from Messrs Hunter and Parsons. Council noted with regret that Mr Hunter had been involved in a car accident, and that Mr Parsons was still under medical care.

Appointment of new Honorary Treasurer
Council agreed to take first recommendation "A" of the Finance and Staff Committee meeting held on 21 April 1970. It was resolved that Mr A. C. Morris, G3SWT, be appointed Honorary Treasurer of the Society until 31 December 1970.

Mobile Committee
Mr Yeomanson reported that a committee meeting had now been held, and Messrs McClintock, Miller, MacBrayne and Rollinson had all agreed to serve.

Honorary trophies manager
The general manager reported that there had been no response to the request for a volunteer for this position published in the May issue of *Radio Communication*.

VHF Field Day 1970
Mr Stone reported that he had a discussion with G3EEZ during the VHF Convention on 25 April. He had explained the present Society policy in respect of VHF Field Day and the reasons for deleting the shf bands above 1,296MHz. G3EEZ had accepted this, and also the suggestion that shf workers should be encouraged to go out during VHF NFD outside the actual contest, but nevertheless have their activities tabulated. (See p333 May *Radio Communication* for Council policy on VHF NFD.)

Membership and affiliation
It was resolved:

(i) to elect 132 corporate members and 54 associate members;
(ii) to grant corporate membership to 34 associates;
(iii) to grant corporate membership to 21 applicants contained in subscription applications received from various overseas organizations;
(iv) to waive the subscriptions of eight members due to blindness or other disability;
(v) to grant affiliation to the Bolton and District ARS, Newark ARS, Tyneside ARS (Wallsend), Wakefield and District RS and Wrekin ARS.

Norman Caws
In accordance with Articles 9 and 14 it was proposed that Mr Norman Caws, FCA, G3BVG, be made an honorary member of the Society.

Council unanimously approved the motion and the President agreed to write to Mr Caws to advise him of this decision, and to thank him formally for the outstanding service he had rendered to the Society over the years.

The late J. Fraser Shepherd, GM3EGW
A letter had been received from Mr Shepherd's solicitors advising that a bequest of £300 to the Society had been made in Mr Shepherd's will. The testator had expressed the wish that the interest on the bequest be used for an annual award to be fixed at the discretion of the governing body of the Society.

Council agreed gratefully to accept this bequest, and the general manager was instructed to write to Mr Shepherd's solicitors accordingly.

Regional and Area Representatives
Council approved the nomination of Mr A. G. Cole, GC3GS, as Area Representative for Jersey, and noted the appointment of Mr W. Furness, G3SMM, as Deputy Regional Representative for East Lancashire.

Region 10 ORM
Mr Parsons had requested Council's approval in principle to the holding of a Region 10 ORM on 26 September, and this was agreed. Mr Parsons had asked that the President should attend, but Dr Saxton advised that due to previous engagements it was unlikely that he could be present. Council gave approval to the attendance of Mr B. Armstrong, executive vice-President, and Mr R. F. Stevens.

Minutes of committee meetings
Council approved the minutes of the VHF Contests Committee (28.4.70), HF Contests Committee (12.3.70), Finance and Staff Committee (21.4.70), GPO Liaison and TVI Committee (17.4.70), VHF Committee (20.4.70), RAEN Committee (4.4.70), Scientific Studies Committee (13.4.70) and Exhibition Committee (3.4.70 and 24.4.70).

NRSA Convention
Mr Armstrong reported that he had visited the Northern Radio Societies Association's Convention at Belle Vue in accordance with Council's wishes, and he had been very impressed by the standard of the exhibition. The show differed from the London exhibition in that stands were taken by clubs and societies in addition to manufacturers.

He had been asked to raise the question of the provision of a central register of dates, notably those for major functions and mobile rallies. After discussion Mr Yeomanson offered to maintain such a register, and it was agreed to discuss this matter further at the next Council meeting.

Council was in session 3¼ hours.

SPECIAL EVENT STATIONS

Finchley Carnival, 9-11 July
The Southgate Radio Club will run station G3SFG at Victoria Park, Finchley, London N3, in connection with this carnival. Operation on 2m and 160m. Details from A. Edwards, G3MBL, 244 Ballards Lane, North Finchley, London N12.

Dagenham Town Show, 11-12 July
The Barking Radio Club will be operating GB3DTS during this period on 160m a.m., 80–10m ssb, and 4m and 2m a.m. It is also hoped to have tv reception on 70cm. Special QSL cards will be sent. Further information from BRS31976, 43 Waterloo Road, Barkingside, Ilford, Essex.

Manchester Flower & Horse Show, 23-25 July
The South Manchester Radio Club will be operating from this show at Platt Fields Park, Manchester. It is hoped to use the call-sign GB3MFS and to be operational on all bands from "Top" to "Two". Details from G3YKJ, 4 Drayton Grove, Timperley, Altrincham, Cheshire. Tel 061-980 2523.

Wycombe Show, 5 September
GB3WRA will be operated by a group of local amateurs from the annual Wycombe Show on the Rye, High Wycombe, Bucks. Operation will be on all bands 160–10m, a.m., cw and ssb. Further information from A. C. Butcher, G3FSN, 70 Hughenden Avenue, High Wycombe, Bucks.

YOUR OPINION

The Editor
Radio Communication
Sir—*Criticism—"Decibels down the Drain"*.

My sternest critic, G3RZP, had already found fault with this article before it appeared: He says:

"It is just like the Old Man to assume that because his linear is a grounded grid, everybody else's will be the same! Therefore, the statement that a linear amplifier will normally have a gain of about six to ten decibels is true only of this type of amplifier."

This is of course perfectly correct. Other forms of linear amplifier give much greater gain. But all one would have to do to keep the same watchful eye on things is to continue the downward scale of "negative decibels" and refer to the *Radio Communication Handbook* to find out what one ought to expect.

You will have guessed that the critic is the kid I taught radio many years ago!

Yours apologetically,
Harold S. Chadwick, G8ON

The Editor
Radio Communication
Sir—Band occupancy is a subject which has been written and spoken about apparently with some despondency, particularly with regard to the vhf/uhf bands losing out to commercial interests.

The Echelford Amateur Radio Society of Ashford, Middlesex, does not take band occupancy lightly. In addition to a high level of activity, many club members take part in three regular weekly nets, 160m on Sunday mornings, 2m on Wednesday evenings and 4m on Friday evenings. The club callsign, G3UES/A/P, is heard during contests, at exhibition stations and in local activity periods. The contests sub-committee runs a very popular 12-monthly activity contest. Slow morse transmissions on 160m are put out by club members six days out of seven.

If it is a case of "use or lose" our portions of the spectrum then this club and its members are going all out to make "use" the operative word.

Yours faithfully,
R. S. Hewes, G3TDR,
hon secretary, Echelford Amateur Radio Society

The Editor
Radio Communication
Sir—Like Mr Dorey (*Radio Communication*, May 1970, p298), I have been experimenting with direct conversion receivers using hot-carrier diode mixers. Some work with elliptic function audio filters has been encouraging, and the low-pass circuit below yields a shape factor (6 to 60dB) of 1·18, with a cut-off frequency of 3kHz. Ultimate attenuation is over 75dB. (See Fig 1. below)

The filter is designed for source and load impedances of 4·7kΩ, the source being a low-noise fet preamplifier connected directly to the mixer output. (See Fig 2, right)

The capacitor values should be accurate to about 1 per cent, but inductors on Mullard Vinkors can be set to the correct values experimentally. Using 38swg wire on a LA2303 assembly, L2 is 650 turns, L4 520 turns and L6 560 turns. The inductors are set for minimum output at frequencies of 6,480Hz, 3,585Hz and 4,090Hz, respectively.

Yours faithfully,
P. G. Martin, G3PDM

The Editor
Radio Communication
Sir—I refer to the letter from Mr Broadbent, G3AAJ, regarding beryllium oxide used in the E3280 and similar devices.

This matter has been of concern to manufacturers, and very strict precautions are taken when handling this material. As far as the user is concerned, the following warning notice is attached to these devices' technical data sheets: "WARNING. This device incorporates Beryllium Oxide, the dust of which is toxic. The device is safe provided it is not dismantled nor its component parts or finish tampered with. Care should be taken to ensure that all those who may handle, use or dispose of this device are aware of its nature and of the necessary safety precautions. In particular, it should never be thrown out with general industrial or domestic waste. Advice on disposal can be obtained from The Applications Laboratory of the M-O Valve Co Ltd."

In addition, another notice containing this warning is packed with the device so that the actual user also has warning of the hazard.

I hope this information will allay any fears that Mr Broadbent has on this matter.

Yours faithfully,
G. R. Jessop, G6JP

The Editor
Radio Communication
Sir—I sympathize with your correspondent Mr Harding in his complaint about the people who "sit" on top of slow morse transmissions. He has hit the nail on the head by suggesting that those responsible are unable to appreciate their action as they are unable to read morse anyway. I have heard comment from them to the effect that "there were commercial teletype transmissions on the frequency", so Mr Harding can have little hope but that one may see his letter and wonder.

The deadly CQ menace could probably be best avoided if the frequencies chosen were between 1,820 and 1,840 (indeed some stations already transmit slow morse there) but I have no doubt that there are good reasons for using 1,920kHz and the like.

Anyhow, I should like to encourage BRS30328 to continue despite the opposition as we can never have too many key bashers on the bands and it is good to hear the new calls that continue to pop up on the key.

Yours faithfully,
J. Worthington, G3COI

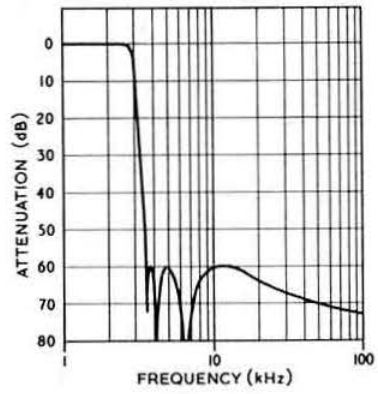


Fig 2.

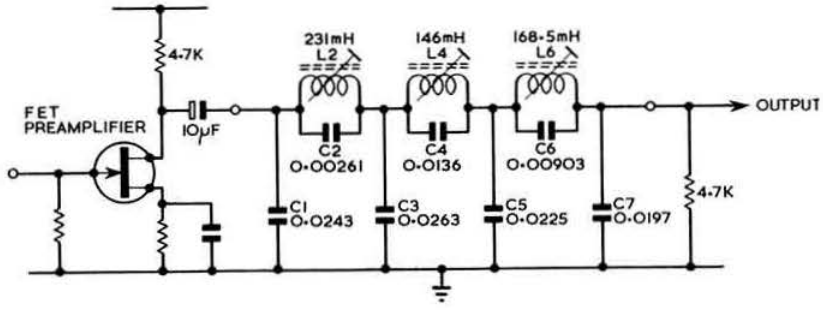


Fig 1.

The Editor
Radio Communication

Sir—In reply to Mr J. P. Wells, RNXS/AFCA, whose letter in the June issue of *Radio Communication* complained of amateur "blocking of exercise frequencies", the situation could never have arisen if the frequency chosen was not in an amateur band. I am not suggesting that other services have no right in a "shared" band, but there is much more room outside than in, and usually they have the choice.

While the RSGB is correct in publishing such complaints, I decry the subservient tone of certain requests that have appeared over the years, exhorting us to keep off various frequencies in the shared bands. The official line should be strong criticism of such allocations. It is not the job of the defence to argue the case for the prosecution.

Yours faithfully,
Ian Jackson, G3OHX

The Editor
Radio Communication

Sir—Reference Mr J. P. Wells' letter in the June issue of *Radio Communication*.

I am also a RNXS communicator, as are many other radio amateurs, and we abhor the manners of certain other amateur radio operators who have the attitude that a certain frequency belongs to them. The unfortunate thing really is that the RNXS allocated frequency in the 160m band coincides exactly with one that is chosen by certain ssb nets. The 160m band is allocated to the amateur service on a secondary basis—not shared like 80m secondary means what it says. So Royal Naval fixed or mobiles have priority and it is the amateurs onus to clear the frequency. The RNXS has only three allocated frequencies, one between 1·8 and 1·9MHz, and two in the 3·6 to 3·8MHz band, they are crystal frequencies and we cannot QSY. The amateur can, unless he is one of the very small minority nowadays that still uses crystal control.

Yours faithfully,
D. Walmsley, G3HZL
RNXS—RNARS

Editor's note—*Several letters on the subject of Mr Wells' letter in the June issue have been received but lack of space precludes the publication of all of them. The table of frequency allocations in the Radio Regulations (p49) states that in Region 1 the frequencies 1,605 to 2,000kHz are allocated to FIXED, and MOBILE except aeronautical mobile. A footnote (194) to this section states that certain specified countries, including the UK, may allocate up to 200kHz to their amateur service within the band 1,715-2,000kHz. However, when allocating bands within this range to their amateur service, administrations shall, after prior consultations with administrations of neighbouring countries, take such steps as may be necessary to prevent harmful interference from their amateur service to the fixed and mobile services of other countries. The mean power of any amateur station shall not exceed 10W.*

The Editor
Radio Communication

Sir—In Gibraltar ex-service equipment is practically unheard of, commercial gear (apart from one EC10) has never been displayed at all, and spares are either too difficult to find or far too expensive.

There are quite a few prospective ZB2s who are trying to get equipment but cannot afford the expense of a decent receiver plus shipping costs and import duty. The advertisers in *Radio Communication* are naturally not prepared to extend hp terms to Gibraltar, and this makes it practically impossible for anyone to get any equipment at all.

Would any member willing to help, please get in touch with me. All or any correspondence will be answered by return.

Yours faithfully,
S. G. Payas, ORS30364
25 Alameda House,
Red Sands Road,
Gibraltar

The Editor
Radio Communication

Sir—I would like to place on record the gratitude of my association to the chairman and members of the Liverpool University Amateur Radio Society who lent us their KW1000 linear amplifier at very short notice for Scoutabout '70.

Despite the poor propagation during the event we were able to demonstrate world wide contacts with comparative ease.

Yours faithfully,
J. A. Share, G30KA,
secretary, Wirral DX Association

OBITUARY

J. Boulter, G3OCX/GW3OCX

Jim Boulter, G3OCX, passed away suddenly on 6 June. The Blackpool & Fylde ARS, of which Jim was honorary secretary for many years, has lost a good member and friend.

MOBILE RALLY NEWS

White Rose Mobile Rally, 26 July

At Allerton High School, King Lane, Leeds 17, just off the Leeds Ring Road near Harrogate Road.

Talk-in stations will operate on 160m and 2m using the callsigns G3XEP/A and G3YED/A, respectively. All the usual trade stands, with stands on behalf of RAIBC, CHC, surplus equipment (bring yours to sell), plus other attractions. Adequate car parking facilities available.

Further information from G3WIX, QTHR.

Torbay ARS Mobile Rally, 16 August

At Newton Abbot Rugby Club ground on the Newton Abbot to Exeter Road opposite the Newton Abbot race course.

Talk-in stations will be active on 1,880kHz and 144MHz from 1030bst using the callsign G3NJA/A. The ground will also be well signposted.

There will be various competitions, a bar, a "Ham Jumble" stand and the usual trade stalls.

Plymouth Radio Club Annual Picnic, 23 August

At the Scenic Car Park, Harrowbeer, Yelverton, near Plymouth.

Talk-in stations will be using the callsigns G3PRC/P and G3BRJ/P on 160m and 2m, respectively.

During the summer months of this year Mayflower '70 celebrations are in full swing which should be an attraction for any mobiles visiting in the area.

Sheffield (SARC) Picnic, 23 August

At Riber Castle Fauna Reserve and Wild Life Park.

This site is some 850ft asl, overlooking Matlock, and houses the largest collection of British birds and animals in the British Isles.

There is a café, and an exclusive parking/picnic area has been arranged by kind permission of the owners. From Matlock take the B6014 to Tansley and follow RAC signs for 1 mile to the castle.

Preston ARS Mobile Rally, 30 August

At Kimberley Barracks, Deepdale Road, Preston.

A talk-in station, using the callsign G3KUE, will be operating on 160m. Routes to Deepdale Road will be signposted from the nearest A road or M road points.

Looking ahead

25-26 July—British Amateur Television Club Convention, Cambridge.
19-22 August—RSGB Exhibition, New Horticultural Hall, London.
4 September—RSGB Dinner Club, Kingsley Hotel, LondonW.C.1.
28 September—Lecture at the IEE. "The Trans-Arctic Expedition."
11 October—RSGB Scottish VHF Convention, Dundee.
4 December— RSGB AGM.

RADIO AMATEUR EMERGENCY NETWORK

by S. W. Law, G3PAZ*

Has your controller asked about your holiday plans? He should not have had to, but such is the holiday spirit that some of us tend to feel unconsciously that everything takes a holiday when we do. Students of the laws which apparently govern human endeavour will know that this is far from being the case. Trouble thrives on complacency and several wasted calls to absent people can throw away a great deal of valuable time. So do please have the courtesy to let your controller know when you will be away. After all, communications are our basic interest!

South-east controllers meeting

A meeting of south-east area group controllers was held at RSGB HQ on Sunday, 10 May. There was an attendance of 16 representing N, E and W Sussex, Kent, Essex, Lewisham (SE GLC), Surrey, NE Hampshire and Mid-Thames.

Following reports on progress by each of the groups represented, subjects such as publicity, membership cards, insurance, RSGB membership and national calling frequencies were fully discussed and certain matters referred back to the RAEN Committee for action.

It was generally felt that similar meetings should be held regularly, say twice per year, with similar meetings throughout the country as inter-group co-operation was desirable and a regular get-together both useful and enjoyable. The meeting was in session for nearly four hours.

Cumbria

The Cumbria group has now ratified its 2m and 4m channels which are 145·44MHz and 70·362MHz, respectively. It will be noted that the latter is the same as the Manchester 4m channel which will make inter-group operation readily available.

The group's members are planning an interesting indoor exercise in message-passing using a multi-way telephone system rather than radio. This will enable any errors in procedure to be corrected as training proceeds without causing untoward comment from the local amateur population!

Still they come

We have mentioned before the interest shown by other countries in our activities. The latest enquiry to the RAEN Committee came from West Germany. Doubting Thomases note that the UK RAEN set-up is still regarded as a model by others. Let us keep it that way!

Car stickers and badges

A stock of RAEN car stickers and lapel badges is now held by the honorary registrations secretary at current prices. It would be appreciated if postal charges were added when orders are sent.

RAEN Committee

The RAEN Committee met on 30 May at RSGB HQ. Present were G3BPT, E. R. L. Bassett, G3MBQ, G3IIR, G3WCO, G3PAZ and G6NZ. Apologies for absence were received from GM3LTW and G2UK. A number of topics were discussed among which were compatibility of apparatus between adjacent groups, the use of frequencies, report on south-east controllers meeting and the Northampton civil aid meeting, registration cards, group activities and enquiries from various sources re RAEN methods. Certain aspects of the possible expansion of user services also received attention, together with members' insurance. A resolution was passed to adopt the national calling frequencies of 70·375 and 145·8MHz, this not to prejudice use by groups already operating on these. The committee was in session for four-and-a-half hours.

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

New interest

We are glad to hear of a revival of interest in the Southampton area and also the enquiries from Basingstoke. There are still some gaps on the map, however, and the committee would be delighted to provide every assistance to any potential groups that may be envisaged in areas not already covered. Lectures to radio clubs can be arranged on application to the hon sec or to the chairman.

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.**

RAEN Group of the Month

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

The Norfolk and NE Suffolk Group

Group controller: D. F. Willies, G3HRK. Tel. Horning 364.

The Norfolk RAEN Group was formed 17 years ago, spontaneously and immediately after the disastrous east coast floods in 1953.

Since those early days membership has steadily increased, and combined with the North-East Suffolk Group now stands at close on 100. Equipment availability on 160m and 2m is steadily improving and the mobile/portable capability is very encouraging. There is excellent co-operation with the primary user service, the police, while good contact exists with BRCS. Recently the St John Ambulance Brigade has also been taking an interest in the group's activities.

The group has this to say of RAEN: "As volunteer members of an important emergency service we must always bear in mind our responsibilities to our user services, and thus our responsibilities to the public. Remember that lives, human lives, may well depend on **us**, our equipment, our ability to communicate and to communicate efficiently. This means reliable and effective equipment, well trained personnel and good liaison with those who may need our facilities in case of a disaster.

"It all adds up to something **very** worthwhile, **very** rewarding and a means by which the true spirit and ability of radio amateurs can be utilized to the best advantage . . . as a PUBLIC SERVICE."

Mobile rallies calendar

12 July—Upton Mobile Rally organized by Worcester and District ARC, Hill County Secondary School, Upton-upon-Severn. Contact G3VJN.

19 July—Scarborough Amateur Radio Society Rally, Burniston Road Barracks, Scarborough.

26 July—Wessex ARG Mobile Picnic, Stoney Cross Airfield, New Forest. Talk-in stations on 160m and 2m. Further details from G8BBN, QTHR.

26 July—Saltash and District ARC Rally, Saltash School, Wearde Hill, Saltash. GB3SAL will operate as talk-in station on 160m and 2m. G3XWA.

2 August—City and County of Bristol RSGB Group Mobile Picnic, Ashton Park. Bristol. G3ULJ.

9 August—Woburn Abbey Mobile Rally.

9 August—Stratford-upon-Avon Mobile Picnic.

16 August—Derby Mobile Rally, Organized by Derby and District Amateur Radio Society. Rykneld School, Bedford St, Derby. Further information from T. Darn, G3FGY, QTHR.

23 August—Swindon and District ARC Annual Mobile Rally, No 15 MU RAF Wroughton aerodrome, near Swindon. Talk-in stations: G8AUG on 2m; G3WEF on 160m; from 10.30am.

Mid-September—RSGB Scottish Mobile Rally Region 14.

CONTEST NEWS

144MHz Open Contest 7-8 March 1970

This contest will long be remembered as the one with the good auroral opening. The opening was first noticed at about 1430 on the Sunday and continued with occasional breaks up to the end of the contest and ultimately to 2230. Some stations did not notice the Aurora, but many contacts were made on cw to as far as SM. Surprisingly some a.m. stations were identified via the Aurora, but no QSOs were reported. One ssb auroral QSO was reported between PA0CML and G3USB. The latter station accounted for 25 per cent of his score via the Aurora. Oddly enough G3OHH at Mowcop could find no trace of the auroral dx.

One hundred and two entries were received in spite of poor to average tropo conditions. The weather was cold and many of the portable stations suffered from snow and ice. At least one discovered that bottled gas will not vaporize below a critical temperature. In view of the large number of entries and the premium on space in *Radio Communication* it is not possible on this occasion to give full station details in the results table. However, 10-element yagis either singly or in pairs were used by the most successful stations. High power input was certainly not a pre-requisite of success; G8CIT managed 48 contacts with 0·55W.

Subject to Council approval the Mitchell Milling Trophy for the highest score goes to Geoff Tibbetts, G3NUE, and certificates of merit to G3JXN, G8BCL in Section "A", G3OXD/A, G3WSC in Section "B" and GW3TXR in Section "C".

Section "A"

Posn	Callsign	Score	Stations	Best dx (km)	County
1	G3JXN	560	178	402	LD
2	G8BCL	472	95	340	YS
3	G3GJY	413	85	330	YS
4	G3MOT	385	100	295	OX
5	G3NNG	377	101	368	BE
6	G8AYN	328	159	216	SY
7	G3USB	315	89	467	CE
8	G3OHH	312	89	–	SD
9	G2WS	300	70	708	ST
10	G2XV	294	78	628	CE
11	G3PWJ	289	94	220	SD
12	G8AXZ	287	125	515	BE
13	G3YXM	281	102	220	LR
14	G8CKG	276	99	275	WR
15	G3AKT	272	100	256	BD
16	G3WHK	266	139	212	SY
17	G8ANZ	264	84	410	ST
18	G8CCE	202	129	180	BS
19	G8AEL	197	61	180	BD
20	GD2HDZ	194	31	392	IM
21	G8CKT	193	110	199	SY
22	G8AFA	189	69	225	ST
23	G8CAI	186	118	205	LD
24	G8DHL	178	72	158	BE
25	G3ZDY	173	68	230	HE
26	G8APZ	168	100	197	MX
27	G8BXT	162	61	210	SD
	G8COA	162	92	140	SY
29	G8CZQ	152	98	110	MX
30	G3TWX	148	50	200	NM
31	G3XKT	146	64	185	DY
32	G3TKF	140	44	680	ST
33	G8BHD	137	79	160	KT
34	G8CJV	133	53	157	WR
35	G8CTT	127	89	–	KT
	G3XFW	127	55	141	ST
37	G8CVV	125	55	150	BE
38	G8DJF	115	65	160	BS
39	G8CUO	108	40	220	NM
40	G8CMU	105	33	174	NR
41	G8BWW	103	42	240	LE
42	G8BKR	102	44	119	GR
43	G8CXK	89	41	158	NM
44	G8CBZ	88	26	180	DN
45	G8CVS	81	40	130	OX
	G8CRN	81	30	224	CE
47	G8BWE	79	40	163	YS
48	G8BVV	71	35	110	ST
49	G8CCH	66	36	98	HE
50	G8DBA	65	43	105	SY
51	G8CDW	60	47	100	MX
52	G8CUZ	57	32	210	BS
53	G8CIT	54	48	82	MX
54	G8CKC	49	25	120	DN
55	G8CRP	36	32	64	SY
56	G8ACR	33	19	101	WK
57	G8BZY	30	20	80	YS

Section "B"

Posn	Callsign	Score	Stations	Best dx (km)	County
1	G3OXD/A	675	177	520	WR
2	G3WSC	636	170	1040	SX
3	GW3UCB/A	586	130	885	DB
4	G3KMI	431	126	224	HE
5	G3WMS/A	401	141	284	EX
6	G3PMH	395	108	227	CE
7	G8CVK/A	355	126	230	WR
8	G8CSA	352	171	–	LD
9	G3RLE	324	86	445	YS
10	G3UOA	272	118	160	WK
11	G3LRS	265	95	221	LR
12	G3YGR/A	258	146	230	LD
13	G8CDL/A	229	102	210	BD
14	G3XEP/A	225	74	272	YS
15	G3UOK	180	79	–	SD
16	G3IXH	165	56	217	LN
17	G3YUW/A	154	61	165	ST
18	G8CYT/A	152	58	157	DT
19	G3VUM	146	68	142	LE
20	G3UHF	130	66	153	LE
21	G3RZG	96	30	350	DT
22	G8BRY/A	70	37	135	YS
23	G8BQR/A	55	44	81	LD
24	G8DAD/A	30	15	91	GR

Section "C"

Posn	Callsign	Score	Stations	Best dx (km)	County
1	GW3NUE/P	1631	281	500	BR
2	GW3TXR/P	1160	138	297	MG
3	G8BQX/P	806	184	370	SX
4	G8BRN/P	544	155	218	GR
5	G3XAC/P	527	129	310	YE
6	G8ASR/P	506	151	216	OX
7	G3GBU/P	452	156	325	SD
8	G3ONP/P	340	80	258	SE
9	G3XUS/P	318	101	215	SX
10	G8AZU/P	298	111	220	HE
11	G3SFG/P	261	97	238	BS
12	G8ALM/P	257	93	227	HF
13	GW3VXC/P	212	57	235	MH
14	G8DKU/P	151	41	410	YS
15	GI8AYZ/P	96	23	323	AM
16	G3THW/P	93	35	–	SD
17	GW3UUS/P	58	24	80	MH
18	G8DGS/P	42	20	117	SX
19	G3PYC/P	27	11	–	SX
20	GI8CFA/P	10	4	89	LY
21	GM8APX/P	3	1	58	PH

Listeners

A5032	384	136		HF
BRS28005	338	94		SX
A6804	203	60		FT
A4798	104	13		—
BRS15822	90	58		LD
A5957	67	49		MX
A5489	51	27		KT
BRS29592	30	20		YS
BRS30386	18	14		SY

Check logs received from G8CQA, G3BPM and G2HH. G3SLJ/A disqualified—Rule 17.

Contestants' comments:

"Most stations in the London area seemed to be below 144·5"—G8CZQ.

"Why pick contest to coincide with Mothers' Day"—G8ACR.

"Let's have some truthful reports"—G8CVK/A.

"Disaster! The crystal for the cw zone could not be persuaded to oscillate"—G3RLE.

"Had to go QRT on Saturday evening because dancers in the building objected to 'CQ Contest' drowning the Edgar Broughton Band"—G3VUM.

April 1970 70MHz Open Contest

A reasonable entry was received for this contest, although there were not enough entries in Sections "B" and "C" to enable the runner-up to qualify for an award. Brian Turner, G3RLE, won Section "A" over Roger Hargreaves, G3OHH, both being well ahead of the field. G3OXD/A, the Albright and Wilson Club, narrowly came out on top of Section "B", and the inevitable winner of Section "C" was GW3NUE/P in the Black Mountains of Brecknock. The best dx was between G3TDH and GM3VPK/P at 430km: both stations agreed exactly on the distance! Comments were generally favourable.

Section "A"

Posn	Callsign	Score	Contacts	County	Best dx	Km	Power	Aerial
1	G3RLE	244	43	YS	G3DAH	330	50	4-ele yagi
2	G3OHH	209	50	SD	G3DAH	295	50	6-ele yagi
3	G6HD	125	45	KT	G3RLE	285	32	4-ele yagi
4	G5UM	114	25	LR	GM3VPK/P	325	16	4-ele yagi
5	G3EKP	110	28	LE	GI3RXY	290	22	4-ele yagi
6	G3NEO	108	25	YS	G3WMR/P	230	40	3-ele yagi
7	G3VFD	103	40	KT	G3RLE	280	50am 30cw	+ dipole 4-ele yagi
8	G3RDQ	95	27	BS	G3RLE	234	50	4-ele yagi
9	G3VSA	90	25	LE	GM3VPK/P	220	50	5-ele yagi
10	G3VCV	81	19	HD	GW3NUE/P	—	10	5-ele yagi
11	G3VNQ	69	24	LE	G3NNG/P	250	50	4-ele yagi
12	G3HBG	48	13	SY	GW3NUE/P	230	30	4-ele yagi
13	G3XMG	42	22	LE	G3OXD/A	133	50	4-ele yagi
14	G3XVU	36	18	YS	GW3UCB/P	168	8	3-ele yagi
15	G2WS	24	6	ST	G3OXD/A	135	45	4-ele yagi

Section "B"

1	G3OXD/A	276	53	WR	GM3VPK/P	307	30	4-ele yagi
2	G3TDH	266	71	BD	GM3VPK/P	430	46	4-ele yagi
3	G4KF/A	175	58	EX	GW3TXR/P	298	40	4-ele yagi
4	G3VWS/A	164	48	SX	G3RLE	305	25	6-ele yagi
5	G3VJR/A	129	32	YS	GM3VPK/P	268	20	4-ele yagi
6	G3ZCI/A	21	7	SX	G3TDH	120	10	4-ele yagi

Section "C"

1	GW3NUE/P	415	63	BR	G3DAH	300	25	4-ele yagi
2	GW3UCB/P	333	55	CV	G3JHM	350	50	6/6 slot
3	GW3TXR/P	302	60	DB	G3DAH	338	50	2×3 ele yagi
4	G3NNG/P	221	43	BE	GM3VPK/P	402	30	4/4 slot
5	GM3VPK/P	205	28	WG	G3TDH	430	50	6/6 slot
6	G3TDM/P	200	60	BS	GW3UCB/P	265	15	4-ele yagi
7	G3WMR/P	161	27	SY	G3RLE	300	25	4-ele yagi
8	G3KSU/P	114	28	HE	GW3NUE/P	190	10	3-ele yagi

G3GVM disqualified—Rule 14 (i)
Check logs received from G3WKF/P, G3UUT and G3LAS.

May 1970 144MHz Portable Contest

The provision of a long section for this contest held on 2-3 May seems to have been generally received with favour. Forty-one logs were received for Section 1 and 46 for Section 2, representing an overall 20 per cent increase on last year's entry.

Once again Wales has produced the leading scores. The Worcester VHF Group, operating from Brecon as GW3TQZ/P, made 346 contacts in the 24 hours. The runner-up was the Albright and Wilson ARS, GW3OXD/P, operating from a popular site in Radnor. Notable single-operator entries in this section were received from G3WKF/P, G8AJC/P and G8CKC/P.

Top scorer in Section 2 was the RAF Sealand Radio Club, GW3ITZ/P, operating from Denbigh. With 140 contacts in eight hours they established a clear lead over G3RZG/P operating from Dorset.

With the South under the influence of an anticyclone, conditions were generally good to the Continent, especially during early Sunday morning. In the North conditions seem to have been fair during the Saturday, declining steadily on Sunday. Towards the end of the contest a lift to F and HB was evident in the South. The best recorded contact was G8BGG/P with F9NL at 930km. Entries were received from GM, GI and F with GC and GD being logged.

Most of the leading stations used QQVO3-20A transmitters at 25W dc input with fet front-ends on receive.

Comments:

"Best for many moons"—G3XUS. "Yo-Yoish"—G8ARS.

"Suffered from dandruff from some of the hairy Welsh signals"—G8BQX.

"Won't people listen out for foreigners!"—F0PV/G8CEA.

Section 1

Posn	Callsign	Score	Stations	Op	County	Best dx	Dist km
1	GW3TQZ	2671	346	M	BR	HB9AEN/P	870
2	GW3OXD	2296	279	M	RN	F6ADZ/P	858
3	GW3SLJ	1832	269	M	RN	DK1QT/P	720
4	G3WKF	1488	138	S	CL	F9DN/P	670
5	G8BQX	1406	203	M	WR	F2OG/P	910
6	G8AJC	1389	151	S	KT	F1BF/P	640
7	G8BGG	1374	152	M	ST	F9NL	930
8	GW6OI	1268	212	M	DB	F9NJ	490
9	G8CKC	1229	157	S	ST	ON5EW/A	630
10	G8APV	1108	153	M	SY	F6ANQ/P	651
11	G3EFX	1063	151	M	KT	HB9AEN/P	620
12	G8AWZ	1058	141	M	NK	GM8DQW/P	490
13	GW3UCB	1048	181	M	CV	PA0MJK/P	665
14	GW8BXC	1041	129	M	MH	DL6WT/P	757
15	GW3VXC	1012	146	S	MH	ON5EW/A	637
16	GW3NWR	950	170	M	DB	F1BCI/P	400
17	G8ARS	948	187	M	SE	PA0EZ	510
18	G3SFG	936	195	M	BS	ON5EW/A	485
19	G8AXA	917	197	M	SY	HB9AEN/P	685
20	G3KMT	858	164	M	EX	G3WKF/P	—
21	G3UES	710	165	M	HF	F1QZ/P	402
22	G3XUS	694	140	M	SX	HB9AEN/P	640
23	G8BCL	693	120	M	YS	F1YM	625
24	G3CMH	692	131	M	WE	F1APA/P	705
25	GW3ONP	658	86	M	MR	F1YM	510
26	G8CZE	640	105	M	SD	DK1QT/P	685
27	G8DIZ	635	160	M	SY	ON5EW/A	520
28	G3PIA	627	162	M	BE	F1YM	385
29	G5PI	606	74	M	DN	F1FG	712
30	G3VER	566	131	M	HF	F1MJ/P	662
31	G3ZIS	539	113	M	YS	F1YM	650
32	G8CDL	517	123	M	BD	ON4RY	350
33	G8BEB	501	84	S	SX	—	—
34	G8ACR	499	113	M	WK	F1YM	460
35	G3VBQ	488	110	S	WE	HB9AEN/P	870
36	G8CIB	472	100	M	GR	DL8GA/P	650
37	G8BZG	416	100	M	BS	F5HX/M	568
38	F0PV	351	58	S	50	G8CSU/P	320
39	GM8DQW	250	45	M	KE	G8AWZ/P	524
40	G8BWW	236	52	S	YS	G3KMT/P	350
41	G3HXN	235	75	M	GR	F1TE/P	—

Section 2

1	GW3ITZ	784	140	M	DB	G3EFX/P	345
2	G3RZG	700	97	M	DT	F1AAS	660
3	G8ANZ	573	92	M	ST	F5HX/M	650
4	G3OBD	471	83	S	WE	F5HX/M	609
5	G3PXP	425	112	S	LR	—	—
6	G3IGV	379	42	S	CL	FIAPA/P	766
7	G3JEQ	371	84	M	SY	F1BF/P	725
8	G8APO	362	66	M	SX	HB9AEN/P	650
9	G3ERD	331	101	M	DY	PA0CML	407
10	G3CGQ	306	47	S	DT	F1TC/P	375
11	G3OGY	301	78	M	LE	GC2FZC	468
12	G5HZ	299	72	M	HE	F1ATP	360
13	G8AQO	296	66	M	BS	HB9AEN/P	750
14	G8CKN	290	56	M	HE	ON4RY	420
15	GW8CKT	284	54	S	BR	F9NJ	455
16	G3OTK	277	61	S	ST	GD2HDZ	350
17	G6XM	273	57	S	HE	G3XPT/P	270
18	G8BKY	272	77	M	WK	F1BCI/P	308
19	G3WIR	246	54	M	BS	HB9AEN/P	720

20	G3XDY	242	57	M	LN	G8ANZ/P	325
21	G8BRC	237	69	M	WK	G3WKF/P	330
22	G3EEZ	235	60	S	SE	G8CHO	207
23	GI8AYZ	231	28	S	LY	G3AOS	330
24	G8BLM	218	68	M	SE	G3DAH	285
25	G2CUZ	217	56	M	LE	GI8AYZP	—
26	G3LLE	207	44	S	YS	G3WKF/P	415
27	G3UHK	197	52	S	OX	G3IGV/P	—
28	G6YB	187	57	M	GR	GD2HDZ	330
29	G8DDC	185	68	M	BD	GW3NWR/P	220
30	G5UM	162	51	S	LR	G3WKF/P	416
31	G3TQF	152	40	S	NK	G3WKF/P	350
32	G8BRT	142	31	S	YS	G8AXA/P	245
33	G3IXH	133	51	M	DY	G3JXN	197
34	G8AFN	132	32	S	EX	GW6OI/P	285
35	G8DBA	126	27	S	SY	F5JO/A	325
36	G8DGS	102	18	M	SX	F1ASH	380
37	G3THW	92	42	S	SD	GW3TQZ/P	—
38	G8BFM	90	34	M	DY	G6GN	200
39	GM6ZV	87	26	M	RW	GW3ITZ/P	300
40	G8CXK	86	39	S	NM	GW3OXD/P	180
41	G3THX	85	33	—	LN	GW3SLJ/P	240
42	G8DKU	83	18	M	DM	GI8AYZ/P	325
43	G8CXS	82	32	M	YZ	GW3UCB/P	154
44	G8BXF	56	19	M	ND	GW3OXD/P	330
45	G3JDM	33	17	S	SD	GW3UCB/P	122
46	G8CUB	29	8	M	KT	ON4RY	—

Listeners

Posn.	Call	Score	Stations	County
—	A5032	722	140	HF
—	BRS28005	567	76	SX
—	A6804	378	73	FT
—	BRS15822	345	75	LD
—	A6111	80	20	DN
—	A5957	67	24	MX

M = Multi-operator
S = Single-operator

Check logs were received from G2DHV/P, G8ARQ/P, G8BKR, G8CBZ, G8CMU, G8BNJ.

DF Qualifying Event—Grimsby (Results)

Twelve teams reported at the start on a dry, cool and moderately windy day; good signals were received from both stations.

Station "A" was operated by G3NJF (M. Knights) and was concealed in a car parked in a central clearing in Bradley Woods, one mile from the start. The car was backed up to a tree, the transmitter being hidden in the boot with a dirty wire coming out from under the car into a tree. The microphone was concealed behind the operator's lapel.

Station "B" was operated by G3RSD (J. Reynolds) and was situated 12 miles from the start in scrub land on Saltfleet marshes. Apart from the natural concealment of the scrub, no effort was made to hide this station because the aerial was kite-borne 300ft high, and with a force six wind was almost vertical, giving a signal of S9 + 40dB in Grimsby!

Competitors divided into two groups from the start, one group chasing the big signal which an old-stager like Mollart reckoned could not be more than three miles from the start. The other group made for Bradley Woods. A. Hitchcock began to suspect the car in which sat a man (G3NJF) and his wife dressed in "Sunday best" reading their newspapers. He decided to have a look in the back of the car for traces of equipment. On peering in the car, the two occupants dropped their newspapers and glared at him; feeling very guilty, he retired to examine the area further but soon plucked up his courage to timidly approach the driver to ask if he was a radio amateur. First blood to A. Hitchcock, time 1440, followed two minutes later by D. Newman and E. Bristow.

Meanwhile, the other group were approaching the "B" station having negotiated the winding marsh roads *en route*. B. North arrived first at 1450, followed by G. Woods at 1452 and O. Harding at 1452½, all three looking up at the 300ft of nearly vertical wire in awe. E. Mollart was next on the scene, calling the operator all sorts of uncomplimentary names for putting out such a signal. He said that he thought the organizers had borrowed Humber Radio for the afternoon. At 1528 Alan Hitchcock arrived at the "B" station having run the three-quarters of a mile from the road; he lay prostrate for a few minutes to recover his breath. Unlike the first group, he took time to get a good cross-bearing, and kept to the main roads, which proved to be a much faster route.

Both stations were operating to a predetermined time schedule, and it is most unfortunate that the transmitter at the "A" station failed after the statutory 1600 transmission. However, his next transmission was not due until 1615 and by that time the first three competitors had found both stations.

A party of 36 sat down to an excellent tea at the Cleethorpes Red Cross Headquarters and expressed their appreciation to Mrs Reynolds and her helpers for such a grand spread. Many had travelled long distances to take part in what all agreed was a well organized and novel contest, but A. Hitchcock will never forget the withering look he got for daring to examine the back of a certain car, and E. Mollart will never trust Grimsby again.

Subject to confirmation, the only three competitors to find both stations qualify for the final.

Results	Time of Arrival	
	Station "A"	Station "B"
A. Hitchcock—Derby	1440	1528
E. Bristow—High Wycombe	1442	1604
D. Newman—Rugby	1442	1605
B. North—High Wycombe	——	1450
G. Woods—Grimsby	——	1452
O. Harding—Lincoln	——	1452½
E. Mollart—Oxford	——	1458
A. Roberts—Derby	——	1543

Four other competitors failed to find either station.

DF Qualifying Event—Derby (Results)

This, the first national qualifying event of 1970, proved very successful with 22 teams participating, the largest number ever for a Derby event. The weather prior to, and almost immediately after the contest, was shocking, but good fortune smiled at the right time and fair weather prevailed during the afternoon.

The conditions for the organizers had, however, been most unpalatable as only a fortnight previously four inches or so of snow had made things difficult at the "A" station and a deluge of rain stopped the operators exploring the site of the "B" station.

The "A" station was approximately nine miles north of the start and 15 miles from "B", well positioned in a wood for the use of which permission had been obtained from a very co-operative Forestry Commission. The station was not particularly well hidden but it was thought that the distance involved and the ruggedness of the terrain, coupled with bearing inaccuracies which this area can produce, would be enough deterrent in themselves.

The "B" was sited approximately 10 miles west of the start in Bradley Wood, located in an underground bunker right on the end of a disused airfield. It was well camouflaged and presented some difficulty, particularly to Ian Butson who spent some time exploring a badger set some 200yds or so away!

As the results show, 13 competitors successfully found both stations and, subject to confirmation, the first three qualify for the final.

At the conclusion of the event competitors enjoyed an excellent tea at Hazelwood Memorial Hall. Geoff Peck, representing the RSGB, summed up the results and expressed the thanks of all to the operators, their assistants and the participants for making the event such a success.

Results		Time of arrival	
		Station "A"	Station "B"
1	I. Butson—Chelmsford	1534	1444
2	M. Gee—Oxford	1541	1430
3	R. Pearce-Boby—Oxford	1544	1430
4	G. Taylor—Rugby	1549	1432
5	P.Tyler—Oxford	1559	1432
6	E. Bristow—Oxford	1501	1601
6	M. Hawkins—Chelmsford	1454	1601
8	J. Drakely—Slade	1614	1432
8	P. Williams—Slade	1614	1436
10	A. Roberts—Derby	1615	1433
11	D. Newman—Rugby	1628	1435
12	A. Simmonds—Oxford	1630	1432
13	W. Bryan—Derby	1630	1436
14	W. North—High Wycombe	——	1452
15	T. Gage—Oxford	——	1453
15	R. Vickers—Stratford	——	1453
17	P. Neal—Derby	——	1454
18	O. Harding—Lincoln	——	1523
19	G. Peck—High Wycombe	1534	——
20	D. Roome—Derby	——	1540
21	E. Mollart—Oxford	1601	——
22	B. Bristow—High Wycombe	1625	——

1970 BARTG RTTY Contest

Congratulations to Giovanni, I1KG, on his magnificent effort in securing the top place in the 1970 Contest with a score of 165 contacts, a result of skilful operation on all five bands available. Close on the heels of this result was the entry of Robert, ON4CK. Bob, SM4CMG, was able to improve on his position in last year's contest by moving up to third place. A welcome newcomer to the BARTG Contest this year was Adrian, VK2FZ, whose 21MHz entry would make any dx hunter's mouth water! Once again it was good to see Alec, G3MWI, right up in the top bracket, so congratulations to him for keeping the UK in the picture. There was much activity from the Italian operators this year, your scribe having logged some 15 different I1 calls on 20m alone. Another very welcome entry was that from Wolfgang, DM2BRN, who was able to give many stations their first contact with the German Democratic Republic, and whose score was very high in view of the fact that he only operated on the 20m band.

Most operators commented on the excellent band conditions, particularly those on 10m, and many operators were able to make three-band contacts with some of the rarer stations. Asia, normally a hard one to corner during a contest, was ably represented by John, KR6JT, Okinawa, and Gin, JA1ACB, Tokyo. Leo, EL2BD, was the sole rtty possibility for Africa and thanks must go to him for putting in such a FB effort. South America appeared to be the stumbling block this time but a late showing by Frank, YV5CIP, on 10m saved the day for those stations fortunate enough to work him. Although only able to make a couple of contacts on 20m the appearance of ZD9BN on Gough Island must have given quite a few operators a surprise, and it is hoped that this station will be able to carry on the good work.

The list of countries known to be active during the contest is quite formidable and included Australia, Belgium, Canada, Canal Zone, Czechoslovakia, Denmark, Eire, England, France, Germany (both East and West), Greece, Guam, Hawaii, Hungary, Italy, Japan, Liberia, Lithuania, Netherlands, New Zealand, Norway, Sardinia, Scotland, Sweden, Switzerland, USA and Venezuela.

Posn	Callsign	Points	Conti-nents	Different countries	Total contacts	Countries 3·5	7	14	21	28
1	I1KG	177800	5	27	166	10	7	24	18	11
2	ON4CK	167118	5	28	147	10	7	24	17	11
3	SM4CMG	156860	5	28	160	8	7	25	14	8
4	VK2FZ	135072	5	25	146	2	3	21	20	10
5	G3MWI	123480	5	26	152	6	4	15	15	9
6	VE7UBC	109312	WAC	24	137	2	3	21	18	—
7	W4YG	105164	5	27	119	–	1	20	21	12
8	I1CAQ	91556	4	22	122	2	2	22	14	7
9	SV0WO	91520	5	23	108	–	–	22	17	5
10	I1CGE	91224	5	24	126	2	3	22	15	–
11	KG6NAA	91180	5	23	94	–	2	19	15	11
12	K8ILL	90418	4	25	117	2	5	21	17	8
13	W5QCH	83590	5	24	101	–	4	18	16	11
14	WA6WGL	81540	WAC	20	76	2	4	16	11	12
15	W1JKL	81200	4	22	96	2	3	21	14	10
16	SM4CNN	76152	5	21	102	–	6	17	15	–
17	I1CWX	75816	WAC	22	84	3	7	20	6	3
18	I1EVK	73500	5	22	87	1	5	21	12	3
19	DL1VR	72734	5	20	79	4	3	16	12	6
20	EL2BD	71280	5	17	98	–	1	10	14	11
21	F9RC	63700	5	19	82	6	5	14	10	–
22	DL8VX	52700	5	18	75	8	2	15	6	3
23	WB5RXM	49600	WAC	15	60	2	3	12	6	8
24	WA2YVK	49104	4	20	66	–	–	12	13	11
25	PA0GKO	47128	4	23	60	9	4	21	–	–
26	SM0KV	46748	5	17	62	–	2	13	11	3
27	VE3GSZ	45600	5	18	88	1	1	18	5	–
28	LA6OI	39370	4	18	47	5	1	18	7	–
29	DM2BRN	38940	5	22	77	–	–	22	–	–
30	OZ4FF	37990	4	15	51	6	1	12	8	2
31	EI4AL	37128	4	17	56	2	1	11	14	–
32	W1BZT	34860	3	20	42	–	–	14	15	6
33	I1LCL	33318	4	17	49	1	1	15	9	1
34	EI5BH	32900	3	17	74	–	2	13	10	–
35	WB2JBH	32292	4	17	46	–	–	14	13	–
36	DJ8BT	29700	4	15	55	–	–	14	8	–
37	W6AEE	29568	WAC	14	32	1	–	8	3	9
38	GB2SM	26268	4	16	41	1	2	9	10	–
39	JA1ACB	25460	5	11	34	–	–	4	11	4
40	ON4BX	23800	5	9	23	1	1	8	6	4
41	AX3DM	18756	4	14	25	–	–	11	7	–
42	WA8GVK	18600	3	14	37	–	–	8	12	–
43	G3OWM	15200	3	12	35	–	–	9	7	–
44	VE3RTT	14550	4	11	17	–	–	5	5	5
45	ZM2ALW	12768	3	14	32	–	–	14	–	–
46	K9BJM	10944	4	10	12	–	–	4	3	5
47	ON5WG	8856	1	11	30	6	3	8	1	–
48	OZ6OB	8580	2	12	26	–	–	9	2	2
49	WA2CGR	7104	4	7	12	1	–	3	4	–
50	OK1MP	4920	1	10	21	–	2	10	–	–
51	K4GJW	4774	3	6	13	1	–	6	–	–
52	W8CTO	2260	2	5	6	–	–	–	5	–
53	ZD9BN	840	2	2	2	–	–	2	–	–
Short Wave Listener Section										
I114112 (Italy)		5730	1	9	–	–	4	7	4	–
I113018 (Italy)		1626	1	6	–	–	2	2	3	–

The contest manager gratefully appreciated the check logs from G8LT, G6JF, G8CDW (!) and PA0LCE.

August 1970 144MHz SSB Contest

1900gmt to 2200gmt on 10 August.

All entries and checklogs must be sent to the adjudicator addressed to: VHF Contest Committee, c/o G3JKY, 60 Merlin Grove, Beckenham, Kent, BR3 3HU.

The following **General Rules,** as published in the January issue of *Radio Communication*, will apply: 1, 2, 3, 4b, 5a, 6a, 7a, 8d, 9c, 10, 11, 12a, 13-24.

August 1970 70MHz CW Contest

2200gmt on 15 August to 0100gmt on 16 August, and 0700gmt to 1100gmt on 16 August.

All entries and checklogs must be sent to the adjudicator addressed to: VHF Contests Committee, c/o G3EDD, 39 Angle End, Gt Wilbraham, Cambridge, CB1 5JG.

The following **General Rules,** as published in the January issue of *Radio Communication*, will apply: 1, 2, 3, 4b, 5a, 6a, 7a, 8d, 9b, 11, 12a, 13-24.

DF Qualifying Event—Chelmsford

Date: 9 August 1970.
Map: OS Sheet 162 (Southend-on-Sea).
Assembly: 1300bst for start at 1320bst.
Location: NGR 704029 Galleywood Common next to church, approximately two-and-a-half miles south of Chelmsford town centre. Frequencies and callsigns will be announced at the start.

Intending competitors are asked to notify Mr M. Hawkins, G3WMM, at 24 St Cyrus Road, Colchester, Essex, of the numbers in their parties requiring tea, not later than 2 August.

Contests calendar

11-12 July—High Power HF Field Day
18-19 July—HK Independence Contest (cw/phone)
19 July—DF Qualifying Event, Stratford
26 July—432MHz Open
1-2 August—YO DX Contest (cw/phone)
8-9 August—WAE DX Contest (cw)
9 August—DF Qualifying Event, Chelmsford
10 August—144MHz SSB
15-16 August—70MHz CW
5-6 September*—VHF NFD and IARU Region 1 VHF Contest
12-13 September—WAE DX Contest (phone)
13 September—80m Field Day
20 September—DF National Final, Slade
3-4 October*—IARU Region 1 UHF/SHF Contest
10-11 October—28MHz Phone
24-25 October—7MHz CW
24-25 October—CQ WW DX Contest
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

*To coincide with IARU Contests

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:
13 September—Region 1 Field Day. Local representatives have been notified. Further copies of the rules may be obtained from the regional representative.
30 August—Preston Mobile Rally.
Official Regional Meeting—Southport—date in September, yet to be announced.

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

Ainsdale (ARC)—8, 22 July, 5 August, 8pm, "Morris Dancers", Scarisbrick.

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

Blackburn (East Lancs ARC)—2 July (Open night), 6 August (Surplus equipment sale), 7.30pm, Edinburgh House, Shearbank Road, Blackburn. Further details from *G4JS*.

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

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.

Cheshire (Mid-Cheshire ARC)—Wednesdays. 7pm to 8pm—RAE course by Ken Staines, G3JWK, Alan Rigby, G3FCI, and Brian Moore, G8CFY, Technical Activities Centre, Winsford Verdin Grammar School, Grange Lane, Winsford.

Chester (C & DARS)—Tuesdays, except first Tuesday in each month which is net night on 160 and 2m, 8pm, YMCA.

Douglas (D & DARS)—Second and fourth Wednesdays, 7pm, Rosemount, Douglas. Further details from *W. J. McEvoy* at the same address, telephone Douglas 6146.

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

Leyland Hundred Amateur Radio Group—Net nights: Thursdays at 2000 gmt, 1915kHz. Saturdays at 1900gmt, 148·8MHz.

Liverpool (L & DARS)—Tuesdays, 8pm, Conservative Association Rooms, Church Road, Wavertree. On 16-18 July there will be an exhibition station at the annual Liverpool show, operating on 20, 15, 10, 4 and 2m. Contacts with this station count as two points towards the Worked all Liverpool award. Secretary, K. Wood, G3WCS, 90 Childwall Valley Road, Liverpool 16.

Liverpool (NLRC)—3, 17, 31 July, 14 August, 8pm, Labour Party Headquarters, 13 Crosby Road South, Liverpool 22. Secretary, *M. Graham, G3XMG*, 14 Albert Road, Liverpool 22.

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

Manchester (SMRC)—3 July (Df demonstration by G3HZM, G3WFT and G8BOT), 10 July (Activity night), 17 July ("Aerials", by P. G. Tovey, G3SMT), 24 July (Club meeting at the exhibition station, Manchester Flower Show, Platt Fields, Manchester), 31 July ("More on aerials", by M. Barnsley, G3HZM), 7 August (Activity night), 8pm, Conservative Association Divisional Office, 449 Palatine Road, Northenden, Manchester 22.

North West VHF Group—Mondays, 8pm, in the Club Caravan "Greeba", Shady Lane, Manchester 23.

Preston (PARS)—9, 23 July, 6 August, 7.30pm, "Windsor Castle" (private room), St Pauls Square. Secretary, George Windsor, 26 St Gregory's Road, Preston.

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

Southport (SRS)—Wednesdays, 8pm, Sundays 2.30pm, the Esplanade. Secretary, *A. White*, 91 Portland Street, Southport.

Southport (73 SSB Society)—Thursdays, 8pm, at 73 Avondale Road, Southport. All meetings start with a talk on part of the RAE syllabus.

Stockport (SRS)—Second and fourth Wednesdays, 8pm, the Blossoms Hotel, Wellington Road South. 1970 is the 50th anniversary of the Stockport Radio Society, the actual date of foundation being 4 June. On this date the society held a "Get together" and buffet supper at the Blossoms Hotel for members and ex-members. Council member J. Petty and regional representative B. O'Brien were amongst the guests, together with their wives. Later in the year, possibly October, there will be a formal dinner and reunion. Any ex-members who wish to attend should contact the secretary as soon as possible.

In the past month the society has taken part in three portable contests, namely the 70cm Open, hf nfd and Region 1 VHF Contest. Gear permitting they will be taking part in many more. Further details of any of the activities may be obtained from the secretary, *G8BCG*, QTHR, or better still by going to one of the meetings as a guest.

Thornton Cleveleys (TCARS)—8, 22 July, 5 August, 8pm, St John Ambulance Brigade Hall, Fleetwood Road North, Thornton, nr Blackpool.

Warrington, Culcheth (CARS)—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: *Jim Forester*, 44 New Street, Carnforth.

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

Wirral (WARS)—First and third Wednesday in each month, 7.30pm, Former Civil Defence Headquarters, Upton Road, Bidston, Birkenhead. Secretary: *Alf Fisher, G3WSD*, 34 Glenmore Road, Oxton, Birkenhead.

Wirral (Wirral DX Association)—Last Thursday in each month, July and August (Informal) at the Red Cat Hotel, Greasby. Visitors and their wives are welcome. September (Visit by regional representative).

On 16 May the association manned a demonstration for the West Wirral Scout "Scoutabout" and had four rigs on the air all day. The weather was perfect and the whole event was a tremendous success.

REGION 2 — RR K. Sketheway, BRS20185

Bradford (BRS)—7 July ("What not to twiddle", by D. M. Pratt, G3KEP), 21 July (Natter night), 7.30pm, 10 Southbrook Terrace, Great Horton Road, Bradford.

Halifax (NHARS)—15 July (Ragchew), 29 July, (What's your pet grouse ?), 7.45pm, Peats Pitts Inn, Ogden, Near Halifax.
Hull (H & DARS)—3 July (Swl night), 10 July (Night on the air from the club), 17 July ("Interpreting wave forms", by G3PQY), 24 July ("A trip around dirty joints", by G3RDM), 31 July (Construction night), 7 August (Swl night), 7.45pm, 592 Hessle Road, Hull. *M. Longson.*
North Riding (NRARG)—Meets in back room of the Ship Inn, Falsgrave, Scarborough, alternate Tuesday and Thursdays, fortnightly. Details from secretary, Jeff Jones, G3VLM Bingley Private Hotel, Albermarle Crescent, Scarborough. *G3VLM.*
Pudsey (P & DRC)—Main task at the club at the moment is organizing the White Rose Rally, to be held on the 26 July at Allerton High School, King Lane, Leeds 17. Much hard work has gone into the details and they are hoping to meet many of their friends from last year's rally. *G3WIX.*
Scarborough (SARS)—Thursdays, 7.30pm, c/o RAF Association, Fulbeck House, 3 Westover Road, Scarborough.
Sheffield (SARC)—Meetings on the fourth Tuesday of each month, 7.30pm, at the Crosse Scythes Hotel, Totley. Secretary: *G3JMV*, QTHR. 23 August (SARC picnic at Riber Castle near Matlock). *G6NN.*
South Shields (SS & DARC) Fridays, 8pm, Trinity House Social Centre, Laygate, South Shields.
Sunderland (SARS)—Meetings on first and third Tuesday of each month, 7.30pm, at Sunderland Technical College. *G3XID.*

REGION 3 — RR R. W. Fisher, G3PWJ

Forthcoming events:
12 July: Upton Mobile Rally organized by Worcester and District Amateur Radio Club, Hill County Secondary School, Upton upon Severn, *G3VJN.*
Birmingham (MARS)—14 July, 7.45pm, Midland Institute, Margaret Street, Birmingham 3.
Bromsgrove (B & DARC)—Second Friday of each month. 14 July (British Legion fete), 18 July (Sale of surplus equipment), The Royal Oak, Barley Mow Lane, Catshill Bromsgrove.
Coventry (CARS)—3 July (Radio car rally), 10 July ('Visit to Gl land', by Chris Plummer), 17 July (Night on the air), 24 July (Open meeting), 31 July (Night on the air), 8pm. City of Coventry Scout County HQ, 121 St Nicholas St, Radford Road, Coventry.
Dudley (DARC)—14, 28 July, 8pm, Central Library, St James' Road Dudley. *G3PWJ.*
Hereford, (HARS)—Every Friday, Civil Defence HQ, Goal Street, Hereford.
Lichfield (LARS)—First and third Fridays of each month, the Swan Hotel, Lichfield. *G3NAS.*
Stourbridge (SARS)—4 July (Railway trip), 11 July (Visit to Woofferton radio station). Regarding the "railway trip": it was hoped to operate /M from the Welshpool and Llanfair Railway but the Ministry of Posts and Telecommunications has ruled that there can be no operation allowed from a moving train on the grounds of "interference with the signal and operating circuits". This is done mechanically on the privately-owned railway concerned. Also there is only one train on the line. GW6OI/P will operate from a tent near the railway station at Llanfair Caereinon. *G8CVK.*
Stratford (SoA & DRC)—10, 24 July, 7.30pm, Halls Croft, Old Town, Stratford. *G3RPJ.*
Sutton Coldfield (SCRS)—13 July (Film show), 27 July (Natternite), 8pm, Sutton Town Football Club, Coles Lane, Sutton Coldfield. *G3XXJ.*
Worcester (W & DARC)—Every Wednesday and Saturday evening, 7.30pm, Perdiswell Park, Droitwich Road. *G3VJN.*

REGION 4 — RR T. Darn, G3FGY

Derby (DADARS)—1 July (Bring and buy), 4, 5 July (144MHz open contest), 8 July (Practical demonstration), 15 July (Df practice run), 22 July (Quiz night), 29 July (Television dxing). Morse classes are now held in the clubroom every Tuesday, 7.30pm. All meetings are held in the Society's clubroom, 119 Green Lane, Derby.
Grimsby (GARS)—9 July (Df hunt, on foot, starting 7pm), 23 July (Shack layout and safety precautions), 6 August (Df hunt, start 7pm). All meetings other than the df hunts are at the usual time and place, ie North Lincs Photographic Society, rear of 50 Welhome Road, Grimsby.
Nottingham (ARCON)—All meetings of the club until 26 July will take place at the Festival of Nottingham Station, Wollaton Park, Nottingham, GB3FON.

REGION 5 — RR S. J. Granfield, G5BQ

Bedford (B & DARC)—Club meets on Thursdays, 8pm, at the Dolphin Inn, Broadway, Bedford. Morse classes are held at 7.30pm.
Bishop's Stortford (BS & DARC)—20 July (RSGB tape lecture), 8pm, the British Legion Club, Windmill, Bishop's Stortford, Herts. All visitors are welcome. Hon sec: P. J. Toynton, G3RGA.
Cambridge (C & DARC)—3 July (Informal), 10 July (Hf portable/mobile), 17 July (Informal), 24 July (Junk sale), 31 July (Informal). Club meets on Fridays, 7.30pm, Club HQ, Corporation Yard, Victoria Road, Cambridge.
Dunstable Downs (DDRC)—Meetings held on Friday evenings at Chew's House, High Street, Dunstable, Beds. Hon sec: G8BWZ, 51 Manor Park, Houghton Regis, Dunstable, Beds.
March (M & DRAS)—Club meets on Tuesday evenings at the Old Police HQ, High Street, March, Isle of Ely. Hon sec: G8BEN, 36 New Road, Whittlesey, Nr Peterborough. President: G3BK, 28 Regent Avenue, March, Cambs.
Peterborough (P & DARS)—Meetings on first Friday in the month, 7.30pm, in the Electronics Section, Peterborough Technical College, Eastfield Road. On other Friday evenings meetings are held at 8pm, in the Club HQ, the Old Windmill behind the Peacock Inn, London Road, Peterborough.
Shefford (S & DARC)—2 July (Vhf and uhf field day planning, G8AKT), 9 July ("Progress we have made", G2DGF), 16 July (Surplus sale and quiz—the club), 23 July ("Starting as an amateur", by G2DPQ), 30 July (Df hunt—the club). Meetings on Thursdays, 8pm, Church Hall, Shefford, Bedfordshire. Hon sec: C. W. Stedman, G3XWS, 10 Wychwood Ave, Luton, Beds.

REGION 6 — RR L. W. Lewis, G8ML

Cheltenham (RSGB Group)—First Thursday, 8pm, Great Western Hotel, Clarence Street, Cheltenham.
Gloucester (GRS)—No meetings until September.
South Bucks VHF Club—7 July (On the air), 4 August (Ragchew) 8pm, Bassetsbury Manor, High Wycombe.

REGION 7 — RR P. A. Thorogood, G4KD

Can your club show on the RSGB stand at Radiocom 70 your prize winning home-constructed equipment? Let me have details *now*, deliveries to me. You could win a club award of a £10 voucher.
Acton, Brentwood & Chiswick (ABCRC)—21 July (Mobile exercise), 7.30pm, Chiswick Trades & Social Club, 66 High Road, Chiswick.
Addiscombe (AARC)—Second and fourth Tuesdays, 7.30pm, Toc H Hall, 158 Lower Addiscombe Road.
Ashford, Echelford (ARS)—Second Monday and last Thursday of month. 13 July ("Practical ssb", by John Ellerton, G3NCN), 30 July ("Varicap diodes for tuning", by Robin Hewes, G3TDR), 7.30pm, St Martin's Court, Kingston Crescent, Ashford, Middx.
Barking (B & DREC)—Tuesdays and Thursdays, 7.30pm, Gascoigne Recreation Centre, Gascoigne School, Morley Road, Barking.
Bexleyheath (NKRS)—Second and fourth Thursdays. 9 July (Natter evening), 23 July (Brains trust), 7.30pm, Congregational Church Hall, Chapel Road, Bexleyheath. At the last meeting 25 RSGB members and five non-members attended to discuss NFD arrangements. Newsletter No 144 takes on a new shape. Report on AGM states average club attendance of 35, which is jolly good—a credit to the last committee. NFD camping out suggested with families, attempts for second station. Weekly net on Sunday evenings now to be on Wednesdays at 2000bst.
Cheshunt (CDRC)—First Friday of month, 7.30pm, Methodist Church Hall, opp Theobalds Station Cheshunt.
Chingford (RSGB Group)—Fridays, telephone 01-524 0308.
Chingford (SRC)—Fridays. Friday (lecture and natter night). 11 July (Exhibition station for Chingford day at Wellington Avenue

School. Active on 160 and 2m and possibly on 20 and 15m). On Bank Holiday the club will be on the annual four-day camp. All band activity up to 432MHz. Club now has a permanent radio room with hf and vhf stations installed. Club calls, G3SRA and G8CSA, are often on the air. The room can be used for construction and operation. Visitors are welcome except on the third Friday in the month, which consists of business meetings. 7.30pm, Friday Hill House, Simmons Lane, Chingford, E4.

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

Croydon (SRCC)—Third Tuesdays, 7.30pm, Swan and Sugarloaf, South Croydon. At the last meeting 41 turned up for lecture by KW, out of a total of 91.

Crystal Palace (CP & DRC)—18 July ("Direction finding", by John Gould, G3JKY), 8pm, Emmanuel Church Hall, Barry Road, SE22.

Dorking (DR & DRS)—Second and fourth Tuesdays. 14 July (Informal meeting, 8pm, "Wheatsheaf"), 28 July (Vhf mobile night 4 and 2m), 8pm, the "Plough", Coldharbour. XYLs and YLs welcome.

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

Edgware & Hendon (E & DRS)—13 July (Informal, and club station on the air), 27 July ("Patents", a lecture by G3SJE), 8pm, St Georges Hall, Flower Lane, Mill Hill, NW7.

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

Gravesend (GRS)—Mondays, 8pm, Community Centre, Cedar Avenue, Kings Farm Estate, Gravesend.

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

Hampton Court (TVARTS)—First Wednesday, 7.30pm, the Three Pigeons, Portsmouth Road, Surbiton.

Harlow (DRS)—Tuesdays, general; Thursdays, cw practice; Fridays, junior. 7.30pm, Mark Hall Barn, First Avenue.

Harrow (RSH)—Every Friday. 3 July ("Aerials", a lecture by G3OLM), 10 July (Practical and film show), 17 July (Practical and sale of equipment by G3PRR), 24 July ("Direction finding", a lecture by Eric Mollart and Martin Hawkins, G3WMM, both guest speakers), 31 July (Practical). 8pm, Roxeth Manor School, Eastcote Lane, Harrow.

29-31 August—GB3RSH operated by RSH at annual Harrow Show, Pinner Park, Headstone Manor Recreation Grounds, on all bands, 1·8MHz to 430MHz simultaneously. Also rtty station and amateur tv exhibit. Talk-in stations on 160m, 4 and 2m.

9-11 October—GB3DSH as above but at the 1st and 3rd Ruislip Scouts HQ, Poplars Close, Ruislip, for Jamboree on the Air.

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, Highgate Hill, N19.

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

Kingston (K & DARS)—Second Wednesday. 8 July (Vhf converters—a discussion on building and designing converters by Dick Babbs, G3GVU), 8 pm, 37 Brighton Road, Surbiton.

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

London (UHF Group)—First Thursday (Discussion on future programme and microwave operating), 7.30pm, Whitehall Hotel, Bloomsbury Square, Holborn, WC1.

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

Maidenhead (N & DARC)—Third Tuesday of month, 7.30pm, Victoria Hall, Cox Green, Maidenhead.

New Cross—Wednesday and Fridays, 8pm, 224 New Cross Road, SE14.

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

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

Reigate (RATS)—First Wednesday. 15 July (VHF NFD meeting if you wish to take part), 7.45pm, George and Dragon, Cromwell Road, Redhill.

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

Scouts (ARS)—Third Thursday of month, 7.30pm, Baden Powell House, Queensgate, South Kensington, SW7.

Sidcup (CVRS)—First and third Thursdays. 16 July, 6, 20 August, 8pm, Congregational Church Hall, Court Road, Eltham, SE9.

Southgate (SRC)—Second Thursday of month. 9 July (Technical talk), 7.30pm, Civil Defence Hut, Bowes Road, N21. The club committee now consists of: Chairman A. Dutton, G3TIE; Secretary A. Hydes, G3XSV; Treasurer R. Mason, G3TDM; Editor R. Limebear, G3RWL; SWL representative P. Truran; member, P. Gould, G8DAX; publicity, D. C. Donnison, G8CBJ.

St Albans (Verulam ARC)—15 July (Talk by "Mr QSL", G2MI), 19 July (Df hunt), Town Hall, St Peters Street, St Albans.

Sutton & Cheam (SCRS)—Third Tuesday. 15 July ("Demonstration in the use of oscilloscopes", by Bob Tillin, G3MES), August (no meetings), 8pm, The Harrow Inn, High Street, Cheam.

Welwyn (Mid-Herts ARS)—Second Thursday of month, 8pm, Welwyn Civic Centre, Welwyn.

Wimbledon (W & DRS)—Second and last Fridays, 8pm, St John Hall, 124 Kingston Road, South Wimbledon, SW19.

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

REGION 9 — RR J. Thorn, G3PQE

Bristol, City & County (BARC)—Every Tuesday and Thursday. 2 July ("Heathkit HW100", by G3SWH), 28 July (Third business general meeting), Club HQ, G3TAD, 41 Ducie Road, Barton Hill, Bristol 5. *G3SXY*.

Bristol (RSGB Group)—27 July (Home constructed equipment evening—bring your new rig, or latest gadget), 7.30pm, Becket Hall, St Thomas Street, Bristol 1. *G3ULJ*.

Bristol, City & County (Shirehampton Group)—Every Friday at Twyford House. *G3YIQ*.

Bristol, City & County (University ARC)—Every Saturday afternoon, Dept of Physics, Royal Fort, Woodland Road, Bristol. *G8ADP*.

Cornish (CRAC)—2 July (Potted talk on nfd, by G3UCQ), 5 July (Mobile rally at St Ives County Secondary School). Meeting at SWEB Clubroom, Pool, Camborne. *G3UCQ*.

Falmouth Club—Oddfellows Hall, near the Severn Stars, Penryn. *G3OJN*.

Newquay Club—Meetings suspended during summer.

Exeter (EARS)—7 July, YMCA, St Davids Hill, Exeter. *G3HMY*.

North Devon (NDARC)— 22 July (Ragchew), 7.30pm, "Grinnis" High Wall, Sticklepath, Barnstaple. *G4CG*.

Plymouth (PRC)—7 July, 7.30pm, Club HQ, G3PRC, Virginia House, Bretonside. *G3SPI*.

Saltash (S & DARC)—3 July (Talk on mobiles), 17 July (Rally briefing), Burraton Toc H, Warraton Road. 26 July (Mobile Rally No 5 at Saltash School, Wearde Hill, Saltash). *G3XWA*.

South Dorset (SDARS)—10 July, Room E2, Weymouth Technical College, Newstead Road. *G3RZG*.

Taunton (T & DARC)—Every Friday, County Control Centre, The Crescent, Taunton, *G3WPJ*.

Torbay (TARS)—Every Tuesday and Friday. 25 July (Talk by G6XJ, and final arrangements for rally). Club HQ, G3NJA, Bath Lane, rear 94 Belgrave Road, Torquay. *G3NQD*.

Weston-super-Mare (WSMARS)—3 July, 7.30pm, Westhaven School, Ellesmere Road, Uphill. *G3GNS*.

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

REGION 10 — RR D. M. Thomas, GW3RWX

Blackwood (ARC)—Fridays, 7pm, Blanche Cottage, off High St, Blackwood, Mon. *G6BK*.

Barry College of Further Education (ARS)—Details of summer meetings from *GW3VPB*.

Cardiff (RSGB Group)—Monday 13 July (Quiz and sale of surplus equipment); 7.30pm, TA Centre, Park St, Cardiff. *GW3GHC*.

East Glamorgan Raynet Group—First Tuesday in each month, 7.30pm, Cardiff Emergency Services HQ, Womanby St, Cardiff. *GW3ZFG*.

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

Port Talbot (ARC)—Meets on second Tuesday of each month, 7.30pm, Trefelin Club and Institute, Port Talbot, Glam. *GW5VX*.

Pontypool (ARC)—Tuesday, 7.30pm, during school term at the Educational Settlement, Rockhill Road, Pontypool, Mon. *GW3JBH*.

Pembroke (ARC)—Last Friday of each month, 7.30pm, at the Defensible Barracks, Pembroke Dock. *GW3LXI*.
Rhondda (ARS)—Meets at Rhondda Transport Employees Club and Institute, Porth, Rhondda, Glam.

The social held in May was undoubtedly the finest yet, and was highly appreciated. Details of meetings from *GW3PHH*.
Sully & District Short-wave Club—Tuesdays, 7.30pm, at the Annexe, Sully Bowls and Social Club, 59 South Road, Sully, Glam. Secretary: *Mr Glyn Maggs*, 3 Thorley Close, Cyncoed, Cardiff.
Swansea Telephone Area (ARS)—Tuesdays, 7.30pm, Telephone Engineering Centre, Gors Road, Townhill, Swansea.

The society now has its own station which was opened by the telephone manager on Tuesday, 23 June. Callsign: GW3ZTK. Secretary: *Mr M. D. E. Connor*, 7 Glanmor Park Road, Sketty, Swansea. Tel Swansea 23742.
University College, Cardiff (ARS)—Regular meetings for the present session have ceased, but the shack is still available for local members. Interested students entering college next session are advised to contact the secretary c/o Students Union, Dumfries Place, Cardiff.
University College, Swansea (ARS)—Meetings for the present session have ended, but new students entering next session are advised to contact the secretary if interested. Correspondence to the secretary c/o Students Union, University College, Singleton Park, Swansea.

REGION 11 — RR P. H. Hudson, GW3IEQ

Conway Valley (CVARC)—16 July (Activity meeting held on the hills at Bryn Pydew, the usual QTH for outside activities). August (no meetings). Club meets at Parade Hotel, Church Walk, Llandudno.
Rhyl & District ARC—No meetings in July and August.

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 (nr railway station), Inverness.
Lerwick (LRC)—Tuesdays and Thursdays, 8pm, Annsbrae House, Lerwick. *GM3XPQ*, telephone Bixter 249.
Lhanbryde (MFARS)—Mondays, 7.30pm, St Andrews School, Lhanbryde, by Elgin, Morayshire. *GM3UKG*, telephone Clochan 225.

REGION 14 — RR N. G. Cox, GM3MUY

Ayrshire (Ardeer Recreation ARC)—7, 9, 14, 16, 23, 28, 30 July, 7.30pm, Ardeer Recreation Club, Amateur Radio Section, Stevenston, Ayrshire. Details: J. F. McCreight, GM3DJS, 10 Auchenharvie Road, Saltcoats, Ayrshire.
Ayrshire (AARG)—5 July, 30 August, 27 September, 7.30pm, YMCA, Howard Street, Kilmarnock.
Glasgow University (GURC)—No meetings in July or August.
Greenock (G & DARC)—3, 10, 17, 24, 31 July, 7.30pm, Watt Library, Union Street, Greenock.
Mid-Lanark (RSGB Group)—17 July, 7.30pm, YMCA, Brandon Street, Motherwell.

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 Technical College, Colchester. *G3VAG*.
Gt Yarmouth (GYRES)—Fortnightly, 7.30pm, 98 South Market Road, Gt Yarmouth. Details from *G3HPR*.
Ipswich (IRC)—Details from *G3YWM*, the new secretary.
Maldon (MYGRC)—Thursdays, 7.30pm, The Friary, Chequers Lane, Maldon, Essex.
Norwich (NARC)—Mondays, 7.30pm, The Brickmakers Arms, Sprowston Road, Norwich. Details from Gary Purcell, telephone Drayton 459.
Southend (SDRS)—Details from *G8BSB*.

REGION 17 — RR C. Sharpe, G2HIF

Basingstoke (BARC)—18 July (Club will be taking part in the annual fete and draw at Le Court, Greatham, Liss, Hants. The gates open at 2.30pm. The programme includes a glider visit, a parachute drop, contests and side shows with an evening dance at 8.30pm. Stations on the air will be G3TCR/P, G8CKN/P, G3CBU/P, operating on 80, 2m and 4m respectively, talk-in facilities being included. All the family welcome).
Bournemouth (Wessex ARC)—Meetings each month on the first Friday and on the Monday in the third week following, 7.30pm, Cricketer's Arms, Windham Road, Bournemouth, Hants. 26 July (Special event—mobile rally and picnic at Stoney Cross Airfield, New Forest, off the A31). *G8BBN*.
Farnborough (FDRS)—Meetings on the second and fourth Tuesdays in each month, 7.30pm, Railway Enthusiasts Club, 310 Farnborough Road, Farnborough, Hants. Visitors and new members always welcome. *G8BVM*.
N Berks (AERE, Harwell, ARC)—Meetings on the third Tuesday in each month. 21 July (Preparations for vhf nfd and informal), 7.30pm, Social Club, AERE, Harwell, Nr Didcot, Berks. *G3NNG*.
Reading (RDARC)—Meetings on alternate Tuesdays at the Victory Public House, Meadway, Tilehurst, Reading, Berks. *G3NBU*.

MEMBERS' ADS

These advertisements are accepted free of charge as a service to members of RSGB. They must be submitted on the Members' Ads order form printed on the penultimate page of each issue of *Radio Communication*, or on a 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

19 Set rx, tx stripped, gd cond, 1·8–8MHz, audio output stage, 6·3V heaters, £4 ono. Will deliver locally. G8CRP, QTHR. Tel 01-654 1761.

888A, Vanguard 160-10m, both fb cond, £95. Will separate. Pye hi-band base station, 6 channel, with hndbk, £25. Pye Westminster all transistor tx/rx, lo-band, £40. Comp 4m base station, mains, £22 10s. Donohue, 41 Garway Woolton, Liverpool, L25 5LP. Tel 051-428 6851.

TA33jnr CDR AR22, perfect, little used, £27. Codar /M rig: AT5, T28, 12MS, 12RC and Halson whip, mint cond, £32. BC454. £4. GM3DJT, QTHR.

National NCX5 Mk2 and ac psu, little used, £179. G3OND, QTHR. Tel 01-713 4104.

RSGB *Radio Communication* 1969, 25s; 1968, 20s; 1966 10s. 1967 bound volume (one only), 20s. Baldwinson, 33 Cherry Close, Tulse Hill Estate, SW2.

FL200B, FR100B, ptt mic, speech-amp/clipper, LED swr, semi-auto key, KW lpf, Z match-dl, class D wavemeter, hb scope, Geloso pi-tank, switched heavy duty psu, spare valves, key relay, Cowl Gill motor and psu, books etc. The lot, £200, buyer coll. GW3FPH, QTHR. Tel Northop 326.

Swan 350 and ac psu in matching cab, £165. GW3TBG, QTHR. Tel Buckley 3634.

Pye Ranger, tunable and modified for 4m, £10. Also boot mounted Ranger tx only, transistor psu. G3USE, QTHR. Tel 0582 26800.

KW/Geloso amateur band convtr. I. Poole, 41 Linton Rise, Leeds, LS17 8QW.

KW 2000 with ac psu and manual, £130 ono. Also much improved B44 4m tx/rx, new cab and front panel, 12V dc operation, £8 10s. Can deliver in the North. G3WDW, QTHR. Tel Leeds 53806.

30ft sectional mast comp in canvas bag, £4 10s plus carr. G2ATD, QTHR.

KW Vespa Mk2 with 6LQ6 pa, comp with psu, 11 months old, gd cond, £110 ono. GW3WSU, Decca Navigator Transmitting Station, Llancarfan, Nr Barry, Glam.

Transistorized 3rd method ssb generator for 465kHz, with handbook, £12. BRT tx/rx, 72MHz a.m., with mains psu, £6. Dodd, 25 Wood Rd Spondon, Derby.

Hallicrafters S27 rx, 27-144MHz, int psu, S meter, £15. All ok, with hndbk. G8DJU, 25 Stirling Road, London N17. Tel 01-808 9080.

CR100, mod for ssb, £12. Elizabethan tx, less psu, £8. RF27 5s, RF26, 10s. E & V 500V Megger, £10. Cossor 1035 scope, £12. Buyer must inspect and coll. G3KLD, QTHR. Tel 021-777 7177.

KW 2000 /M psu, £16, G3TLB, QTHR. Tel Crowborough 5527.

BC221 wavemeter with mains psu, output stage, spkr and xtal checking facility, £12 buyer coll. G3MEH, QTHR.

Valves: 813, 5B254/Ms (min 807), 15s ea. Wanted: 2m J Beam 10 or 14 ele beam. G8BGQ, 25 Church Lane, Sarratt, Rickmansworth, Herts.

FT250 trnscvr, new, boxed, £140. G3LDA, 40 Chelmsford Ave, Warden Hill, Cheltenham, Glos, GL51 5DN.

45ft timber/dural tilt-over and telescopic mast comp with fulcrum winch, CDR TR44 rotator and control unit. Breaks down for transportation. Easily erected by one person. Bargain at £50 comp. Move necessitates sale. G3MDM, QTHR.

8007·27kHz 10XJ xtal, 10s. Type 7026 coax relay, 26s. Wanted: QQVO6-40A; Xtals: 36-36·3MHz(HC6/U), 60-60·4 (HC6/U), any HC18/U and HC6/U xtals. G8CCH, 84 Elmwood Way, Basingstoke, Hants.

Eddystone 940, gd cond, £120. Brand new EC10 Mk2, £65. Also TO-3 oscilloscope, £32. HA500, £30. KT340, £18. HE73 preselector, £12. All excellent cond. Offers to G8ARO, 8 Sevington St, London W9. Tel 01-286 0759.

HW32A with /M psu, £60 ono, will separate. AR88D hndbk, 30s. Eagle TE188 sig gen, £12. G4HU, 34 Birch Ave, Romiley, Cheshire, SK6 4DG.

Mohican, gd cond, with manual and batts, £25 inc carr. G3UZM, 26 Featherbed Lane, Exmouth, Devon.

Hv supply for linear, 1800V dc 500mA, big and heavy, to be collected from Durham, £2. Transistor rx, Electroniques Quoilpack, ssb i.f., audio power module, comp, needs final touches, £30. G3MOU, 85 Sutton Road, Heston Hounslow, Middx. Tel 570 6181.

Inoue IC700R rx, £72 ono. Lafayette HE40 gen cover rx, £12. Joystick and tuner, £6. Thomson, 4 Hawick Ave, Stanley, Paisley. Tel 041-884 4988.

Pye transistor Ranger comp for 4m (12V), exchange for Pye Reporter for 2m. Griffiths, 7 School Hill Ave, Castletown, Isle of Man.

21ft 2in steel mast, galvanised, comp with socket clamps and guy ring, unused. £5. G3XNA, QTHR.

Eddystone EC10 with S meter, mains psu and 2m convtr, £40, 19 Set Mk3 and 12V psu, gd cond, £10. Reynolds, 102 Becher St, Derby. Tel Derby 45863.

EC10, £29 19s. Siemans 745 rx, 1·5-30MHz in 7 bands, £61. G3UXA. QTHR.

Hy-Gain 12AVQ vert, like new, unassembled, £10. Crutchfield, 32 Eldorado Road, Cheltenham, Glos.

Hamgear preselector and atu, mint cond, £5 10s. Also Codar CR70A, just back from overhaul by manufacturers, perf cond, inc ldspkr and hdphns, £15 15s. Cross, 64 Semley Rd, Norbury, SW16. Tel 01-679 3215.

Basic Electronics by Technical Press, Vols 1-6, almost new, £2 10s. *Basic Electricity*, Vols 2-5, £1 10s. G3XPU. Tel 837 8688.

Codar CR170A rx + PR30 preselector, mint cond, £15. G3KGM, 52 Pinewood Ave, Sidcup, Kent. Tel 01-300 0767.

Hammarlund HQ170 rx with clock 1·8-54MHz, £95, or best offer. GM5AIH, 6 Caiystane Hill, Edinburgh 10. Tel 031-445 2608.

DX100, Geloso 209 rx and Vibroplex key, £100 ono. C/o GW8NP. Tel Cardiff 68768.

Galaxy 5 Mk2, 400W, G1000DCPU hb ac psu, manual, mint, air tested, only £195. Del free reasonable distance. 0-2000V electrostatic meter, new, 30s. Electro-dynamic low Z hdphns, chamois

earmuffs, 25s. Please add carriage. G3KPO, Jersey House, Eye, Peterborough. Tel Eye 351.

Pye high band Ranger, 12V, dash mount, comp with valves and rx second oscillator xtal, offers. G3SKN, 6 Hilltop View, Whitburn, Co Durham.

Command rxs, one lw, one mw, modified for 12V, fitted rf and af gain controls, bfo switch, jack sockets, tuning knobs, gd cond, £5 ea, plus post. G3IOA, QTHR. Tel 061-681 5406.

Standard Joystick plus 3A tuning unit, £3. Heathkit GR-64 gen cov rx, £12. Both in gd cond. G8DLD, 23 Mersey Road, Sale, Cheshire.

Hallicrafter SR150 trnscvr, 80-10m, with ac psu, spkr unit, dc psu, mobile mount, KW EZ match, £145. Cossor 1052 oscilloscope, not ex Govnt, £20. Linear amp 2-4X150A, 600W, £25. G3NPY, QTHR. Tel Skegness 4185.

Trio TS500 trnscvr, PS500 and VFO5, £150 ono. G3PUV, QTHR. Tel 090-2733411.

R1155B rx, ideal for swl, lw, mw, 3-18MHz, in 5 bands, int mains psu, output stage, variable bfo, slow motion dial, exc perf, £8 + carr. Eagle SA-80 stereo amp, exc cond. Valves, resistors, sae for list. Price, Greenbanks, Cuckney, Nr Mansfield, Notts.

200W modulator, comp, integral bias supply, stabilisers, £8. 40W mod and psu, no mod trnsfmr, £3. Thorndarsin T8470 mod trnsfmr, 30s. comp 2m and 70cm tx, mod, psu, the lot, £30. G8BKK, QTHR. Tel 01-850 3492.

HRO, gc coils, bfo unstable, £10. Valves 2s ea, xtals 3s ea. *SWM* March 1960-Dec 1961, 6d per copy. Af chokes 2s. Variable capacitors. Send sae for lists. Miles, 12 Farrhill Drive, Briglan Port Talbot, Glamorgan. Tel Neath 3197.

EC10, mint, £35. Raditec police radar detector, new, £11. G3PNQ, QTHR. Tel 02576-2797.

RAF rx type R1224, 1-9MHz, gd cond with details and circ, ht psu, £8. Write or phone. Barker, 26 Elliott Drive, Inkersall, Staveley, Nr. Chesterfield, Derbyshire. Tel Staveley 2796.

Must sell: Rack mounted HRO senior, psu, 9 coils, many extras. Also oscilloscope type 1089B, all in wkg order. Any offer considered, will deliver 50 miles. Pearcey, 15 Southway, Carshalton Beeches, Surrey.

R1155, T1154, no psus, 10s ea. WS38 Mk 3, comp. WS38AFV + af amp. WS8, WS17, museum pieces, £5, £10. Tele L 35s. All + carr. 4in tape, cine spools, 70 for 25s. Hankinson, 41 Maison St Louis, St Saviour, Jersey, CI. Tel Jersey Cen 32340.

Trio TS500, PS500, VFO5, nearest £150. G4HW, QTHR. Tel Sheerness 2782.

Pye low band Ranger comp, £8 or why. Wanted: Jan '69 *Bulletin* (third request). G8BXO, QTHR.

Cab sliding chassis with sub chassis, nl, lf, op stages psus, uncut front for dial, i.f.s gang, £4. 5 years *SWM* FOC. G3KPW, QTHR.

Audio phase-shift network B & W type 2Q4, 35s. 2m xtals: 12·062 MHz, 12·053MHz (B7G), 15s ea. 4m xtals: 5·850, 5·865, 5·870, 5·875, 5·880MHz (10X), 5·8733, 5·840, 5·8525 (moved to 70·26) (FT243), 8·790 (10XJ), also 8·0015 (10X), 8·075, 8·1066MHz (FT243) all 5s. G3RDQ, QTHR. Tel Radnage 2461.

AR88D, gd cond with trimming tools and man, £32 or with cash, adjustment (AR88 too heavy for attic shack!!). G3JQL, 22 Alnwick Road, Newton Hall, Durham.

20 *SWM* and 17 *Radcom* 1967-70 asstd, offered in exch for post and hd pi tank type switch. Buckstone, 20 Greenleas Ave, Emmer Green, Reading, RG4 8TA. Tel 72145.

Emigrating. Several txs, rxs, psus, scope, teleprinter, tu trnsfmrs, capacitors, chokes, valves, xtals, coax, Muirhead drive, plugs, sockets, etc. G3VUT, QTHR. Tel 01-550 9300.

R1155 unmod, psu and audio stage, reconditioned tuning gear, offers over £5. Wanted: pair KT88; airflow bases for 4X150 series. G8CHC, QTHR. Tel Harlow 20812.

KW Vespa, Mk 1, and psu, 6146B, hndbk, mint, £75 ono. G3XLW, QTHR. Tel 01-393 5236.

Drake TR4 used only 10hrs approx with DC4 mic mounting kit. 3FIF /M aerial, as new, only high offers need reply. G3KVH, QTHR. Tel Stourbridge 5893.

HT44, PS150-120, SX117, HA10, £250, write first. G3FPD, QTHR.

G2DAF tx Mk 2 with psu. Tx needs re-alignment, £35, pp extra. Set G2DAF conversion xtals, new, offers. G3LFB, QTHR.

Modified Pye Reporter for 144MHz, xtal or variable frequency rx, xtal controlled tx, 12V input, comp with handset but no xtals, £5 ono, carr extra. G3NPF, QTHR. Tel Southend 544096.

72 ele Parabeam, 23 dB gain, £32. Hofnor semi-acoustic bass guitar, £32. Burns Mk 1 meter convtr board, 24-26MHz i.f., £8 10s. Transistor 25W modulator, £7. Lavoie 375-725MHz wavemeter, £5. 115 Venturi fan, £1 10s. G8APV, QTHR.

R107T, perf order, new cond. HRO mx with psu, 5gc coils, gd order, £12. R107T, £12. Slater, 110 Commonwealth Road, Caterham, Surrey.

Trio TS510 trnscvr with external vfo, new, accept £180. Also factory assembled American Heathkit SB310 rx, cost £225, little used, accept £150. G3YQE, QTHR. Tel 01-592 7800.

Hallicrafters CRX120 144-174MHz, monitor rx, £12, vgc. Wanted: G & D 70CM1000. G3VGH, QTHR. Tel York 69245.

Marconi valve millivolt meter TF899, £4, Two Avo CT38s, £10, needing attention. Marconi TF144G, £10. Muirhead tunable filter D-925-A, £10. Ediswan socket for 4X150A, £2. Solartron scope type CD523-3-2. G3XNH, QTHR. Tel East Horsley 3982.

CR100, vy gd cond, £20 ono. Shore, 19 Chapelton Drive, Largs, Ayrshire. Tel Largs 2302.

CR300 rx with psu, £12. Joystick de luxe with 4RF tuner, £5. Laycock, Hall Place, Fen Ditton, Cambridge.

AR88 ganged capacitor with cover, 20s. Webster 12V genny with smoothing, 350V at 180mA out, 45s. Brand new 19 Set 12V psu, with spares, all in unopened waxed container, 70s. Sae please. G3IUD, QTHR.

19 Set Mk 3, grade 2, £3. Mains psu, £1 5s. Will collect up to 20 miles. Perrott, 222 Chislehurst Road, Petts Wood, Kent. Tel Orpington 33901.

R206 rx with ac/dc psus, £20, Minimitter MR44/2 rx, £20. Telequipment laboratory scope type D53, twin beam, ac/dc, 15MHz, vert amp, delay timebase, cost £212, little used, accept £150. Offers considered. G3OYU, QTHR. Tel Biggin Hill 3836.

Du mont 274 5in scope and hndbk, £6. B40 rx, requires attention, £7. New 12V 5MHz standard, £14. Transistors, varicaps, nixies, gd but used ttl, 1·6MHz xtal filters, sae for list. G3VCS, 94 Swaledale, Bracknell, Berks. Tel Bracknell 20336.

Codar CR45 with all 5 coils, gd cond, £8 10s. G3HSC beginners Morse records, £1 5s. Books: *Manual of modern radio* (pub 1937), *Fun with radio*, and *Fun with short wave*, any offers. Pick, 30 Merlin Grove, Beckenham, Kent. Tel 01-650 7801.

HC6/U xtals: 8055 and 8060kHz, 20s ea. Mast-head preamp with mains psu, 13dB, 40-800MHz, £6. Multibeam tv ant, group A and B, £3 ea. Morse records, £1. G8BPK, QTHR. Tel Aston Clinton 600.

Hi fi stereo 12 + 12W preamp, separate from mainamp, 28-58V stab psu and 5ft column loudspkr, sell £40 or exch for EC10 Mk 2 or sim. Tel after 11 July. Cash adjustment. Gallagher, 24 Sunnybank Ave, Whitley, Coventry, CV3 4DQ. Tel Coventry 301494.

HRO dial, straight through drive, £1. 7360 beam mixer, £1. Xtal: STC triple Midlands vhf/fm frq, £2. FT243: 5950, 6400, 6500, 6600, 6625, 6240, 455kHz. RCA: 8887·5, 7150, 8235, 8375, 8150kHz, 5s. G3AFP, 3 Bank St, Somercotes, Derby.

Bags of 50 new large resistors, well mixed, 2s per bag. 12 bags, £1. Post extra. Rugby ARS. Orders to hon sec. G3YQC, 73 Hillmorton Road, Rugby, Warks.

BC221, as brand new, £15. Another used but with ac psu. £12. Both with orig charts. 2m tx, 12V, comp, less mic and xtal, £10. Sae details, all carr paid. G3UI, QTHR. Tel Halifax 60574.

VRL 250 rx + matching stab psu, 240V ac, 1·5–30MHz, wkg, bfo needs attention, £7 ono. Also R109A rx, 1·8–85MHz, 6V dc int psu, £2 10s. Both buyer coll evenings. Goodall, 31 Gainsborough Ave, Canvey Is, Essex.

160/M: Command rx, Command tx, 12V psu, £5. SX27, 28–8–143MHz, £15. *Amateur hndbk*, 1964, £1. *World at their fingertips* by G6CL, 25s. *Transistor theory and circuitry*, 25s. RCA tube rx manual, 25s, Ham radio projects, 25s. Wanted: Codar AT5 tx and hndbk, mains or /M psu. G3WRD, 32 Elliott Rd, Chiswick, W4. Tel 994 6976.

Heathkit GR64 rx, new July '69, £19 ono. Wanted: PR30 case, offers. Robertson, 31 Greenways, Bow Brickhill, Bletchley. Tel Bletchley 2453.

B44 tx/rx, 4m, in exc cond, comp mic, xtals, air tested, £8 or straight

exchange for R1155N in sim cond. Craine, 223 Park Rd, Formby, Lancs. Tel Formby 75416.

Going solid state—have used 4CX250B, QY4-400, QY3-125, QQVO7-50, DET24, EC8010, 5B/254M for sale, reasonable offers. G8AVB, QTHR.

Codar AT5 tx, T28 rx, control unit, /M psu and whip ant, all immac cond, £35ono. G3WTB, Brooklands, Long Moss Lane, New Longton, Nr Preston.

3kW Onan petrol generator, 1st class wkg order, ideal nfd. Geloso vfo and making of tx, £6. Valves 4 U19s, 15s ea. 3 TZ40s, £1 ea. Information wanted on wavemeter W1631. G8BJR, QTHR.

Heathkit DX100U with Heathkit grid-block keying mod, new 6146s, manuals, etc, £45 ono. Lafayette HE80 rx, extremely sensitive, £35 ono, both above in exc cond. 5 813s, one brand new, others inspect, £5. GM3TNT, QTHR. Tel Campbeltown 2763.

Eddystone S640, 1·5–30MHz with S meter, ldspkr and hndbk, £18. G3PFH, QTHR. Tel Ripe 394.

Omega-T ant noise bridge TE7–01, 1–100MHz, new, with batt, £10. Eddystone SM full vision dial, £1. Band-checker, 3·5–28MHz (Raymart), £2. Post extra. G2GM, QTHR. Tel Freshwater 2709.

Panda PR120V, 120W a.m. 140W cw, mains filter and manual, £30 ono. G3GWD, QTHR. Tel 01–650 3163.

Channelmaster, rotator/thrust bearing, used but in gd cond. Suitable for vhf beams, £5. G2BVN, QTHR.

Cossor 3339 scope, tube ok, with circuit diagram, £12. Can deliver 20 miles. G8ABR, 45 School Lane, Milton, Cambs, CB4 4BS. Tel Cambridge 61199 ext 82.

Cossor oscilloscope 1035 Mk2a plus trolley, £20 ono. CR300/2 rx, wkg but needs slight attention. Offers. Chambers, 954 Harrow Road, Wembley, Middx. HA0 2PY.

HAC1 valve rx with head-set and extras. £8. Graves, 2 Banchory Road, Blackheath, London SE3. Tel 01-858 7912.

Eddystone S640 rx with manual, spkr and extra amp, gd cond, £14. Philipson, Yelwater, Whittingham, Alnwick, Northumberland.

Sphinx ssb tx plus Delta control unit, £40 ono. G3UWK, 10 Powell Ave, Quinton, Birmingham 32.

Trio TS510 trnscvr with psu, new, £165. New boxed 5CP1 crt, used VCR97, £2. Bendix radio compass rx, £5, Buyer coll all. G3FXA, QTHR. Tel 0242 21917.

KW Atlanta with ac psu, latest model, as new, 4 months old, £200. Davies, 26 Sandy Ridge, Port Talbot, Glam. Tel Swansea 74660.

4m xtals, 7090, 4840 and 30 other xtal freqs, Wearite "P" coils, 6V vibrator power pack, hdphones, Powell, G3NNO. QTHR.

KW Vespa Mk 2, 6LQ6 p.a. and alc, KW201, one year old, £185, may separate, both excellent cond. G3XPO, QTHR. Tel 01-550 7112.

TCS12 tx/rx heavy psu, 10 yrs *Bulletins*, *SWM*, and lots of comps, all vgc, all for £25. Prefer hard-up club or junior. Bring van. G3MQU, QTHR. Tel Diss 2875.

Bantam tx, mod for 2m, rx xtal on 144·91 MHz, with hdbk, offers. G8BXC, QTHR. Tel 504-4984 (after 7pm).

Polaroid camera model 103, with flash etc for exch, why. Wanted: hand morse key, FL8 filt. G3COI, QTHR. Tel Wombourne 2288.

Brush xtal mic, £2. Instant heat soldering iron, £1. Smoothing chokes, cheap. Wanted: small mains trnsfmr, 100V 50mA. Aerial staywire strainers. G3KH, 133 Station Rd, Cropston, Leics. LE7 7HH.

KW Vespa Mk2, 6LQ6 p.a., as new, with ac psu, £98 plus carr. G2DGB, QTHR.

2m 8 over 8 J-Beam ant, gd cond, little used, £4 carr paid. G8BCA, QTHR.

Electroniques ssb Mk3 i.f. strip, as new, £10 ono. Philips EL3312 stereo tape recorder comp with mic, cassettes, two spkrs, £38 ono HRO, miniature valves, new cab, Collins mech filt, rpod det etc. Offers sae pse. G3IKN, QTHR.

KW Vespa Mk2 with ac psu, vy gd cond, 6LQ6 p.a., alc, £85. With Shure 210 mic, £88. GW3XHD, QTHR. Tel Neath 55788.

Panda Cub, 60W, 10—160m. Offers to GM3MUQ, QTHR. Tel Portobello 3264.

B2 coils, comp set, £3. TUBs, £1 ea. Rotory gen, 24V dc in, 230V ac out, £8. Rtty type 44 reperf, £6. T/P3X, first class cond, £9. Seen wkg. G3CTR, QTHR.

Marconi TF144G sig gen, 240V input, 85kHz to 25MHz out. Perf wkg order, £20 ono. G8BLI, c/o 11 Chestnut Ave, West Wickham, Kent.

AR88, brand new, ex wkg order and cond, pref buyer coll or arranges transport, £40 ono. PR30 preselector with int psu, hardly used, £4. Perry, 137 Turf Lane, Chadderton, Oldham, Lancs. Tel 061-681 5093.

KW 2000, latest makers mods, ac psu, £165. KW 2000 dc psu £25. KW 600 lin amp, £85 ono. All vy gd cond. G3LDH, 9 Cranwell Road, Greasby, Wirral, Cheshire.

Generator type AVR2. Excitation data: V 15/36·5, A ·18/·77. Output: 3·2kW 240V 50Hz, £5. Will exchange for wkg 19 Set. Vickers, 2 The Denes, Laughton Road, Ringmer, Sussex.

R1224A comm rx, batt superhet, 30-300m, ex cond, ht psu only, comp with circ and details, £8. Write or phone. 22V psu, 15s. Wanted: CR100 in gd cond, £10-£15. Barker, 26 Elliott Drive, Inkersall, Staveley, nr Chesterfield, Derby. Tel Staveley 2796.

KW 2000B comp with ac and dc psus, £220. G3PNQ, QTHR. Tel 02576 2797.

K6AXN 23cm convtr, works well, £10. Eddystone EC10 Mk1, £28. G8AYN, QTHR. Tel Lodge Hill 4671.

TH3 Mk2 Hy-Gain 3 ele yagi, 1kW capability, comp with balun and CDR rotor TR44 and 22yds 11 core power cable, £55. G3LGW, QTHR. Tel Weeford, Staffs 202.

Special valve offer: EF80, EF91, 6D2, 6F13, 10F1, 3s ea. 15s for six Jeapes, 165 Cambridge Road, Gt Shelford, Cambridge.

Creed teleprinter type No 54, ex wkg cond, with cover but less keyboard, £25 ono. G3SUY, QTHR.

Eagle Mini-Lab testmeter, new, £4 10s ono. Wanted: Cheap a.m. hi-band dash Ranger. Elms, 110 Arundel Road, Walton, Peterborough. PE4 6JH.

Hamgear PM1 preselector, mains powered, £3 10s. BC221 with mains psu, less xtal, £15 10s. G3RAD, 1 Approach Road, Broadstairs, Kent.

Trio JR500SE rx, one month use only, mint cond with matching spkr, £52. G3DAA, 9 Foresters Terrace, Teignmouth, Devon. Tel Teignmouth 3303.

KW 2000 dc psu, comp with cable, mint cond, £17 or why. G3JNX, QTHR. Tel Brixham 3142.

SR200 rx, ham bands 160-10m, xtal calib, half lattice xtal filt, S meter, prod detector etc, plus 10MHz channel for WWV. Sensitivity better than 1uV for 10dB s/n. £30 ono. With hndbk. G3JFC, QTHR. Tel 01-854 6646.

Magazines: *Practical Wireless* and *Short Wave Magazine*, 1961 to 1967. Offers. G3URZ, QTHR. Tel Cambridge 55601.

KW 2000 with ac psu, Shure 401A mic; KW 77 rx. Both fb cond, £190 ono, will separate. G3IFB, QTHR. Tel Churchdown 3792.

Eddystone 898 dial, new, £3. Tokai TC99 walkie-talkie, 28·5MHz, as new, £7. Sphinx ssb/am/cw tx, 20, (40), 80 and 160m plus Delta control, £45. G3VOF, 50 Fairfield Rise, Billericay, Essex. Tel Billericay 54455.

Cannonball ssb tx, new and unused, £25. Pref buyer coll. (80m model). G3OGD, 20 Bevan Ave, Talke Pitts, Stoke on Trent.

Marconi sig gen TF390G, 16-150MHz, perf specimen, with calib book, £25. Class D wavemeter, mains psu and hndbk, £5. G8AVA, 181 Swanstead Vange, Basildon, Essex.

Six 813s, £1 10s ea. 813 bases and top caps, 10s a set. G3RVM, 27 Kingsthorpe Gr, Stratton St Margaret, Swindon, Wilts. Tel Swindon 6251.

Heathkit SB301E ham band rx, absolutely new cond, £120, Suggest inspection prior to purchase. Going QRT. G3HJT, QTHR. Tel 01-759 6487.

Osram DA41, TZ40, 18s ea. Wanted: rx. G2UZ, 2 Cliff Road Gardens, Leeds. LS6 2EY.

Heathkit Apache, £30. SB10, £10. Sae for details. G3YJE, QTHR. Tel 01-349 9060.

Sphinx ssb tx plus Delta control unit, £45. Buyer coll. G3TNY, QTHR.

Hallicrafter Super Sky Rider with matching spkr and cab. Vgc, £20 ono. Buyer coll. G3VBE, 65 Montgomery St, Hove, Sussex. BN3 5BE.

5 complete colour tv lectures, lp records and coloured slides, cost £20, ex cond, reasonable offers. Nicholas, 12 South Road, Cwmbran, Mon.

BNRS Morse course lp (0-15wpm), RSGB Morse practice tape, 450ft, G3HSC simulated morse GPO test record—all with detailed instruction lit from successful A licensee, £3, + post. GM3ZHG, 2 Rockall Drive, Simshill, Glasgow S4. Tel 041-637 0681.

Trio JR500SE, mint cond, boxed, 160m, bargain at £40 + pp. Cannon Ball Mk 2, 160m, 6146 pa, half lattice filt, as new with ac psu, £15 + pp. Delta change over relay unit, £1 10s. All ono. Going down to two. G3RFB, Yeomanry House, 9 Sporle Road, Swaffham, Norfolk.

Drake 2-BQ Q mult, £10. Mech filts: Collins F455Z1, £7; Kokusai MF-455-10K, £5. Rotax cowl gill motor, 24V dc, for big beams. G8PB, QTHR. Tel Billericay 2498.

HQ170A, £90. KW Vespa 2 (6LQ6) with ac psu, £95. O52U, £15. TF144G, £20. Superpro SP200X, £12. 70cm parabeam, £3 10s. G2DD convtr, £3. W24HD 24in wall brackets, £3 10s. 50ft 2in sectional mast, £5. G3RRF, QTHR. Tel Epsom 21224.

Kelvin-Hughes 4 channel dynamic strain recording equipment, inc psu, control unit and 3 channel pen recorder. Originally approx, £900. Offers around £75. Will deliver reasonable distance. A. G. Worrell, 129 Wymersley Road, Hull, HU5 5LP.

KW201 + cal, £70. KW EZ Match, £10 10s. Eddystone 600Ω earphones, £2. RSGB Morse instruction tape, 3¾in/sec, 15s. Hawkins, 249 Herries Rd, Sheffield S5 7AX.

Vespa Mk2 with psu and Shure mic, good cond. G3XRH, QTHR.

Comp station CR150 and B4/40 tx, gd cond, only £20, no callers. G3AKG, QTHR.

Sommerkamp FR-100B, mint. RD5 dipole. Spkr. £90. Beckley, 32 Hillside, Totteridge Hill, High Wycombe, Bucks. Tel HW 23777.

ARR-2X aircraft rx, switch tuned around 240MHz, 11 valves, £1 10s ono. Will exch for gd lpf or why. G3YXO, 87 Sandridge Rd, St Albans, Herts. Tel St Albans 57930.

Comp rtty station: Olivetti teleprinter loop, psu, tu, AP 100386 with scope monitor and afc unit. National 50T1rx. Hall, 22 Maple Drive, Beverley, E Yorks. Tel Hull 885854.

Mags: *SWM*, Vols 25, 26, 27, *PW* 1967-1969, *PE* 1967. Bulletins Vols 37 and 43, *Radio Communication* 1968, 1969, £1 ea lot + postage, dozens of odd numbers, £7 the lot. Cooper, High Ridge, Water Lane, Storrington, Sussex. Tel Storrington 2302.

G2DAF Mk 2 tx and metered psu, £45. Will exch for Heathkit HW12A or HW32A and dc psu. G3WBT, QTHR.

Any info and/or circ diag for US Navy rx type RAY5, model PR7NA. Buy or borrow. Redfern, 5 Pinfold Rd, Worsley, Manchester, M28 5DZ. Tel 061-790 2662.

No 52 set tx, 813 final, 12V psu, £15. DX100U, £40. G3TCJ, The Pippins, Lake Lane, Liskeard Cornwall. Tel Liskeard 2073.

Commercial stabilized supplies, variable, metered; 500V 250mA, £10. 500V 150mA, £7 10s. 250V 50mA, £5; all with h/d heater supplies Wanted: TA33 jnr, details to G3CXI, QTHR. Tel Bishops Cleeve 3834.

RCA AR88 comm rx, hardly used, modified for 3Ω output, £40 ono. Wkg ok. PR30 preselector with int psu, hardly used, £5. Buyer coll or arrange transport. Perry, 137 Turf Lane, Chadderton, Oldham, Lancs.

Eddystone EC10 rx and mains psu, £32. G3VHA, QTHR. Tel Kingswinford 4258.

"Hy gain 4" 3 ele beam, £20. Quad, £15. Avo cap bridge, £5. Precision condenser 0-600pF, £2. Eddystone mod/field strength meter, 30s, carr etc, extra. G2MF, QTHR. Tel Sheffield 360210.

Clearing shack, B40 (damaged), £9, 30ft sectional aerial, £2. Sae for list of other items of equipment etc. GM3RVL, 5 Hillview Drive, Edinburgh, EH12 8QW. Tel 031-334 7152.

2m station comprising a.m./cw tx, fet convtr and 5 ele Yagi, with xtals, spares, etc. Sae for details. G3NWG, 1 Groton Road, London SW18.

Grid dip oscillators, transistorized, covering 2-30MHz (could be extended to vhf by additional coils). Also act as absorption wavemeters. GW3YQM, 4 Green Park, Pentlepoir, Saundersfoot, Pembs. Tel Saundersfoot 3351.

Pye Ranger, modified and tunable 4m, £10. G3USE, QTHR. Tel 0582 26800.

Transistors 2N2369A equiv, brand new, 1s ea, 24 for £1 post free, otherwise add 6d. G3WVT, 109 Heywood Lane, Austerlands, Oldham, Lancs.

160m TW 12V communicator with ac psu, fixed or /M fbc whip aerial, xtal mic, £45 ono. 2½in oscilloscope by Erskin Labs Ltd, model 2W, £10 ono. G3JNY, 2 St Marys Close, Garforth, Nr Leeds. Tel Garforth 3058.

Pye Vanguard 25W tx and rx /M, comp with control head and cables, unmod, high band, easy 2m conversion, £25. G8BCL, Greencroft Avenue, Northonram, Halifax. Tel Hx 21885.

2m Pye base tx, spare QQVO3-20, £20. 2m JXK fet convtr 28-30MHz, mint, £12. Lafayette KT34O rx, mint, £20. 4/4/2mJ beam ant, mint, £2. G8BLJ, 63 Tilewood Ave, Coventry. CV5 7GT. Tel Coventry 462870.

Selling cheap: exc xtal mic, smoothing chokes, pair FT241 xtals 479·3kHz fundamental. Wanted: small mains trnsfmr, 100V at 50mA secondary; aerial staywire strainers. G3KH, 133 Station Rd, Cropston, Leicester. LE7 7HH.

KW2000A with ac psu, 18 mths old, imac cond, £175. Also KW swr bridge and KW EZ Match, £18, the two. Not sold separately, other equipment also. Send sae for det. G3WXT, QTHR.

Metal rack cab, 19in wide, totally enclosed, 15in deep, 11in high, £1 10s, buyer coll. HRO xtal filt, comp sub-assembly, mint, comp, £1 15s inc post. Fenby, 4 Broadmead, Hitchin, Herts. Tel Hitchin (0462) 52227.

Comp a.m. station, 160 + 80m, in polished wood /P case. Comprises Codar AT5 tx, T28 rx, ac psu, mic, fitted spkr, cost £47 9 months ago, will accept, £35 or first class AR88D. G3YNC, Harringay stadium, Green Lanes, London N4. Tel 01-800 3474.

Eagle minilab testmeter, new, £4. Wanted: cheap hi band dash valve Ranger. Elms, 110 Arundel Rd, Walton, Peterborough.

KW2000 with psu in gd cond, offered as comp station ready to go inc mic and joystick stysem, £125 ono. GC3WOW, QTHR. Tel Guernsey 37318.

HRO, psu, 9 coils, hndbk, £18. Af amp, psu, UM3, all cased, suitable 150W tx, £8. 4 xtals, suitable 2MHz i.f. convrt, for 40 to 10m, £1 10s, buyer coll. G3MVK, 22 Pinewoods, Church Aston, Newport, Shrops. Tel Newport Shropshire 3693.

S640 match spkr and S meter, £22. Withers 2m convtr 14MHz i.f., £6. Special translucent dial for R1155, 15s. Varley 20W multi ratio hi-fi output trnsfmr, £1. All carr paid. G3JMO, QTHR.

R1155F rx, exc cond, mod to incorp psu, output stage and lighted dial, offered with sep spkr and orig air Ministry manual, £8. Will del up to 25 miles. G8CCI, 12 The Tennis, Cassington, Oxford. Tel Banbury 3139 (office hours).

Double beam scope, Hartley 13A; pulse amp, Dynatron 1430A (with book); Dynatron scaler 1009E; Ecko ratemeter 1037A. Any reasonable offers. GM8APX, QTHR.

WANTED

Collaro tape transcriptor, wkg or not wkg, must be comp. Foss 120 Burges Road, London E6 2BN. Tel 01–472 7383.

Ferroxcube pot cores type LA7. G3VFG, QTHR. Tel Leeds 57692.

Electroniques hamband valve coilpax QP166 S2/DIF, 1·46D, 6·46. Parmeko output trnsfmr P2361. Eddystone 898 dial. Joystick deluxe. Any reasonable price paid. *QST* May 1961, May 1969, loan or buy. 465K mech filt. Sutcliffe, 24 Medfield St, Roehampton, SW15. Tel 789 4979.

1132 aircraft rx. Also sw rx for 12V operation. Pyatt, 23 Arundel Drive, Orpington, Kent. Tel Orpington 20281.

TW 2-50, TW 2-120 or TW 70. Sale: New metal cased xtals, 1MHz 12/6, over 100 freqs inc vhf types for convtrs from 2/6d. G3NXT QTHR.

Poverty stricken schoolboy swl is looking for a kind amateur willing to lend, give or sell at a very low price, a rx suitable for receiving short wave bands (pref suitable ssb). Bevan, 7 Drayton Drive, Heald Green, Cheshire, Tel 437 9584.

HB166T, Valient dc psu, m/masts, pe charger, 14AVQ, CR150, DX100, hydrogen source in Glasgow for balloon aerial in Argyll. G2BAM, QTHR.

Complete set of Morse records, must be in gd cond. Beveridge, 18 Braeside, Haugh of Urr, Castle Douglas, Kirkcudbrightshire

TU5B. G3RB, QTHR. Tel Newcastle on Tyne 869811 ext 525.

S meter for AR88D, rh zero, 5mA. Redman, 22 Park Road, Melton Mowbray.

For Bristol ARC: Creed Morse automatic tx model 2, Great Northern Telegraph Co, model 2042 or sim Morse tape reader. Info on Cossor 1042A oscilloscope. G3SWH, 21 Dickensons Grove, Congressbury, Bristol, BS19 5HQ.

History of radio telegraphy and telephony, (Blake) 1927; *Who's who in amateur radio*, (USA) c1934. G3IDG, QTHR.

Electroniques coil pack type QP166 and coil type DLM14 or SHQ-MIPC. Reasonable price please. Slattery, 67 Abbey Lane, Sheffield, S8 OBN. Tel Sheffield 45850.

Hallicrafters SX24 rx, case and S meter. Consider non-wkg rx. Also circ hndbk for SX24. Haseldine, 31 Ellesmere Road, West Bridgford, Nottingham, NG2 7DE.

Handbk for Murphy B40 rx to buy of borrow. Cleaver, 86 Main Road, Dovercourt, nr Harwich, Essex. Tel Harwich 2195.

Urgent. QRO rig in next 6 months. 52, 53 set, p200 old hndbk? (3rd ed). A.m./ssb hb or why, 60W, 80–10. Post refund. Details to G8CCY, Llys Bach, Harlech, Merioneth, N Wales.

Labgear psu + mod for LG300 in gd order. G8BMQ, 2A Convent Hill, SE19. Tel 653 8489 (after 6.30pm).

Hndbk and/or circ, and details of conversion for mains psu, for wavemeter W1191. G8CZJ, Cotswold House, 38A High St, Shrivenham, Swindon, Wilts.

3in diam 5k Ω linear law wirewound pot for transistor Wheatstone bridge. Wardle, 13 Lynn St, Chester-le-Street, Co Durham.

Hy gain TH3 jnr, Mosley TA33 jnr, SNR Mustang, MP33, why. PA0RKT, c/o Clark, 165 Loreny Drive, Kilmarnock, Scotland.

Schoolboy swl requ HRO or CR100. Price up to £10. Will collect up to 30 miles. Stephen Ireland, 10 Chestnut Avenue, Southborough, Kent.

Fi-cord 202A circ or advice on correcting fluctuating motor speed. Croxson, 37 Canterbury Ave, Ilford. Tel 01-554 3535.

EC10 in gd cond. Evenings after 6pm. G8DHL, Open View New Road Hill, Woolhampton, Reading, Berks. Tel Woolhampton 2428.

Young swl wants Electroniques i.f. strip 1·6MHz or trnsfmrs for same transistorized version. 23 Penland Road, Haywards Heath, Sussex. Tel 97 50599.

Urgent. CRT for curve tracer type No Cintel-G103-C1 or CV-2467. New or s/hand, but must be wkg. G8CUE, 5 West Crescent, Sunnyside, Nr Rotherham, Yorks.

Xtal type 10 X 100 for class D wavemeter No 2 2 pin. 1·1 mod trnsfmr, centre tap SCR522 would suit. Boswell, 143 Eastfield Rd, Birmingham 9. Tel 021-783 5304.

D104 astatic xtal mic or makers replacement cartridge to repair my instrument. Will reciprocate any offer from USA. G3MIN, 2 Mill Lane, Shoreham-by-Sea, Sussex. Tel 07917 3552.

Df portable equipment 160m. Please give full description and price requ. Dawbarn, "Mellor," 8 Daylesford Close, Parkstone, Poole, BH14 8DY.

Wanted by invalid swl: GC–1U or Lafayette HA800, fairly gd cond, might take HA600 if price right, max £20. Nock, 54 Hunton Rd Erdington, Birmingham 23. Tel 021-373 2302.

Loan of circ or man for Muirhead-Wigan oscillator type D-105-A. Prompt return. Caston, 22 Pentrepoeth Rd, Bassaleg, Newport, Mon. NP1 9LL.

Hndbk or circ diag and/or conversion details to 2m tunable for BCC 715M/E. Buy or loan. G8CZM, 131 Highfields Rd, Chasetown Walsall, Staffs. Tel Burntwood 6654.

Bandspread dial for AR77E rx and dial for Minimitter Mercury tx. Also 300 and 75 Ω twin feeder. G3YKY, QTHR. Tel Henley-on-Thames 2000.

Heavy duty alternator or dynamo for semi /P generator. G3NXO, 14 The Spinney, Camberley, Surrey. Tel Camberley 24622 (office hours).

CQ 5Z4: amateur holidaying in Mombasa, August, seeks local QSO. G3UOV, 11 Orde Close, Pound Hill, Crawley, Sussex.

Vhf a.m./fm rx covering 40MHz to approx 120MHz or sim rx. G3ROF, QTHR.

AR88 S meter. Krystofiak, 128 Park Lane, Harrow, Middx. Tel 01-422 3284.

Tape recorder. G3AUB, QTHR. Tel Maccelsfield 5910.

Hndbk and circ of KW2000 for copying and return. G3ONW, QTHR.

Audio phase-shift network, B & W type 2Q4 No 350 for ssb exciter. G. Foster, 3 Egerton Road, Leyland, Preston, PR5 1YB.

Pair 19 Set relays on mounting bracket. G3NUA, QTHR. Tel Hartlepool 5643

No 1 wireless set, ex-army, any cond. Also info, manuals, etc, on No 1, No 2, No 3, No 8 and other early army wireless sets. Also modern B45 set. Jolly, 68 Liverpool Road, Chester. Tel Chester 29403.

R1155 output stage power supply, top band, good cond, will collect reasonable distance, G3DM, QTHR. Tel 051-922 1565.

Bound or unbound copies of *CQ* magazine. Also *73* magazine. A copy of *Surplus radio conversion manual*, volume one, Good prices paid. Urgently need maintenance hndbk for tx AN/ART13. G8CQM, QTHR. Tel Guildford 68929.

Morse course on record, loan or buy. Also cheap amateur bands rx/tx or trnscvr. Dixon, 37 Bellevue Crescent, Llandaff North, Cardiff, CF4 2FJ.

Manual for R107 Mk 1/1 comm rx, state cond and price. Woollons, 12 Meadow Way Green, Letchworth, Herts, Tel Letchworth 5535.

Manual or any info on R206 Mk 2 rx. Would pay for photostat copy G8DDM, 6 Cherry Tree Way, Tylers Green, Penn, Bucks, Tel Tylers Green 483.

Scrap RA1 rx. Only cond: coil pack and i.f. transfmrs must be ok. Your price please. Newton, 20 Stainton Road, Sheffield, S11 7AX. Tel Sheffield 22821 (day).

Hi-band radio telephone, AM108, AM105, MR820, F27AM or Cambridge. G3HKV. 16 Abbey St, Crewkerne, Soms. Tel Crewkerne 2662.

Scope with long persistence tube. GM3CEA, QTHR. Tel OSR6 2716.

KB (or sim) featherlight /P 11in television. G3JDM, QTHR. Tel Stafford 3271 ext 266 (day).

Convtrs for 2m and 4m to suit Eddystone S640. Also S meter for S640. Locke, 97 Snoots Road, Whittlesey, Peterborough. Tel Whittlesey 3447.

BLY33 transistors; unmod Pye transistorized hi band Bantams, Cambridges, Westminsters, Vanguards, etc. G3YLQ, QTHR. Tel Luton 25595.

Class D wavemeter No 1 or No 2, will pay around £3. Also any alignment det for Trio 9R59DE and any poss mods. Jones, 275 Griffiths Drive, Ashmore Park Est, Wednesfield, Staffs.

Any info on Hallicrafters vhf rx mod CHL-46130-C. Also small rx for /M work, vy cheap, wkg or easily serviced, home brew or commercial. Beament, "Landram," York Road, Camberley, Surrey. Tel 0276 23265.

Circ of USA navy uhf rx, R28/ARC or info where obtainable. G2YL, QTHR. Tel Tadworth 3268.

Pye F27AM high or low band. Also rcu, G3UPB, QTHR. Tel 06-612 3706.

Cossor model 3343 ganging oscillator in gd wkg cond. G8DFT, Norsdale Crown Road, New Maldon, Surrey. Tel 01-942 1230.

Leads and hndbk or connection data for Solarton Monitor 101 oscilloscope. If further dets required write. Brett, 28 Elmcroft Ave, Sidcup, Kent. Tel 01-300 4012.

Any details for converting or relating to the 715 vhf rx for 2 or 4m. All postage costs met. Jones, 275 Griffiths Dr, Ashmore Pk Est, Wednesfield, Nr Wolverhampton, Staffs.

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L pad and attenuator part numbers 40615-B and 40615-C for portable sig gen. Number 2 Avo type AFM2. G3YQT, 18 Ibbett Close, Kempston, Beds.

ham radio magazine

at the RSGB SHOW 1970

Be sure to stop at our stand and see the exciting new Signal/One CX7 solid-state (vacuum tube pa only) transceiver pictured below.

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AMATEUR ELECTRONICS G3FIK

TRIO COMMUNICATIONS EQUIPMENT. We are now in a position to offer full demonstration facilities on all items in the TRIO range for the caller and as previously stated it is our policy to provide the prospective purchaser with a completely unhurried opportunity to actually try each piece of TRIO equipment "on the air" without any obligation whatsoever to purchase. Whilst on the subject of TRIO equipment it would seem a good opportunity to mention the TS-510 TRANSCEIVER which although now widely used is still perhaps not fully appreciated by the uninitiated. Our object in raising this is prompted by the remarks that are sometimes passed at Rallies and Club meetings to the effect that the TS-510 is presumably a Mark II version of the TS-500. This of course could not be further from the truth as the TS-500 has very little in common indeed with its predecessor and represents a truly complete re-design, with the resultant incorporation of many features which the TS-500 did not have. To the man who is contemplating the purchase of a transceiver there is, without doubt, no better buy on the UK market at the time of going to press and it would be well worth a glance at the excellent brochure on the TS-510, which we would be pleased to forward by return of post. Remember, this equipment carries a 12 months' guarantee backed by a first-class after sales service.

Below is our current list of used equipment which is priced to *include* carriage, except where stated.

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CONVERTERS

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400v at 200mA plus	5		N.F.
250v at 150mA V. doubler		Post 6/6	**£6 18 0**

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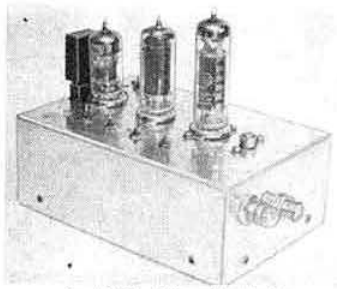

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WANTED.—All types of communications receivers, test equipment, tape recorders, amplifiers, etc. Prompt cash payment—Details to R. T. & I. Electronics Ltd., Ashville Old Hall, Ashville Road, London, E.11 (01-539 4986).

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About time I mentioned second-hand stuff for a change, so cast an optic over, or take a perfunctory butcher's at the stuff listed below. Before I forget—although we'll be at the R.S.G.B. Exhibish 19–22 August, we'll be CLOSED THE REST OF THE MONTH. I will be huddled under an umbrella in the teeth of a howling gale on some rain-sodden beach. "Cor", the locals will say, and they ALWAYS say it, "worst August we've ever had—you should have been here last month." Ah well, bash on. So when you 'phone up at 11.30 p.m. wanting something right away, it's a case of Harry Toughers Ole Boy, 'cos I'll be away and we're CLOSED AUGUST except for aforesaid EXHIBISH. Heigh nonny no, get flogging, Lowe.

NEW

Sommerkamp and Inoue, of course, and the new FE-600, which for a 200W p.e.p. 5 band transceiver ain't bad value at £165 complete ready to go. Chances are I'll be sold out, though. Lots of other goodies that I usually advertise, however, and in the second-hand line:

Receivers

Trio JR-500 £45.
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Got gear to flog? Test gear? If it's nice, we'll either buy it or flog it for you on commission.

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Finally, may I remind you—see you at the R.S.G.B. Exhibish 19–22 August, but we're CLOSED the rest of AUGUST. Yeah, I know—three times I've repeated myself, but even so I'll bet you ten to one that several hundred chaps, "Always read your ads Bill, first thing I turn to," will be playing merry hell with me when they get no reply to their 'phone calls.

73 de Bill

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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
01-837 8688

* I hereby apply for election as a Corporate Member of the Society and enclose a remittance for £2/10/- being the amount of my first annual subscription.

* Being under 21 years of age and not holding a current Amateur Radio Transmitting Licence I hereby apply for election as a Non-Corporate (Associate) Member of the Society and enclose herewith a remittance of £1/5/- being the amount of my first annual subscription.

I, the undersigned, agree that in the event of my election to Membership of the Radio Society of Great Britain, I will be governed by the Memorandum and Articles of Association of the Society and the rules and regulations thereof as they now are or as they may hereafter be altered; and that I will advance the objects of the Society as far as may be in my power; providing that whenever I shall signify in writing to the Society addressed to the Secretary that I am desirous of withdrawing from the Society I shall at the end of one year thereafter after the payment of any arrears which may be due by me at that period to be free from my undertaking to contribute to the assets of the Society in accordance with Clause 8 of the Memorandum of Association of the Society.

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