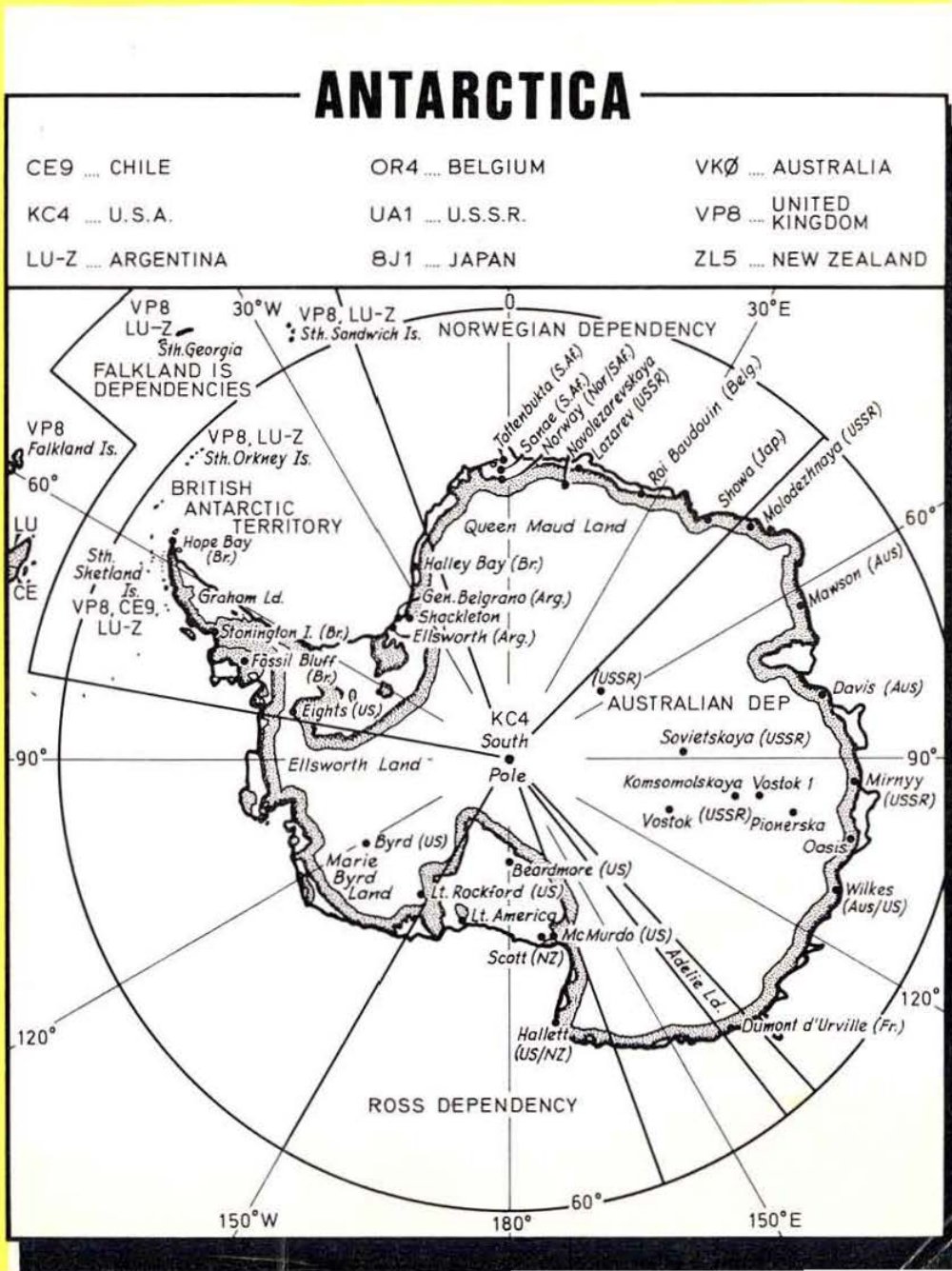
radio communication

October 1971

Journal of the Radio Society of Great Britain



October 1971

radio communication

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

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Second hand Equipment

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Transmitters:	Viceroy II £55 FL-200B £85 FL-500 £100 Star ST-700 £75
Transceivers:	Swan 350 £130 Trio 510 £135 KW2000A *LESS* p.s.u. £120

Service

In order to give an even better deal to our customers, we have appointed the following part-time (evenings and weekends) Regional Service Representatives:

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Alan Bartlett, GW3YSA	35 Pen-y-Waun, Efail Isaf, Nr. Pontypridd, Glam.
Peter Ward, G3XWX	47 Radstock Avenue, Ward End, Birmingham, B36 8HD.

Naturally, if you can get your gear to Matlock we would be delighted to see you and of course our Northern and Southern Agents, Sim and John are very adept at fixing gear in a hurry, but possibly there is an authorized Regional Service Rep. nearer to you who can sort out your problems in double-quick time. In which case, it may pay you to take your gear to him for prompt attention at low cost.

Please drop us a line enclosing s.a.e. and we will send you all our guff.

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73 de Alan and Bill

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QTC AMATEUR RADIO NEWS

RSGB President for 1972

At a meeting of the Council of RSGB on 6 August 1971, Mr R. J. Hughes, G3GVV, this year's Executive Vice-President of the Society, was unanimously elected President of the Society for 1972.

RSGB Awards

The Council of RSGB has approved the following awards:
Calcutta Key to Mr E. M. Wagner, G3BID, for outstanding service to the cause of international friendship through the medium of amateur radio.
ROTAB Trophy to Mr T. Higginson, GW3AHN, for outstanding and consistent dx work.
Founders Trophy to Mr G. T. Peck, BRS15402 for distinguished services to the Society.

The following awards refer to articles published in *Radio Communication* during the year July 1970–June 1971:
Norman Keith Adams Prize to Mr R. J. Baker, G3USB, for *Locate* in the February 1971 issue.
Bevan Swift Memorial Prize to Mr A. Backmann, SM0BUO, for *Slow-scan television* in the February 1971 issue.
Courtney Price Trophy to Mr P. G. Martin, G3PDM/W1, for *Plagiarize and hybridize* in the March–June 1971 issues.
Wortley-Talbot Trophy to Rev P. W. Sollom, G3BGL, for *Flare-spot* in the January–February 1971 issues.
Ostermeyer Trophy to Mr A. L. Mynett, G3HBW, for *A vhf fet dip oscillator* in the September 1970 issue.

QSL Bureau

The attention of members is drawn to the fact that pre-decimal stamps will no longer be valid next year. Members who have envelopes stamped with pre-decimal stamps with their QSL Bureau sub-Manager should ask him to return these to them while the stamps are still valid.

Stolen equipment

The following equipment was stolen between 1 July and 13 August from the clubroom of the Queen's University of Belfast Radio Club: Eddystone EA12 receiver, Heathkit SB400 transmitter, Garex 2m fet converter, Green 4m converter, B44 Mk2 4m transceiver, Heathkit gdo, Heathkit RC bridge, Heathkit valve mV meter, Avo Universal multimeter, Advance rf and af signal generators, and Hy-gain 14AVQ trap vertical.

Anyone with information concerning these items is asked to contact the police at Donegal Pass RUC Station, Belfast; any other police station, or Mr J. S. J. Craig, G3SGR/GI3SGR, 47 Ashley Avenue, Belfast 9.

Are you in the Woolwich area?

Amateurs in the Woolwich areas are trying to re-form a club there. Anyone interested in taking part in this is asked to contact Mr B. D. Corper, G3ZOJ, 54 Nightingale Place, London SE18.

Invitation to the palace

The President, Mr F. C. Ward, G2CVV, and Executive Vice-President, Mr R. J. Hughes, G3GVV, and their respective wives, were honoured by an invitation to attend one of HM The Queen's summer garden parties at Buckingham Palace on 15 July.

The photograph shows Mr and Mrs Ward leaving RSGB headquarters on their way to the palace.

Illicit transmissions

Following the recent bank robbery which received widespread publicity in the press because the radio transmissions of the thieves were intercepted while the robbery was in progress, HQ has had several enquiries as to the correct course of action by members who may receive suspicious transmissions in future.

They are advised that any information received from such transmissions should be passed to the local police.

Licence figures

The Ministry of Posts and Telecommunications advises that the following numbers of amateur licences were in force at the end of July 1971:

Class A	13,848
Class B	2,736
Class A/M	2,666
Class B/M	455
Television	208
Model control	20,264

WAMRAC

The World Association of Methodist Radio Amateurs and Clubs has changed its headquarters address from 178 Manchester New Road, Middleton, Manchester M24 4DA, to G3NJB, The Manse, Kendal Road, Tebay, Penrith, Cumberland.

Get your 1972 *Call Book*—Now!

Special Offer

The 1972 edition of the *RSGB Amateur Radio Call Book* will be published this month at a cover price of 50p, plus 7p for postage and packing.

As a **special pre-publication offer,** no charge will be made for postage and packing on all orders for the *Call Book* received on or before 1 November 1971

Send your order with 50p now and save the postage!

And it will speed despatch if a self-addressed gummed label is enclosed.

Reciprocal licensing in Denmark

The Danish national society, Experimenterende Danske Radioamatorer (EDR), is anxious to obtain material for discussion with the Danish authorities concerning reciprocal licensing. EDR would be glad to hear from any radio amateur who has not been able to obtain an amateur licence in Denmark. Copies of the relevant documents would be an advantage.

Please send such information to EDR, PO Box 335, DK 9100, Aalborg, Denmark.

G3XBF Constructor's Award

This award is sponsored by *Carrier*, the journal of the Barking Radio and Electronics Society, and judging will take place at the Gascoigne Recreation Centre, Gascoigne School, Morley Road, Barking, Essex, on Thursday 11 November 1971 at 8pm. There are to be three prizes, each presented with a hand-produced certificate. All entries to arrive before Saturday 30 October 1971. Entry fee, 15p.

For those who have not read the conditions of entry, as published in *Carrier*, a copy may be obtained from Alan P. Foss, G8EAY, 73 Coolgardie Avenue, Chigwell, Essex, to whom all entries and enquiries should be sent.

"Plagiarize and Hybridize"

A small quantity of reprints of this article by G3PDM, which appeared in the March–June 1971 issues of *Radio Communication*, are available at HQ. Anyone who would like a copy may obtain one, while the stock lasts, by sending a stamped addressed foolscap size envelope to the editor.

Can you help?

Information and photographs of vintage radio equipment wanted for a Certificate of Secondary Education Project. This is asked for by Michael Rychlik, 48 Whitstable Road, Canterbury, Kent. He is willing to pay for copies and postage, and if anyone living in the east Kent area has vintage radio equipment he could photograph, would they please let him know.

SWL News

It is proposed to include a regular feature devoted to news and items of special interest to the short wave listener in *Radio Communication*, commencing with the January 1972 issue.

Mr R. A. Treacher, BRS32525, has kindly volunteered to compile this feature and would be grateful if all items of news and comments on swl activities could be sent to him. His address is 392 Rochester Way, Eltham, London SE9 6LH.

The success of this new feature will depend on the support that all SWLs give to it.

RAE Courses, 1971-2

London. De Beauvoir GLC Evening Institute, Balls Pond Road, Tottenham Road, London N11. 7.30–9.30pm, Tuesdays and Thursdays. Instructor: Fred Barns, G3AGP.

Eastbourne. Eastbourne College of Further Education, St Annes's Road, Eastbourne, Sussex. Commenced 21 September. 7–9pm Tuesdays and Thursdays. Instructor: P. Simmons, G3XUS.

Broxbourne, Herts. East Herts College of Further Education, Turnford, Broxbourne. Every Wednesday. Instructor: J. V. Beavan, G3GBL.

Region 12 ORM

Beach Ballroom, Aberdeen

23-24 October 1971

Saturday programme

9am—Hall opened.
11am—Official opening of exhibition.
1.45pm—Bus tour of Aberdeen for the ladies, including afternoon tea.
2pm—Lecture by Mr M. C. Hateley, BSc, MIEE, entitled "Oscillators and modulators".
3pm—Tea-break.
3.30pm—Official Regional Meeting commences. Mr F. C. Ward, President of RSGB, and Messrs E. G. Ingram and A. W. Smith, RSGB Council members, will be present.
6.45pm—Dinner, followed by a social and dance.

Sunday programme

11am—A visit to an establishment of radio interest.

Bookings should be made for all functions other than the ORM and exhibition and should be received not later than 10 October by Mr G. M. Grant, Easter Bogs, Buckie, Banffshire.

A transmitter for 28MHz with a Class D modulator

by Dr A. GSCHWINDT, HA8WH*

IN recent years some interesting circuits have been used in broadcasting transmitters, and this article introduces an audio amplifier in connection with an rf amplifier which has only, to the author's knowledge, been used in broadcasting or professional equipment.

The rf amplifier works in A1 and A3 modes and has the following specification:

Output power: in A1 mode	16W
in A3 mode (carrier power)	4W
Supply voltage	20V
Input af level for m = 100 per cent measured at 1kHz	1mV
Input impedance of the modulator	80kΩ
Maximum speech clipping in trapezoid modulation	15dB
Driving power	160mW
Envelope distortion measured at 1kHz if m = 98 per cent	3 per cent

The block diagram of the amplifier and modulator can be seen in Fig 1, and from this some basic working principles appear. The rf amplifier has two stages, both being modulated by the same voltage. The modulator is connected in series with the modulated stage, and the dc current of the rf stages flows through it. With this arrangement it is possible to modulate the rf amplifier by dc, which is a good arrangement for trapezoid modulation.

Should a classic type audio amplifier be used in the series modulator, the efficiency would be low because of Class A working. In the audio amplifier of this transmitter a Class D amplifier has been used as this system also ensures efficiency in the series modulator.

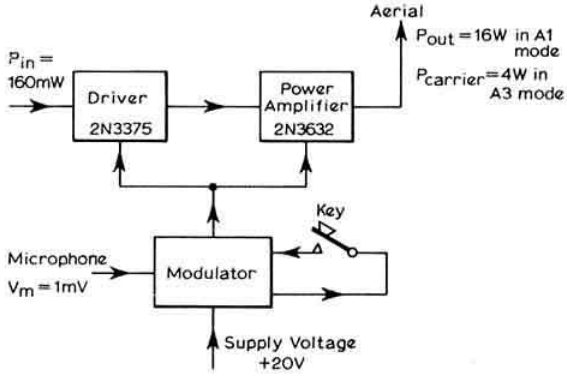

Fig 1. Block diagram of the equipment

In the A1 mode the driver and power amplifier are switched simultaneously. The reason for this common keying is the feedback base to collector capacitance in the power amplifier. If running with zero supply voltage at the last stage, some power could feed through this capacitor to the aerial, and common keying affords protection from this effect.

The key controls the modulator because the modulator is able to switch the power supply of the driver and power amplifier on and off (series arrangement). In this configuration the cw pulse shaping is also simple.

RF amplifier

The rf amplifier consists of two stages and the circuit diagram is shown in Fig 2. The design was based on the article by Cliff Sharpe, G2HIF (*Radio Communication*, November 1968). RCA transistors were used and RCA data sheets and Application Note SMA-36 were used as data sources.

Basic considerations were:

(*a*) the highest power from the unit is obtained in A1 mode; and

(*b*) in the A1 mode the power supply voltage for the rf amplifiers is about 1V lower than the supply voltage. 1V remaining on the last stage of the modulator (emitter follower).

The author chose a power supply of 20V (determined by the local supply) although for this type of transistor the supply voltage can be as high as 28V, the supply voltage being 19V in the A1 and 9·5V in the A3 mode.

The next step was to determine the collector loading resistance of the power amplifier transistor. With relatively good approximation, this will be:

$$R_L = \frac{U_{co}2}{2P_{out}}$$

where R_L = the load resistance for the power amplifier
U_{co} = supply voltage (19V)
P_{out} = output rf power

giving a value for R_L of 10·6Ω. From the data sheet of 2N3632, the output capacitance of $C_p \simeq 30$pF.

In the author's case the load resistance of the amplifier is 72Ω, so a matching element between the collector and the aerial must be used to ensure selective impedance matching. The πL arrangement gives good harmonic rejection by a relatively simple process.

For the design of the driver, the input power for the power amplifier must first be determined. From the data sheet, the 2N3632 needs about 1·5W input for 16W output at 28V supply voltage. At 19V the power amplification is lower, at

*Budapesti Muszaki Egyetem, Budapest 11, Hungary.

worst it is half the figure at the higher supply voltage, and therefore the driver was designed to give 3W output power.

With the help of the data sheet for the 2N3375, and with approximately the same procedure as before for the power amplifier, 60Ω loading for the driver is obtained. The input impedance of the power amplifier (see data sheets) is about 7Ω.

The matching element is also a selective circuit and the method for its determination is given in Appendix 1.

The output capacitance of the 2N3375 at the given working condition is about 20pF.

The input of the amplifier is fed from a generator having 50Ω source impedance. The input matching element transforms this into the input impedance of the driver. The design steps used for this circuit are given in Appendix 2.

To eliminate the undesirable lf spurious oscillations, the lf amplification of the circuit is kept as low as possible with the use of resistive elements, parallel connected with the chokes.

During the mechanical construction of the amplifier, attention must be paid to obtain good screening between the circuit elements of the two stages. The two transistors have electrically independent cases so the dissipated heat can flow easily into the panel.

Modulator output power determination

One part of the modulator power goes into the output of the transmitter as the desired sideband and carrier power, while the second part is dissipated in driver and power amplifier stages or losses in the matching elements.

In theory it is possible to take into account the efficiencies, and in this way to calculate approximately the full power consumption of the rf stages.

The input power for the rf amplifier is the same as the output power of the modulator. The efficiency data for a given working condition depends a lot on transistor parameters. An easier way for an amateur is first to build the rf section and then determine the power consumption of the rf amplifier. In the author's case the full efficiency for the two stages was 48 per cent, so the input power is 33W for 16W output.

From the previous data, the equivalent load impedance for the modulator is 9·6Ω measured at 19V and 9·6Ω at 9·5V supply voltage. In the calculation the input dc current for the rf amplifier must be determined and the load impedance found with the help of Ohm's Law.

To summarize the parameters for the modulator:

maximum output power	= 33W
loading voltage	= 9·6Ω
supply voltage	= 20V

Use of trapezoid modulation

It is desirable, because of the low carrier power, to ensure good modulating properties in the transmitter, and one useful method of increasing sideband power is by clipped speech or trapezoid modulation. In this equipment a maximum of 15dB symmetrical clipping can be used and the improved modulation of the transmitter means better communication in poor reception conditions. The clipper limits the maximum modulation depth to 96–98 per cent and eliminates the danger of over-modulation.

Modulator principle

As mentioned earlier, the modulator works in Class D configuration. The basic working principle for such an amplifier is that the af signal is fed to the input of a pulse-width-modulator. The output pwm signal carries the information on its width and not on its amplitude. The amplifiers following the modulator would be of switching type, and the pwm signal amplified to the desired level will be demodulated with a low-pass filter.

The af amplifier has audio signals at the input and output but the amplification is carried out with pulses. The switched amplifiers work with high efficiency and the demodulator also has excellent efficiency, so it is clear that the whole amplifier will have good efficiency.

In the case of series modulator arrangement it is suitable to use pulses with a steady state pulse duration of 0·5 for the pwm process.

The simple block diagram of the modulator is given in Fig 3.

AF preamplifier

The af preamplifier amplifies the signal from the microphone to the desired level for the input of the pwm modulator.

The lower part of the af band is attenuated because of the trapezoid modulation. The limiter, located in the af pre-

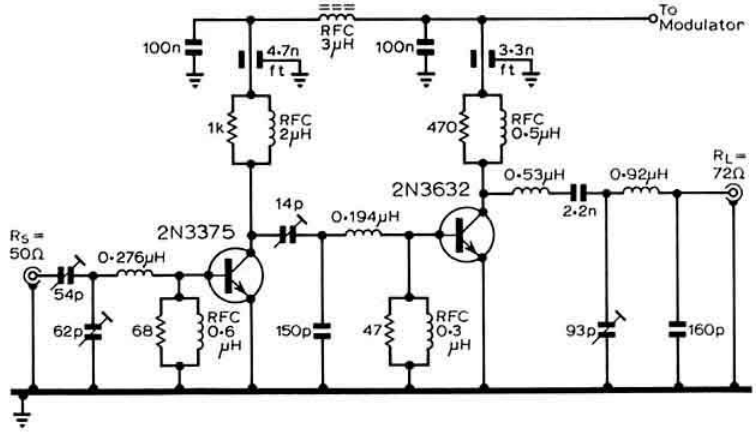

Fig 2. Circuit diagram of the rf amplifier

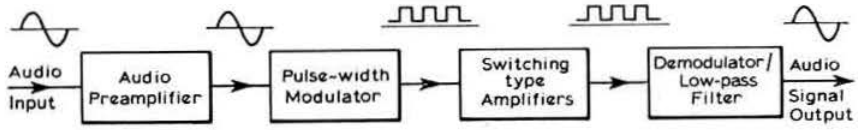

Fig 3. Simplified block diagram of the Class D audio amplifier

amplifier part of the modulator, clips only one part of the signal (asymmetrical clipping). The other part is clipped by the modulator itself. At the output, symmetrically clipped audio signals are obtained.

Pulse-width modulator

The pulse carrier frequency for the modulator depends on the highest af required for transmission. The minimum value for the switching carrier must be six to seven times that of the highest audio frequency. To obtain trapezoid modulation with little shape distortion, the carrier minimum must be 27kHz.

The switching element applied to the modulator ensures the use of a higher frequency, such as 35kHz, which is better from the point of view of the demodulating low-pass filter.

The pwm modulator receives triangular shaped signals of 37kHz frequency on one of its inputs, and the af on the second input. The pwm signals appear at the output of the former.

Pulse amplifier

The pulses from the output of the pwm modulator are amplified by switched stages. The efficiency of the amplifier is determined by the following factors:

1. The saturation voltage of the active elements.
2. The switch on and off times.
3. The saturation voltage of the damping diodes and the diode switching time.

It is not too difficult to obtain an amplifier with efficiency higher than 0·9.

The distortion of the amplifier in the given configuration largely determines the switching time of the elements. The distortion occurs at higher output levels. The maximum modulation depth where the distortion is still low is approximately determined by the following equation:

$$m_{max} = 1 - 2\frac{t_{off}}{T}$$

where T = the switching signal period time.

t_{off} = switch off time for the last switched stage.

In this amplifier $t_{off} = 0{\cdot}3\mu s$ and $T = 27\mu s$. From this data the maximum modulation depth will be 0·98, which is sufficient for our purposes.

Demodulator for the pwm signals

Fortunately the demodulation process is simple and is carried out by a low-pass filter. This is the last element in the modulator chain, so all the undesired frequency components are attenuated by it. The trapezoid signal transmission requires good amplitude and phase characteristic from the filter to ensure low shape distortion.

The author chose a filter cut-off frequency of 4·5kHz (at the −3dB point) to retain a good transfer characteristic for the clipped 300-500Hz frequency components and also for the harmonics.

It is important to note that the filter inductors are constantly magnetized by the dc current for the carrier power flowing into the modulated stage.

Details of the modulator, Fig 4

The signal from the microphone is connected to the input of the audio amplifier having two stages, TR1 and TR2 with the level control potentiometer between them. The lower audio frequencies are attennuated by an RC network to obtain good frequency shaping before clipping.

The phase difference between the limiter and the output of the amplifier is 180°. The limiter located at the output of TR3 limits the upper half of the signal but this means a lower level limitation at the output of the limiter.

The amplifier at the output of the limiter has good frequency response from zero hertz, so this excellent low frequency transmission provides a good trapezoid signal envelope on the carrier without any shape distortion.

The pulse-width-modulator (TR6, TR7 and TR8) is driven on one of its inputs with triangular shaped signals produced by TR12, TR13 and TR14.

The power amplification follows after the modulator. Its first stage is an emitter-follower (TR9). The driver (TR10) and the power stage (TR11) give sufficient output power for the modulation of the rf amplifiers. TR11 works on the input of a low-pass filter and the A1 mode is obtained by the TR5 stage.

Modulator circuit arrangement, Fig 5

The transistor TR1 fulfils two tasks: it gives high input impedance for the microphone (about 80kΩ) and acts as a low noise preamplifier.

The level control potentiometer RV1 is connected at the output of TR1 and controls the depth of modulation until the input level reaches the limit of the clipper, when it controls the degree of limitation up to 15dB. The arm of RV1 feeds the high-pass filter to form the frequency response for trapezoid modulation.

TR2 is a simple amplifier followed by an emitter follower (TR3) to drive the limiter which consists of the resistance dividers and diode D2. The supply voltage of the limiter is stabilized by D1 at 9V.

The limiter output is connected to RV2 to vary the maximum modulation depth. The amplifier (TR4) also amplifies the dc component. This means that RV3 controls the variation of the carrier level or the steady state dc voltage at the output of the modulator. To eliminate this unpleasant effect the dc working point of the TR4 amplifier must be moved independently by RV3 working only in A3 mode. This independent control ensures exact control of the carrier level and modulation depth.

The A1 mode is obtained simply by moving the working point of TR4 from the open to the closed state. In this case the output voltage swings from zero up to the supply voltage at the output of the modulator. The switch K1 varies the mode of operation from A1 to A3. The use of a key having the grounded contact for its body is ensured in A1 mode with the interconnection of TR5. The RC elements located in the collector circuit of TR5 shape the cw pulses. With the given value, the switch on and off time for the cw pulses will be about 8ms.

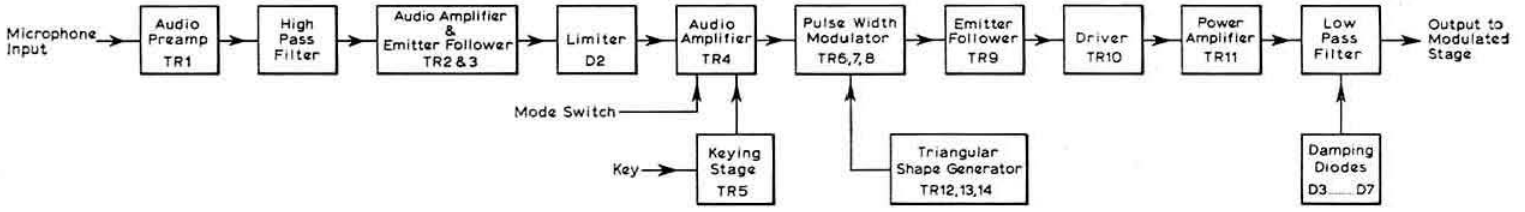

Fig 4. More detailed block diagram of the modulator

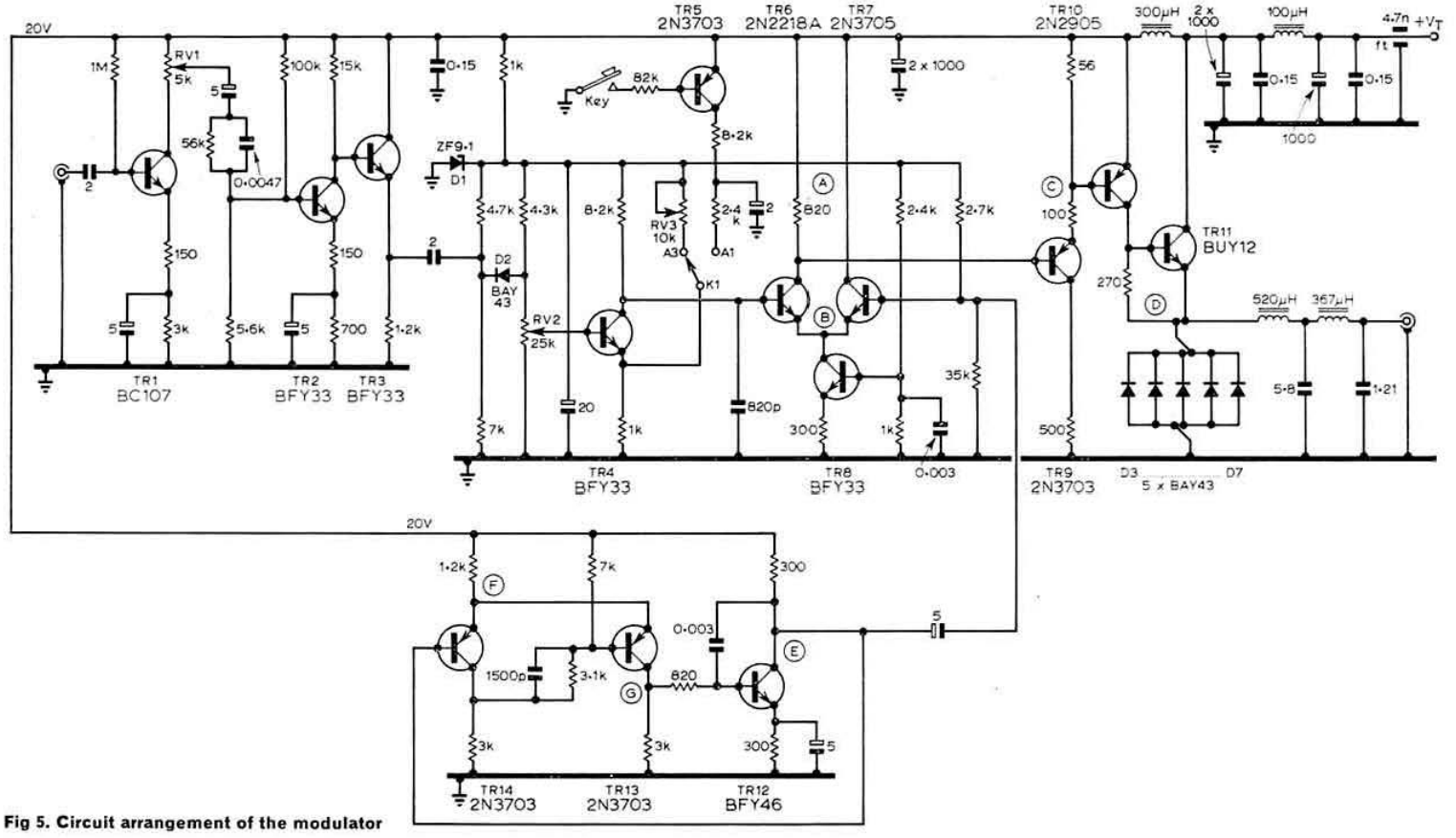

Fig 5. Circuit arrangement of the modulator

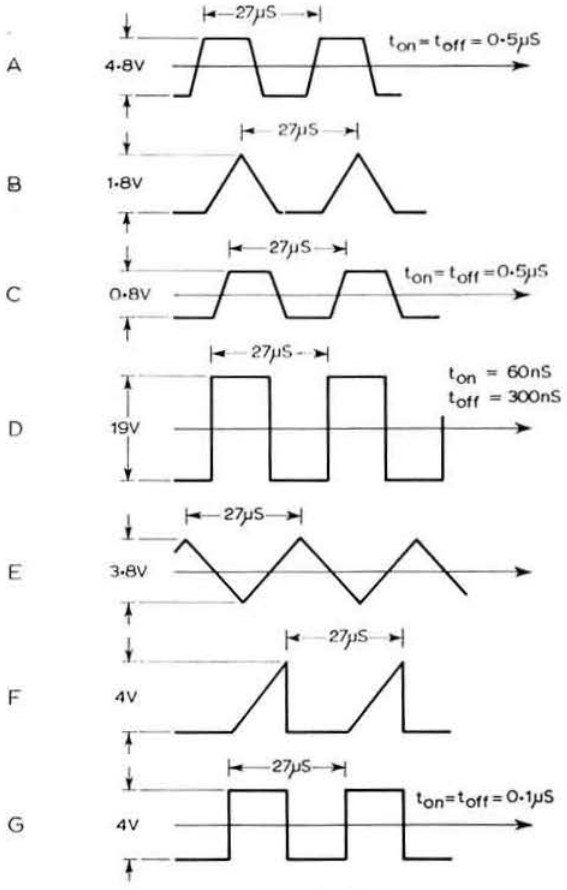

Fig 6. Shape and amplitude of the signals at some interesting points of the amplifier, measured in A3 mode at m = 0

TR4 receives stabilized supply voltage in order also to stabilize the steady pulse duration.

The pulse-width-modulator has three stages and its working principle is as follows. TR8 is a current generator, its current being gated by TR6 and TR7. The duration of the pulses is determined by the af signal feeding the base of TR6. The triangular signal goes into the emitter of TR6 with the assistance of an emitter follower TR7. This kind of pulse-width modulator works with low distortion and fast switching times.

The triangular signal generator having a 35kHz frequency is constructed with transistors TR12 to TR14. The circuit is a feed-back amplifier with an integrator (TR12) and Schmidt trigger TR13 and TR14 in its loop. Its working frequency is determined mainly by the integration time of the integrator and the hysteresis of the Schmidt trigger.

Some signals are shaped in the amplifier and their amplitudes are given in Fig 6.

The modulated pulses are amplified by TR9 and TR10, and finally by the TR11 emitter follower which gives faster switching properties for the BUY12 transistor.

The damping diodes are connected in parallel because of the lack of a fast switching high current diode.

The fast high current pulses can easily enter other units of the station, especially the receiver, if working with a common power supply. To eliminate this effect it is advisable to use low-pass filters in the positive supply line as shown in Fig 6. The high filter electrolytic capacitors decrease the effect of the source resistance of the battery.

The output transistor works with a maximum switched current of 2A determined by the load resistance produced by the rf amplifier and the supply voltage.

If a faster switching high current transistor is available it is better to use it in grounded emitter configuration because in this configuration the saturation voltage decreases.

The design steps for the low-pass filter located at the output of TR11 are given in Appendix 3.

The output of the modulator is connected to the supply voltage input of the rf amplifiers.

Measurements on the actual units

The rf amplifier was designed to give 16W power into the load. The power measurement of the actual amplifier indicated 16W at the output, so the amplifier gives somewhat higher output because the losses occurring in the matching elements were omitted from the design.

The following table illustrates the results measured on the completed amplifier:

	Efficiency (per cent)		Full efficiency
	A3 (m = 1)	A1	
RF amplifier	49	48	36 per cent
AF amplifier	73	88	42 per cent

In the A1 mode the last stage (TR11) works as a switch controlling the supply voltage to the modulated stage.

To design the cooling area for TR11 its dissipated power must be known, and the measurements show that the full power losses in the damping diodes and transistor TR11 together are about 1·6W. For this low heating power the diodes and transistor do not require a high cooling area and it is sufficient to use a small part of the printed circuit to conduct the heat into the air. For this cooling process some parts of the conductor layer of a double printed circuit were used.

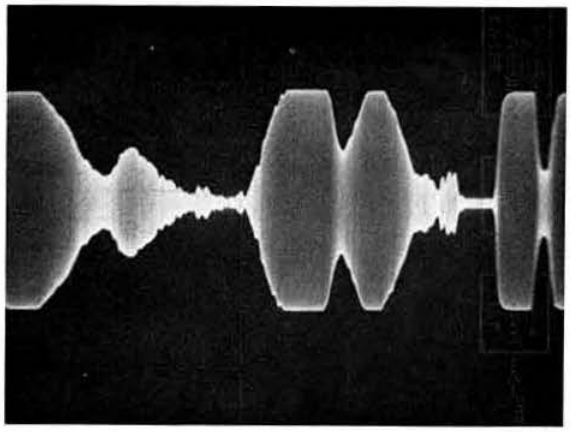

Fig 7. Envelope of the output rf signal, having trapezoid modulation

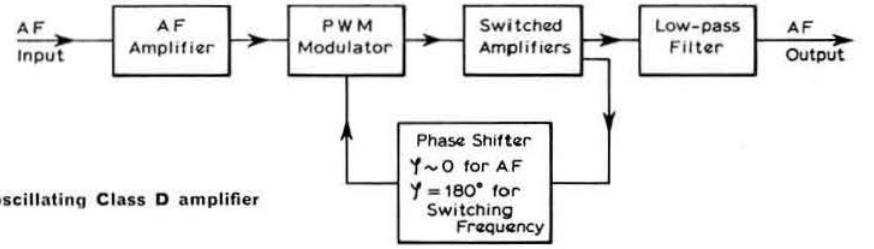

Fig 8. Block diagram of a self-oscillating Class D amplifier

The carrier envelope at trapezoid modulation is shown in Fig 7, in which the good clipping effect of the modulator without any swing on the envelope can be seen.

Self-oscillating Class D modulator

In the modulator amplifier described above, the pulse carrier comes from an independent triangular shaped signal producing stage, but there is another way to produce the switching frequency with the amplifier itself. This somewhat simpler version results in some unwanted spectrum arrangement but this is not a great disadvantage for amateur equipment.

Fig 8 gives the block diagram of the amplifier. At first glance the arrangement appears to be of an oscillator, and, indeed, for the switching frequency the amplifier is working as an oscillator with an oscillating frequency of about 35kHz. The high feedback ensures that the driver and power amplifier is overdriven and is working as a switch.

The phase shift network has no effect on the audio signals. The feedback will be positive for the pulse switching frequency and will be negative for the af signals. This means that the feedback network should be a low-pass type.

There is little need for negative feedback for af because the shape of the pulses coming back from the output and being fed to the input of the modulator is nearly sinusoidal. From this it is clear that the amplifier will hardly distort at high levels when the sinusoidal signal has non-linear shape. The sufficiently high negative feedback takes off this effect and gives good linearity for the amplifier.

The actual circuit diagram is shown in Fig 9. TR1 is an af amplifier which drives the pulse-width modulator constructed with TR3. TR2 is an emitter follower.

The switching signal and the af are also connected to the base of TR3. With RV2 the working point of TR3 can be controlled. TR4 is a matching stage driving TR5. There is feedback between the base of TR5 and the emitter of TR6 which lowers the distortion in the loop, in the complete amplifier two negative feedback paths exist.

The exact working of this loop feedback is complex, but with the 50kΩ potentiometer, low distortion can be produced if the output audio signal is checked on an oscilloscope at the same time.

The output power of the amplifier is 80W, which means that an rf amplifier which has 20W carrier power can be modulated. The full efficiency of the modulator is 82 per cent at 20W output. In the circuit diagram the load resistance is 9Ω. When amplifying single sinewave with full drive, the average output power will be 30W. The efficiency in this case will be 85 per cent.

In the A1 mode the switched power is 80W and the full dissipated power is only about 3W.

Conclusions

The author is sure that the use of Class D systems will be widespread in future. In this article he has introduced two types of Class D amplifier as examples for amateur constructors to produce better and simpler amplifiers.

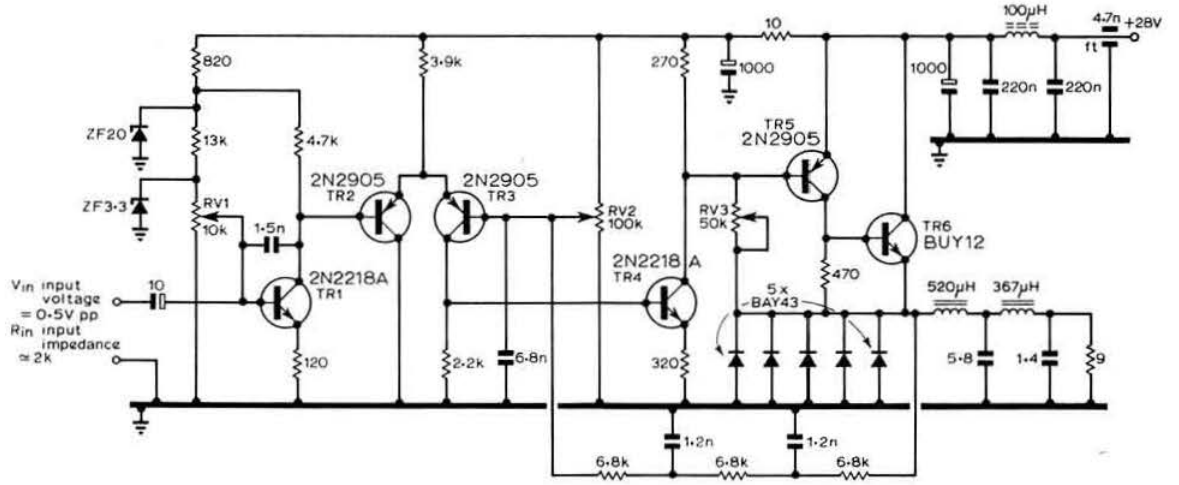

Fig 9. Circuit diagram of a self-oscillating Class D amplifier

With the transistors now being produced the author believes it would be possible to construct better modulators than those using Class B push-pull stages.

Appendix 1. Matching circuit for the input of the amplifier. (Fig 10)

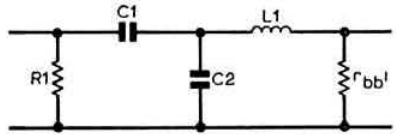

Fig 10. Matching circuit for the input of the amplifier

Commencing data:

Input resistance for 2N3375	$r_{bb'} = 10\Omega$
Driving generator source impedance	$R1 = 50\Omega$
Loaded Q	$Q_L = 5$
Working frequency	$f = 28{\cdot}8MHz$

The elements are determined by the following expressions:

$$x_{L1} = Q_L r_{bb'} \qquad L_1 = \frac{x_{L_1}}{\omega}$$

$$x_{C1} = R1\sqrt{\frac{r_{bb'}(Q_L{}^2+1)}{R1}} - 1$$

$$x_{C_2} = \frac{R2(Q_L{}^2+1)}{Q_L} \qquad \frac{1}{1-\frac{x_{c_1}}{Q_L R1}}$$

$$C1 = \frac{1}{x_{C_1}} \qquad C2 = \frac{1}{x_{C_2}}$$

The results:

L1 = 0·276μH C1 = 54pF C2 = 62·5pF

Appendix 2. Matching circuit design located between driver and power amplifier. (Fig 11)

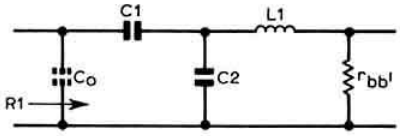

Fig 11. Matching circuit arrangement, locating between driver and power amplifier

Commencing data:

Driver output capacitance	$C_o = 20pF$
Loaded Q	$Q_L = 5$
Input impedance for the pa	$r_{bb'} = 7\Omega$
Optimum loading resistance for driver	$R1 = 60\Omega$
Working frequency	$f = 28{\cdot}8MHz$

With the help of the following formulae it is easy to determine the value of the elements.

$$x_{C_0} = \frac{1}{\omega C_0} \qquad L1 = \frac{X_L}{\omega}$$

$$x_{L1} = Q_L r_{bb'}$$

$$x_{C_1} = x_{C_0}\sqrt{\frac{(Q_L{}^2+1)r_{bb'}}{R1} - 1}$$

$$x_{C_2} = \frac{r_{bb'}(Q_L+1)}{Q_L} \qquad \frac{1}{1-\sqrt{\frac{R1 r_{bb'}(Q_L{}^2+1)}{x_{C_0}{}^2 Q_L{}^2}}}$$

$$C1 = \frac{1}{\omega x_{c_1}} \qquad C2 = \frac{1}{\omega x_{c_2}}$$

After substitution:

L1 = 0·194μH C1 = 14pF C2 = 150pF

Appendix 3. Audio frequency low-pass filter for the modulator. (Fig. 12)

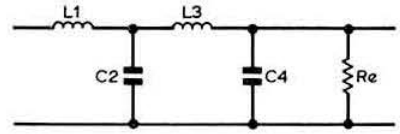

Fig 12. Audio frequency low-pass filter

The filter is driven with about zero source impedance and terminated with 9·6Ω. The 9·6Ω will be the resistance unit.

The −3dB point of the filter will be at 4·5kHz. This is the frequency unit and with it the angular frequency unit will be:

$\omega_e = 2\pi fe$ and $Re = 9{\cdot}6\Omega$

With this data and the equations the values of the filter elements are obtained.

$$L_e = \frac{R_e}{\omega_e} \qquad L_e = \frac{1}{R_e \omega_e}$$

The filter elements:

L1 = 1·531 Le	L3 = 1·082 Le
C2 = 1·577 Ce	C4 = 0·3827 Ce

The results:

L1 = 520μH	C2 = 5·8μF
L3 = 367μH	C4 = 1·4μF

Some part of C4 must be located in the rf amplifier to keep the supply line free of rf signals.

Catalogue received

LST Electronic Components Ltd

The 1971 catalogue contains details and prices of a very wide range of solid-state devices. Transistors, diodes, varicap diodes, encapsulated bridge rectifiers, triacs, scrs, integrated circuits and thick film circuits are all listed in great numbers in addition to a considerable range of opto electronic devices. A section of the catalogue is devoted to capacitors and there are amplifiers offered in kit form. Data sheets for the many items sold by the company are available on request.

Copies of the catalogue may be obtained free of charge but the company would appreciate postage (5p). Requests should be addressed to Mail Order Department, LST Electronic Components Ltd, 7 Coptfold Road, Brentwood, Essex.

MICROWAVES–1,000MHz and up

by Dr D. S. EVANS, G3RPE*

DX on 3cm

G3BNL and G3EEZ will no doubt be claiming a new UK record for 3cm as a result of successful tests over a 105km path from Rhiw in North Wales, across Cardigan Bay, to the Prescelly Mountains in Pembrokeshire. The equipment used 723A/B klystrons and 2ft dishes, and signals were S9 both ways. Signals were also passed one way over a 120km path before rain stopped play. These operators are now very close to earning one of the new Microwave Awards, where the distance required on 3cm is 150km.

As their equipment is typical of that in current use, it is worthwhile speculating on its potential. Signals being S9 implies that there was at least 20dB in hand. Because, over optical paths, the signal strength decreases by 6dB as the length is doubled, the maximum range of this equipment is at least 500km. Unfortunately optical paths of this length are very scarce in this country.

It is, therefore, interesting to ask why, with such equipment, it is sometimes impossible to make contact over paths much shorter than this; a rough calculation will indicate that the chances are usually against it. The relevant factors are the uncertainties in the frequency of the transmitter and of the receiver local oscillator, and the direction in which the dishes are aimed at each end. Consider a system using 2ft dishes, with an uncertainty of $\pm$ 10° in their direction, and of $\pm$ 5MHz in frequencies. These figures are probably conservative. Since the 3dB beamwidth of the dishes is 4°, five positions of each dish require testing. Assuming a receiver bandwidth of 1MHz, 20 different receiver settings require tuning. At worst, therefore, 500 combinations would have to be checked, and checked *systematically*, before contact was made.

Fortunately the chances of making contact can be increased significantly by improved control of these variables, and without doubt the success of G3BNL and G3EEZ is a reflection of the degree of control they have achieved after much effort. With a sufficiently high degree of control, contacts over paths approaching the maximum for the equipment can in fact be guaranteed. The conditions for this are, firstly, that the combined error in defining the transmitter and receiver frequencies is smaller than the bandwidth of the receiver (say 1MHz), and secondly, that both aerials can be pointed in the right direction with a precision better than their beamwidths. In practice the degree of success will depend on how near both stations approach this ideal control.

Dealing here with aerials, a desirable objective is to arrive on site and to be able to point the aerial precisely in a given direction, conveniently with reference to the National Grid, and to be able to maintain its position under even adverse conditions. The aerial system therefore requires to be engineered rather than tied together with pieces of string. Using beamwidth defined by 3dB points as a guide, the precision required varies from $\pm$ ½° for a 6ft dish to $\pm$ 4° for a 1ft dish. Note that these figures normally also apply in the vertical direction, and that errors due to squint of the aerial require calibrating out. From this it is clear that even with a 1ft dish some care is required: by using larger dishes, one may significantly reduce the chances of making contacts unless the precision of controlling the direction of radiation is correspondingly improved.

Frequency checking on 3cm

With the use of free-running oscillators, such as klystrons, it is essential to have some sort of wavemeter built onto the equipment. Its precision should obviously be as high as possible, certainly better than $\pm$30MHz. One that can be built reasonably easily, *and* which is self-calibrating to within 10MHz, sounds too good to be true. But it can be done, as is described in the second edition of the RSGB *VHF-UHF Manual* published recently. As an amendment to this article, the coupling probe should be trimmed in length in situ to produce the minimum convenient "suck out" (say, 10 per cent) as indicated by the power indicator in use.

While $\pm$10MHz is sufficiently precise to make sure that operation is in the right part of the band, it is still a far cry from the $\pm$250kHz which is necessary according to the argument given in the previous section. Fortunately, advantage can be taken of existing crystal-controlled equipment to provide markers having this degree of precision. In recent experiments at G5FK it was demonstrated that feeding the attenuated output of 2m, 70cm or 23cm transmitters into standard diode mixer units (such as described in this column in May 1971), produced sufficient output at 10GHz to be readily detectable in a receiver placed many feet away. The drive required was tens of milliwatts and sufficient to produce several milliamperes of current.

Most current 3cm operation is in the range 10,000 to 10,100MHz, with some preference for 10,035 and 10,065MHz as spot frequencies. To generate a marker at 10,035MHz, for example, the eighth harmonic of 1,254MHz from a 23cm transmitter, or the ninth harmonic of 1,115MHz from a "1,152MHz" driver may be used. Drivers at lower frequencies give more choice of harmonics, thus reducing the need to retune the transmitters, at the expense of lower output and of greater risk of confusion. Thus as well as the 24th harmonic of a 418·23MHz transmitter (say, using a 7·745MHz crystal), the 23rd harmonic of 436·20MHz (8·080MHz crystal) may be used to produce markers at about 10,035MHz. It is also practical to use the 69th and 70th harmonics of 2m transmitters.

Another way of avoiding retuning transmitters is to use the second channel response of a receiver. For example, a transmitter on 433·7MHz will generate a 23rd harmonic at 9,975MHz. A receiver with a 30MHz i.f. tuned to this frequency will have the local oscillator, if on the high side, on 10,005MHz. A transmitter tuned to the second channel will then be on 10,035MHz. This technique works particularly well with a first i.f. in the 150MHz region.

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

Using the SL630

by J. M. BRYANT, linear applications engineer,
The Plessey Company Ltd

The Plessey SL630 is an audio amplifier encapsulated in a 10-lead TO5 package. It has about 60dB internal gain control and mute facilities, and will deliver just under 200mW of audio into a 40Ω load when used with a 12V supply. Its circuit diagram is shown in Fig 1. It is a member of the Plessey SL600 family of integrated circuits for communications applications, which also contains rf amplifiers, double balanced modulators and agc generators—one, the SL620, is designed for use with the SL630.

The most effective way of describing the use of the SL630 is to deal with the device lead by lead, starting with lead 1, the output. To maintain hf stability—particularly on negative half-cycles—the output should be earthed by a 1,000pF capacitor having a low series inductance. The output is coupled to its load with a capacitor having a low impedance relative to the load at the lowest frequency to be used. The load may be resistive or reactive and, for maximum power output, should lie on the load/supply voltage line in Fig 2. Any higher value of load impedance is quite safe but, although the SL630 will not instantly "blow" if the output is short-circuited, it will over-dissipate and eventually destroy itself by overheating. The optimum load, therefore, at any rate with supplies of over 9V, should be regarded as a safe minimum. The circuit shown in Fig 3, which shows the SL630 used as a headphone amplifier, may also be used with loudspeakers having suitable impedances. The distortion is about 0·5 per cent at full output.

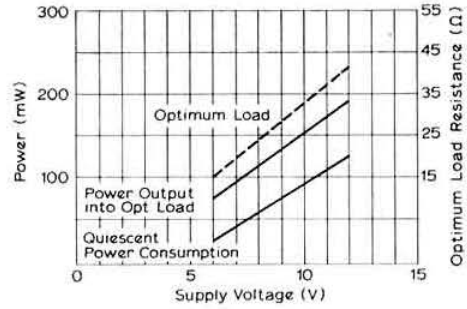

Fig 2

The power supply, to pin 2, should be between 6V and 12V and adequately decoupled both at hf and lf. The quiescent power consumption at various supply voltages is shown in Fig 2, as is the relation of the supply voltage to the optimum load and the maximum power available.

A capacitor connected to pins 3 and 4 defines the high frequency response of the amplifier. The upper 3dB frequency, f, is given by the formula:

$$f = \frac{16{,}000}{C + 20} \text{ kHz (C is in picofarads).}$$

Pins 5 and 6 are input terminals. They may be used together as a differential input and in this mode have an impedance of approximately 2kΩ and a voltage gain to the output (without gain control) of 100 (40dB). When a magnetic transducer or a transformer is used to supply signal to an SL630 this input mode should be used as the signal winding may be connected directly between pins 5 and 6 and no other components are needed. This input is also recommended when the SL630 is being used with an SL620 in the automatic gain control system described below.

An input may also be applied between pin 5 and earth. In this case the gain is 200 (46dB) and the input impedance

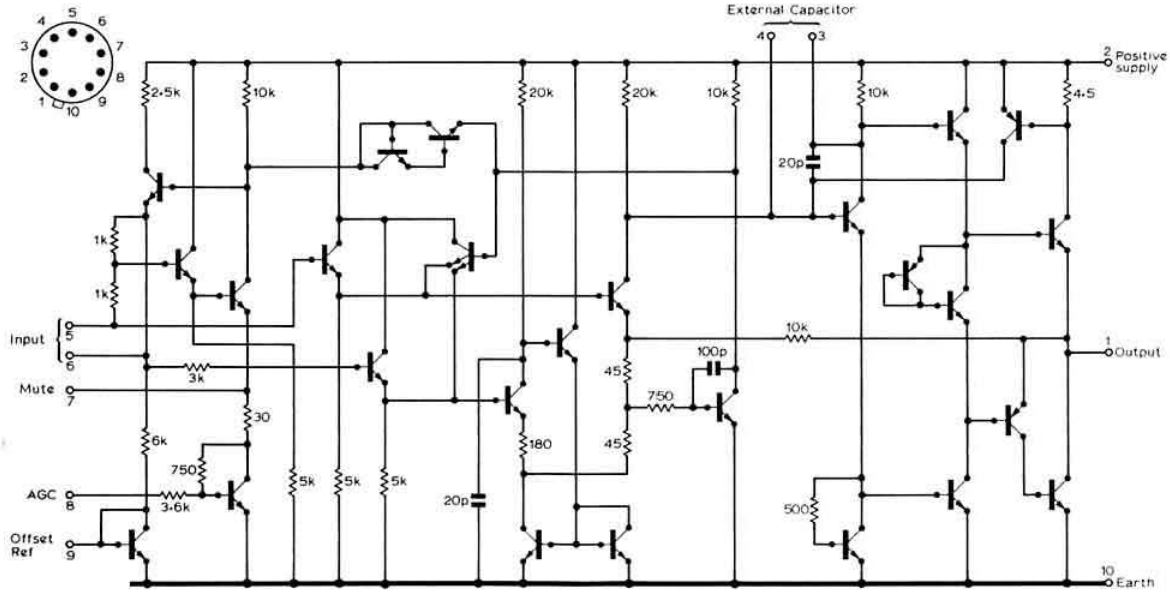

Fig 1

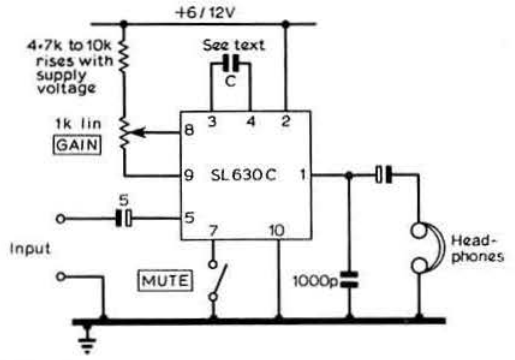

Fig 3. Circuit diagram of a headphone amplifier using the SL630

1kΩ. Pin 6 should be left open circuit. A coupling capacitor is needed between the input and pin 5.

The circuit is muted by earthing pin 7. A muted circuit attenuates an input by about 100dB and presents a high impedance at its output. Several SL630s may, therefore, have their outputs connected together, and hence to a load, without ill-effect provided all but one are muted at a time.

Gain control is applied to pin 8 which has an input impedance of 3·6kΩ. The gain control characteristic is illustrated in Fig 4. It must be appreciated that even with full gain control the input cannot exceed approximately 50mV rms without clipping so that at high gain control levels the output level is limited. The gain control characteristics shown in Fig 5 will vary with temperature but, as shown in Fig 3, a potentiometer connected to give manual gain control can be connected to the internal bias point at pin 9 which provides a temperature compensated reference at the voltage at which gain control commences.

Pin 10 is the signal earth and negative power supply connection.

To apply automatic gain control to an SL630 an SL620 should be used in the circuit shown in Fig 5. To preserve lf stability and prevent motor-boating, C1 and C4 should not exceed the values given and, while R1 should not in any case exceed 330Ω, the time constant C3 R1 should not exceed 800μs.

The system in Fig 5 will adapt quickly (20ms) to incoming signals, apply short-lived gain control to limit noise bursts, track rising and fading signals at up to 20dB sec^{-1} and retain an agc level unchanged during a temporary absence of signal (as in pauses between words). If such an absence of signal becomes prolonged beyond a certain time (which is defined by C7 and is roughly one second per

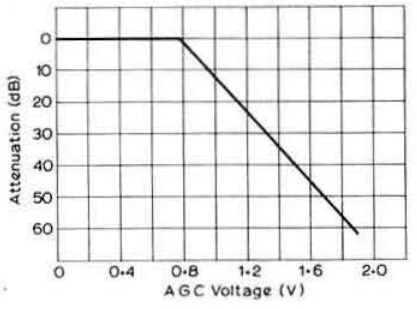

Fig 4

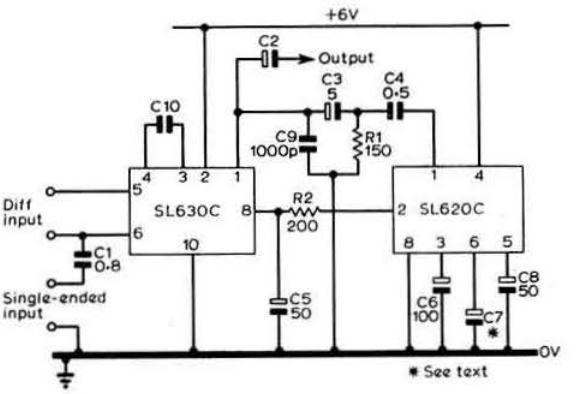

Fig 5. Audio amplifier with agc applied

hundred microfarads of C7 capacity) full gain is restored to the system in about 200ms.

The output from an SL630 so controlled varies little from 80mV rms as the input varies from 0·5mV to 50mV. The system may be used as a decibel meter with a linear scale covering some 40dB by inserting a voltmeter between pins 8 and 9 of the SL630. The agc voltage changes by approximately 17·5mV per dB as the input increases. The power supply to the agc system in Fig 5 should be particularly well decoupled at lf.

The SL630 has many uses in microphone and headphone amplifiers, telephone and intercom systems and various low power loudspeaker output stages. When used with age it is useful in transmitters to ensure constant modulation depth and in tape recorder level meters and speech age amplifiers.

BOOK REVIEW

The Semicon Index, volume 1, 2nd impression 1971. 356 pages. 20,000 entries. Compiled and published by Functional Publication Services Ltd, 29 Denmark Street, Wokingham RG11 2AY, in conjunction with Avo Ltd, Dover, Kent. Price (single copies) £5.25 post paid in the UK. Europe, £5.80, elsewhere £6.10.

The Semicon Index series is designed to provide engineers with comprehensive technical data on both discrete and integrated circuit elements in the semiconductor field. The first volume in the series provides complete information on transistor types and has been prepared in conjunction with Avo Ltd whose well-known transistor data manual it replaces. A new and expanded format enhances the value of this book which lists information on type numbers, CV numbers and manufacturers, in addition to the basic information which is the purpose of the volume. The book contains four sections; Introduction, Transistors up to 1W rating, Transistors over 1W rating, and Additional Data. The second section, for instance, contains six sub-sections listing the *p* and *n* versions of germanium, silicon and field effect transistors. In the latest impression the information on base connections has been considerably expanded.

The type explosion in the semiconductor world has created many difficulties for the ordinary user and reference to this volume will certainly solve many of these, The cost, acceptable to the engineer and constant user, may be considered high for the casual user, and in this case the book would be a valuable addition to any club library. *R.F.S.*

C

A stable vfo for 2m with fm

by H. L. GIBSON, MIEE, G8CGA*

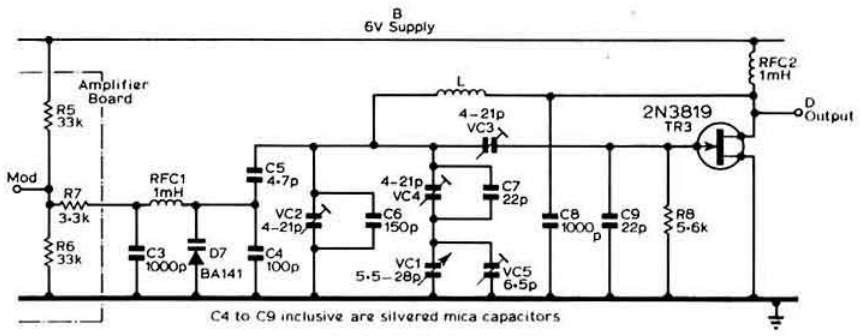

Fig 1. Oscillator circuit

SINCE a note by G3PDM was published in *Technical Topics* in December 1969, there has been a considerable increase in vfo operation on the 2m band. The variant described here has provision for direct fm of the oscillator, increased isolation in the buffer amplifier and a high order of stability in the dc supply. Apart from its use as a transmitter driver, it was intended that the vfo should provide a signal source of accurate and consistent calibration so the frequency pulling due to load changes had to be made very small. Since the dc supply to the oscillator also provides bias for the varactor, an unusually elaborate voltage stabilizer was used as well as rough stabilization to the amplifier by a zener diode.

The oscillator

The oscillator operates at 12MHz and the circuit is shown in Fig 1. The trimmers VC2, VC3 and VC4 are all air dielectric variable types giving control of tuning range, feedback and frequency respectively, although all are inter-dependent. VC5 is a Tempatrimmer of 6·5pF capacitance, and provides an adjustable temperature coefficient from +2,000 to −2,000 ppm/°C. Frequency modulation is produced by a varactor but its effect is reduced by a small series capacitor and a large shunt capacitor, the overall effect being to produce 3kHz deviation at 2m for an audio signal of 1V peak.

The varactor is biased to one half of the stabilized oscillator supply voltage by a potential divider of 33kΩ + 33kΩ. Much higher values were originally used but it was found that small changes of varactor leakage current with temperature led to a change of frequency. The deviation for a 1V audio signal can conveniently be checked by shunting the lower 33kΩ resistor with another of equal value. This changes the bias from 3V to 2V approximately; if required frequency shift does not occur, either the series or shunt capacitors may be modified. Care is needed to prevent rf being fed into the audio amplifier; until the choke-capacitor-resistor (RFC1 C3, R7) network was fitted there was a small frequency shift when the gain control of the speech amplifier was varied.

The setting of the feedback capacitor VC3 is most important in achieving good frequency stability; no more feedback should be applied than is necessary to provide certain oscillation over the band. This was achieved with the variable trimmer rather less than half meshed, representing about 12pF. With the feedback set and VC2 and VC4 adjusted so that the required tuning range is just covered by the full range of VC1, the frequency drift should be examined with the Tempatrimmer in its mid position. A likely result is an increase of frequency of some 9kHz at 2m during the first two minutes, due mainly to heating in the transistor, followed by a similar drift over the following 20 minutes as the whole unit reaches a stable operating temperature. This second drift can be almost entirely eliminated by careful adjustment of the Tempatrimmer, and frequency stability from hour to hour of ± 100Hz is achievable.

During construction it is worth taking care that no connecting leads are in a state of mechanical stress: such leads tend to move with time and during heating cycles which leads to small changes of calibration. The coil was wound on a polystyrene rod and heavily doped with polystyrene cement. The fixed capacitors were anchored to solid objects with Araldite, which was also used to anchor the output lead as it passed through a hole in the cast box.

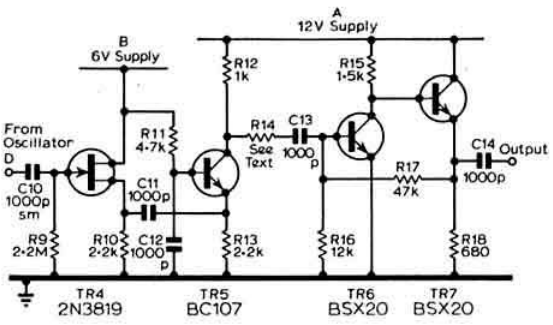

Fig 2. Amplifier circuit

The amplifier

The oscillator output is only a few tens of millivolts and this must be raised to about 1V. Existing amplifier designs did not seem to give sufficient isolation, and two additional stages were added. The first of these, TR4, is a fet as a source follower feeding a bipolar transistor, TR5, with rf grounded base. The collector output from TR5 drives a conventional feedback amplifier, the resistor R14 controlling the current drive to the base of TR6; this may be any value from zero upwards and in the original design was 2·2kΩ.

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The power supply

The vfo is mains driven using OA202 diodes in a bridge rectifier followed by a capacitor-resistor-capacitor filter. An earlier version used a single diode half-wave rectifier but produced an unacceptably rough note. The source resistance of the supply plus the smoothing resistor adequately limits the current through the 12V zener diode to about 10mA, the current drain of the amplifier and oscillator being 24mA. The highly stable supply for the oscillator and first buffer amplifier uses a GET103 as a controlled series transistor, the output voltage being that of the zener diode plus the forward drop across one OA202 diode. Should it be desired to operate the oscillator from a battery supply, this stabilizer circuit will give substantially constant output until the battery has fallen to 6V. If a 9V battery is used to supply the entire vfo, the total battery drain is 22mA.

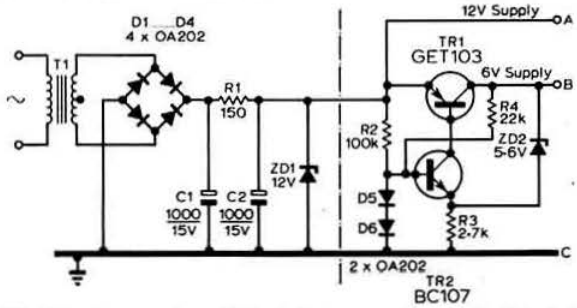


Fig 3. Power supply unit (for battery operation omit all to left of dotted line)

Construction

The oscillator was constructed in a cast box 4½in by 3½in by 2in, while the amplifier and power supply components were in a similar box. In the prototype, the two boxes were bolted together, but a small gap between them might be an advantage to reduce heat conduction to the oscillator components. However, the Tempatrimmer will compensate for heating from the components or changes of ambient temperature. The layout in the oscillator box is sketched in Fig 4 but is not important provided that every component is rigidly mounted or "Araldited" to one that is.

The tuning capacitor was bolted directly to the base of the box and all the air-spaced trimmers were mounted off the base by 2BA bolts. TR3, R8, C8 and C9 were mounted on a piece of 0·15in matrix Veroboard about 1in square also mounted on a 2BA bolt. The 6V supply, audio and rf output leads pass through clearance holes in the walls of the two boxes and were "Araldited" to prevent movement. The amplifier and the stabilizer are mounted on a strip of Veroboard 3¾ by 1½in; the only important connection is the rf ground to the base of TR5 which should be short and direct. The mains transformer, rectifiers, smoothing components and zener diode occupy the rest of the box and could, of course, be replaced by a battery for mobile operation.

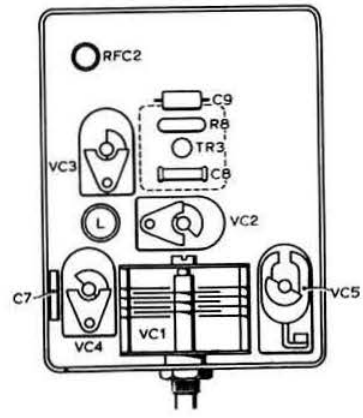


Fig 4. Approximate component layout of oscillator

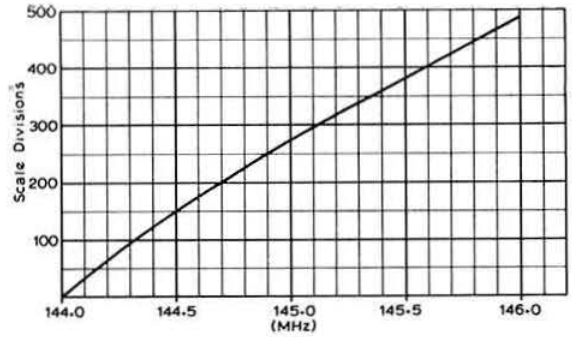


Fig 5. Calibration curve for 12MHz vfo in terms of 2m frequencies

Calibration

Calibration should not be attempted until the vfo can be vigorously tapped with little transient change of frequency and no permanent change at all. It should also be heat cycled a number of times, preferably to a higher temperature than it will ever reach in practice (say 50°C) as this helps to relieve mechanical strains in the wiring and components. Screwing the lid on to the oscillator box has a considerable effect on frequency and the final adjustment of the trimmers for frequency and bandspread will have to be done by cut and try. In the final stages, the lid should be firmly screwed at each corner. The calibration of the prototype was reasonably close to linear, as can be seen from Fig 5.

Components list

C1, 2	1,000μF 15V	R11	4·7kΩ
C3	1,000pF	R12	1kΩ
C4	100pF silvered mica	R13	2·2kΩ
C5	4·7pF silvered mica	R14	see text
C6	150pF silvered mica	R15	1·5kΩ
C7	22pF silvered mica	R16	12kΩ
C8	1,000pF silvered mica	R17	47kΩ
C9	22pF silvered mica	R18	680Ω
C10	1,000pF silvered mica	T1	Radiospares miniature mains—2, 6V secondaries in series
C11-14	1,000pF		
D1-6	OA202		
D7	BA141	TR1	GET103
L	17 turns close wound 18swg enamelled on ⅛in diam polystyrene rod (1·1μH)	TR2	BC107
		TR3	2N3819
		TR4	2N3819
		TR5	BC107
R1	150Ω	TR6, 7	BSX20
R2	100kΩ	VC1	Polar type C28. 6 gaps of 0·015in (5·5-28pF)
R3	2·7kΩ		
R4	22kΩ	VC2, 3, 4	Polar type C31. 9 gaps of 0·015in (4-21pF)
R5, 6*	33kΩ		
R7*	3·3kΩ	VC5	Oxley Tempatrimmer 6·5pF
R8	5·6kΩ		
R9	2·2MΩ	RFC1, 2	1μH
R10	2·2kΩ	ZD1	12V
*these resistors are mounted on the amplifier board		ZD2	5·6V

The short path to "G" on 160

by G. ALLEN, WIA L6042*

Initial exploratory skeds between G and VK6 took place in 1966 about the time of an equinox, which was thought to be the most suitable period, but although these met with limited success on the receiving side, there were no QSOs. The first organized tests, around the December solstice, sparked-off by G3IGW and VK6NK, were successful beyond all expectation and resulted in two QSOs between those stations. In addition, there were several near-misses, and the change to the solstice period appeared to have been a step in the right direction.

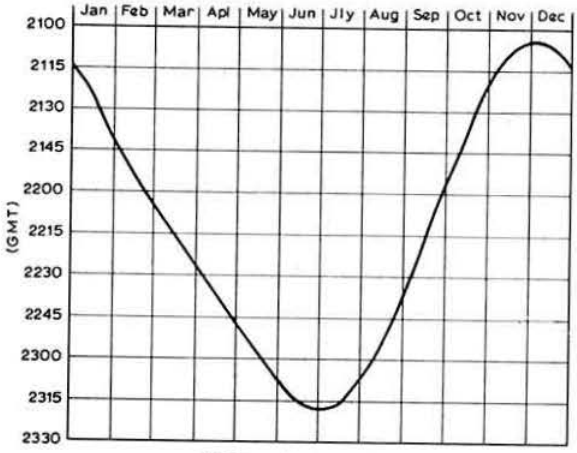
Further tests were then organized to embrace November, December and January 1970-1, and these were even more successful, as results already published show—due to the excellent support from a number of Eu stations to whom we are indebted. Again, there were some near-misses, which it is hoped to rectify in the next tests later this year—as happened last season when previously disappointed Eus eventually made good.

In the hope that next season will be even more rewarding, it is now proposed to offer some observations, based on experience to date, which might help towards a better understanding of some of the factors involved. Analysis of the results achieved over the past two seasons, backed-up by some more random observations before that, has shed considerable light on what was previously a dark subject, enabling some interesting conclusions to be drawn for future use.

In the first place, the west coast of VK6 appears to have the edge on the rest of VK, in that the path is the shortest to Eu, with a clear take-off over the Indian Ocean to the northwest. It will probably surprise many that none of the Eu dx over the past two seasons has been heard elsewhere in VK—despite an almost unbroken vigil on the band throughout the entire year by VK5KO some 1,500 miles east of Perth! Collaborators in VK3 also reported a nil result, though their effort was on a smaller scale. So, for reasons yet to be determined, VK6 has a decided advantage—at the moment!

Further tests as the solar-cycle declines will obviously be necessary before any hard-and-fast conclusions can be drawn, but a pattern begins to emerge indicating that the December solstice is *the* time to try for that elusive VK QSO.

Except for very isolated cases, band openings hinge upon sunrise in VK6, occurring, roughly, some 45min before it and usually lasting for some 15min afterwards. Depending upon prevailing conditions, though, the band may open for only a few minutes. During what might be termed a normal opening, there is usually a peak in signal strength some 15min before the sun rises, and this is when the weaker



VK6 sunrise curve

down-in-the-noise signals are sometimes readable. Fade-out has occasionally occurred *before* sunrise, though this is comparatively rare.

A knowledge of VK6 sunrise times is essential, as knowing when to try is half-way towards success; so, for those interested, a graph showing VK6 sunrise over a year is given. A popular method of showing such times is by tabulating them over a year, but this is rather more cumbersome than necessary. It is relatively easy to display such information in the form of a curve, from which the required time can be readily extracted for any part of a year.

It may not generally be appreciated that sunrise/sunset times recur every four years, for a given locality, with insignificant differences in the interim, and hence a graph for a particular QTH will need no future amendment. The graph is quite accurate for the purpose, and it will be noted that VK6 sunrise has been related to gmt, which puts a given date one day *behind* VK6 local time, which is eight hours ahead of gmt. This should be borne in mind to avoid confusion.

The result of analysing all the available data on band conditions over the past five years is shown in the table, giving for each month the number of days observed (**O**), and the number of days on which Eu dx was heard (**H**). This clearly indicates the superiority of the December solstice over that of June, although, admittedly, there was much less band cover during the June solstice. DHJ was once heard in July: the only sign of life ever noted at that period.

Organized tests around the June solstice should throw further light on how the band behaves at this, so far, lean period, but it is thought that QSOs then are unlikely—though there is some evidence of June reception of VK6 from EI9J. One-way skip, already noted over the path, may then operate and the logical procedure would be to probe this point further.

There is a difference between our summer and winter solstices which might not readily be appreciated without due consideration of some geographical and meteorological factors which may influence results. It appears that one significant factor at the June solstice is that the north polar region is then in its daylight phase, and the difference, then, between G sunset and VK6 sunrise is only some three hours—as against five-and-a-quarter hours at the December

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Analysis of dx heard in VK6

	1966		1967		1968		1969		1970		1971	
	O	H	O	H	O	H	O	H	O	H	O	H
Jan.			1	0	1	1	3	1	12	3	26	9
Feb.			2	0	4	1	1	0	2	0	12	5
Mar.	3	0	4	0	1	0	2	0	4	0	12	2
Apr.	1	0	1	0	6	1					4	0
May					2	0	2	0				
Jun.					2	0			5	0		
Jly.	1	0			2	0	1	0	6	0		
Aug.												
Sep.	13	1			2	0	2	0				
Oct.	1	0					1	1	3	1		
Nov.	2	2					6	4	9	4		
Dec.					1	0	20	13	24	21		

solstice—which seems to have an important bearing on propagation conditions over the path.

As the ionosphere undergoes marked changes at night, it is conceivable that there is less time for it to stabilize in June than is the case in December, when the north polar region is in its seasonal dark phase. Because of differences in latitude, the total variation in G sunset times, from one solstice to the next, is about four-and-a-half hours, and in the same period VK6 sunrise varies by only half that amount—which might be a significant relationship. Though this may be quite fortuitous, nevertheless the known facts do support this idea.

Tabulating the monthly (average) differences between G sunset and VK6 sunrise gives the following result:

December 5.15 hours

November 5.0 hours	January 5.07 hours
October 4.30 hours	February 4.40 hours
September 4.0 hours	March 4.12 hours
August 3.30 hours	April 3.40 hours
July 3.03 hours	May 3.11 hours

June 2.55 hours

This shows a slight bias in favour of December to June, as against June to December, and, roughly, it can be stated that between the September and March equinoxes (including the December solstice) path prospects have ranged from good in the five-hour months to fair in the four-hour months. Except for early April, no evidence is available in the remaining months that Eu dx is either likely or possible, but the prospects do not appear to be favourable. However, it would be unwise to arrive at a definite conclusion without a more thorough investigation.

Around the December solstice, band openings tend to be longer, but thereafter a gradual decrease takes place in the length of time that the band is open. An hour, or even longer, has been noted at the solstice, but *average* times have ranged from 17min in November, 21min in December, 25min in January and 14min in February. These figures also show some correlation with the table of monthly differences.

It will be appreciated from the above that time is very much at a premium, and that every effort should be made to save valuable minutes! A notorious thief of time is the long drawn-out, slowly-sent call — two or three minutes, with plenty of callsign, sent at a reasonable speed should suffice. Ultra-slow sending is *definitely* the least readable of all at dx. And tacking-on a signal report to the station called is an obvious time-saver as this could be half-way towards a QSO—with all further details saved for the QSL card in the event of a contact.

There are virtually no QRM problems in VK6, except around 1,827kHz where there is a "beeper" who has a nuisance value—and Wick Radio sometimes makes a noise there, too! The main headache is tropical type QRM which is often really vicious, and this is where faster sending scores. There is plenty of clear space from 1,832 up to about 1,845kHz, though Loran on 1,850kHz sometimes chops-up adjacent frequencies.

An intriguing feature of Eu signals, often noted, is the erratic behaviour of skip. Signals heard on consecutive dates have been from widely differing parts of G/Eu, ranging from the south or southwest, the north and sometimes from GM only—not due to lack of activity elsewhere—and a few samples from the log illustrate this point:

1970—6 December, G3IGW and G3LIQ; 11 December, EI9J and DL9KRA; 18 December, G3IRS and 3 OKs; 20 December, G3OLI; 21 December, GM3WDF and GM3YCB.

1971—11 January, GM3TKV (14 transmissions in 40 minutes); 12 February, GW3XJC (with very fb signal); 14 February, GW3XJC, G3OLB, G3LYW (all from the west), G6BQ and G3XTZ (RSGB 1·8MHz contest!).

On all the above dates these were the only dx audible.

All other things being equal, there seems always the possibility that someone, running quite a modest rig and not even trying for super-dx, may get through to VK6 when engaged in routine activities on 160m simply by virtue of just happening to be on at the critical moment—and this has happened to Gs running inputs as low as 6W into an ordinary inverted-L aerial!

It has been discovered, too, that DHJ is not the harbinger of dx as was hitherto supposed, as he has appeared, in splendid isolation, for 30min or more without a trace of any other signal on the band. And he is not even a marker for DL! DL9KRA has appeared when there was no sign of DHJ, and vice-versa—and the same holds for OK also.

The most reliable indicator of the state of the path to Eu is Loran, on 1,950kHz, though one is never certain *which* of the numerous chains on that frequency is being received at a given time! Sophisticated gear is required to measure the pulse repetition-rate of a given chain to determine its location. It is quite definite that *some* Loran has to be audible on 1,950kHz before Eu dx can be heard. Frequent checks are necessary because of the startling changes which can occur in the behaviour of Loran transmissions, which often come up out of the noise in a matter of minutes—and disappear just as quickly! It is unfortunate that, as far as is known, there is no transmission in VK6 which could serve as a marker for the Eu end of the path.

An interesting facet of the behaviour of 160m signals over long-haul paths — VK6–G and VK6–W (8,000 and 12,000 miles) — is that they do not exhibit the slow QSB characteristic of E-layer propagation, though short-haul signals do.

There have been many occasions when 160m has behaved more like 20m, both as regards dx content and signal characteristics, which would appear to suggest that more than one reflecting medium might come into the argument. It is a hypothesis that signals *may* penetrate the lower layer to be reflected by a higher one, and so exhibit quite different characteristics as a result.

There is reason to suppose that a given transmission can exhibit *both* types of QSB simultaneously—slow over about 2,000 miles, and fast at long-haul dx—which lends some support to the above theory.

In conclusion, it is hoped that the 1971 December tests will be well supported, and that even more QSOs will ensue.

TECHNICAL TOPICS

A monthly feature by PAT HAWKER, G3VA

SOME thoughts on vhf receiver design in the 'seventies . . . ic and varactor techniques in frequency standards and calibrators . . . a new approach to matching coaxial feeders to complex impedances of non-resonant aerials . . . some simple multiband and dual-band end-fed aerials . . . phase modulation for vhf operators. This month surely something for everyone, except perhaps the GHz-waveguiders who will have to turn to G3RPE's column.

VHF receiver outlook

For many years in *TT* we have been stressing the importance in modern conditions of achieving a wide dynamic range in the front-ends of hf and vhf receivers. As long ago as 1951, H. Magnuski in an article "Adjacent-channel rejection receiver" (*Electronics* January 1951) was stressing the importance of limiting the pre-mixer amplification of vhf receivers to just enough to prevent degradation of the noise performance in the mixer stage. But one amateur's poison is just what the doctor ordered for another. So we always hesitate to apply a single set of rules to all circumstances. While the high-gain "state of the art 144MHz pre-amplifier" of K4PKV and WA4JVE (reproduced in *TT* July, from *QST* April) clearly broke the "gain-distribution" rules so often referred to in *TT* over the years, it seemed well worth drawing attention to the new MS175 series of low-noise transistors. Even now, sometimes the problem is bringing in those very weak signals without there being any strong signals to worry about.

But Arnold Mynett, G3HBW, feels strongly that high-gain pre-amplifiers are likely to prove more of a hindrance than a help, certainly to anyone operating among the high-power vhf/fm broadcast stations. For many operators, he believes, the *QST* approach "represents an almost perfect example of how *not* to improve amateur-band vhf receivers".

"The placing of a virtually untuned 20dB amplifier in front of one's converter," he writes, "is a certain way to lower the inter-mod and cross-modulation crash points of the receiver by 20dB! Such an amplifier will respond to all the tv and vhf/fm broadcast stations in its passband; even with the best available devices, the amplifier (virtually without selectivity other than that provided by the aerial) will generate countless cross-products and spurii. Anyone within a few miles of a broadcast transmitter will find so many spurii being generated that it will sound just like a vaguely modulated rise in receiver noise level."

Unfortunately, he considers, any attempt to put selective circuits or bandpass circuits in front of these internally-compensated amplifiers nearly always results in regeneration or self-oscillation somewhere within the passband; this can be cured only by substantial resistive padding at the input, seriously degrading the noise performance. He wonders if there is *any* local activity in W4—amateur or broadcast!

G3HBW considers that it is not yet possible to build a 144MHz receiver—whether with valves, bipolar transistors, field effect transistors, integrated circuits or anything else yet available—that will when completed have a noise figure within 1dB of the optimum value and yet will still behave properly in the presence of signals of the order of hundreds of millivolts. Yet in many locations such conditions frequently arise, particularly in contests or during dx openings.

His view—which accords with what we have advocated in the past for hf receivers—is that currently the best approach to achieving high dynamic range is to use a Schottky-diode ring mixer (see *TT* June 1970 etc), with very high drive (100mW or so) from a tunable local oscillator of *high purity*, with minimal rf amplification (say about 12dB), feeding a high-linearity i.f. stage (he wonders about the power FETS described in the August *TT* for this application) via at least part of the ultimate passband-defining filter.

G3HBW is prepared to fill in some details in this general outline—and in doing so provide vhf operators with a number of projects into which to get their teeth.

He believes the rf stage should be chosen on the basis of low noise and reasonable power gain alone in quiet locations (ie where strong out-of-band signals are unlikely to be troublesome). Thus a BF180, BFY90 or possibly the recent 3N200 dual-gate mosfet would be used—any of these should give a noise figure close to 1dB at 144MHz. The rf stage should allow a reasonable degree of selectivity to be introduced between aerial and mixer. With a mixer overall noise figure of 7dB, and 12dB rf gain, the overall noise performance will be increased by 1dB, giving a total of 2dB.

The need for a high-purity tunable local oscillator strongly points towards the use of a phase-locked translation loop. Just possibly a simple oscillator could give the required stability at the high fundamental—multiplying up from lower frequencies is highly undesirable. G3HBW considers the last thing one wants to introduce into such a receiver is a series of sub-harmonics.

The passband defining filter needs to be about 80 or 100 dB down at $\pm$10kHz. This, at first sight, suggests a crystal filter centred on 9MHz or 10·7MHz. But G3HBW points out that this approach has problems. The image frequency is a bit too close to the wanted frequency, even with a 10·7MHz filter. Although suitable crystal filters at 30MHz have been developed, they are decidedly thin on the ground. But also, he draws attention to a factor often forgotten: quartz crystal filters have rather poor linearity at high signal levels. One would really like a high-performance filter made up of old-fashioned coils and capacitors! Most of us would flinch at the idea of building such a filter, but not, apparently, G3HBW. He hints that he hopes to have something "on the stocks" in this line before long.

Experience with receivers using crystal filters and a phase-locked local oscillator shows that these will completely out-perform the more conventional fixed-frequency oscillator chain with tunable i.f. in so far as strong signal rejection

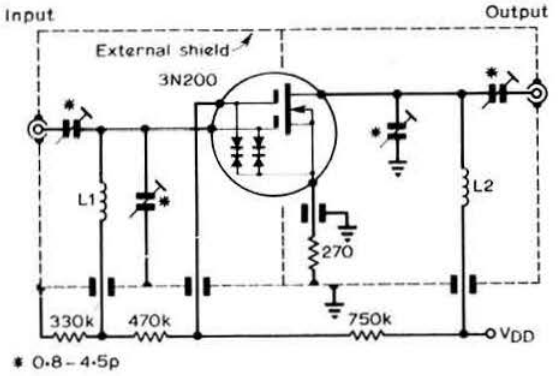


Fig 1. 400MHz low-noise amplifier using RCA 3N200 dual-gate uhf mosfet

is concerned. He feels, however, that the crystal filter still represents a limitation to performance, and expects the passive filter to give a real improvement.

As a practical tip for the present, G3HBW draws attention to the RCA 3N200 mosfet (which retails at about £2) as the basis of a very good 70cm rf stage. He has used one in a new converter (still based on a crystal oscillator local oscillator chain) and obtained a measured overall noise figure of 4·5dB and good linearity. He hopes to bring the noise figure down still further; stage gain is about 12 to 13dB, sufficient to overcome mixer noise.

Fig 1 is a 3N200 400MHz amplifier culled from an RCA advertisement. Even without neutralization a typical performance of 4·5dB noise figure at 400MHz with 12·5dB rf power gain is claimed. A recent RCA economy dual-gate mosfet suitable from "dc to 500MHz" is the type 40841. The USA price in large quantities is less than 50 cents.

Square-wave ic marker generator

Bill Burton, G8ANQ/G4ANQ, passes along some useful ideas following the development of a 1MHz crystal generator for use with integrated-circuit decade dividers of the SN7490N type. Fig 2 shows his generator, using an SN7400N and providing square-wave output suitable for feeding directly into an ic divider chain. In his complete unit, three SN7490N dividers provide square wave output at intervals of 1MHz, 100kHz, 10kHz and 1kHz, see Fig 3.

The basic idea is that one gate of the SN7400 quad two-input NAND gate is used, with external components, as the

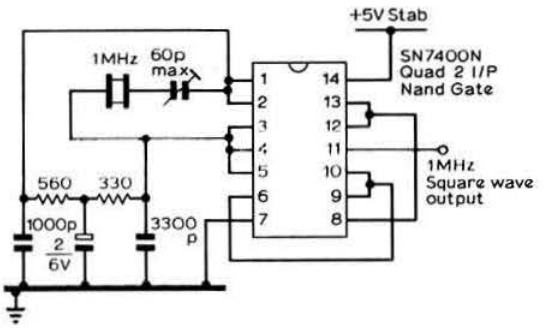


Fig 2. The square-wave crystal generator used by G4ANQ.

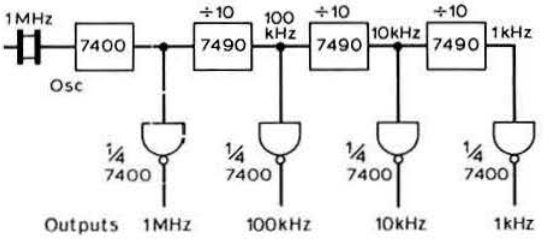


Fig 3. Outline of the 1MHz, 100kHz, 10kHz and 1kHZ crystal calibrator

1MHz generator. The output is fed through the remaining three gates to provide square-wave output. The frequency can be accurately set-up (for example on the 5MHz MSF standard frequency signals) by means of the 60pF trimmer.

G4ANQ has lagged his oscillator unit with polystyrene to provide thermal insulation, and has built it, together with the divider chain, on a piece of 1in matrix Veroboard. The standard, plus its stabilized 5V power unit (see Fig 4), is enclosed in a standard diecast box. Output markers can be heard to beyond 145MHz.

Varactor frequency division

Another technique which can be used for frequency division at higher power levels than integrated circuits is the varactor diode approach, more commonly associated with frequency multiplication. K. Manson, G3XVT, recently recalled a

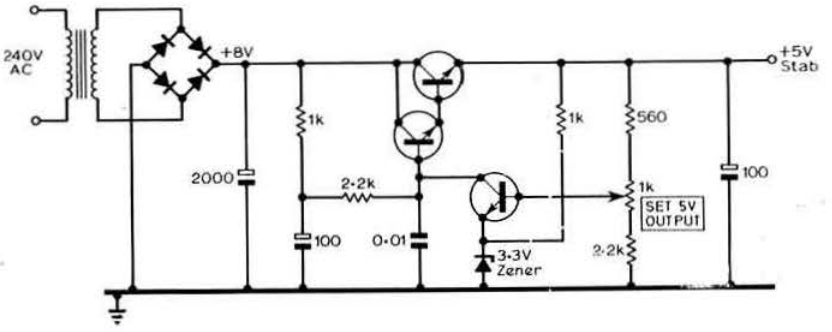


Fig. 4. Stabilised 5V power unit for the crystal calibrator, all transistors in original unit are BFY50

brief reference in *TT* (January 1966) that varactors can be used "the other way round". He felt this might offer a solution to his wish to convert a Droitwich 200kHz "off-air" frequency standard (of the type described by C. Bowden, G3OCB, in the May 1971 *Radio Communication*) to 100kHz before filtering.

Since he considered the usual vhf varactor multiplier circuit would result in inconveniently high values of L when applied to low frequencies, he opted for a shunt approach using the diode as a coupling capacitor. In practice the circuit shown in Fig 5 proved suitable at 1f as either a multiplier or divider. He used for inductors, transformers designed for use in 470kHz first i.f. stages with additional tuning capacitance, thus eliminating the need for the expensive and bulky pot assemblies usually specified for low frequencies.

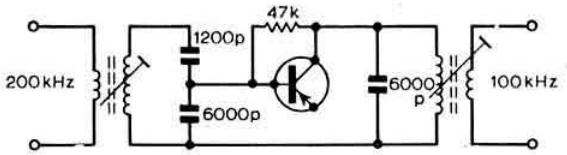


Fig 5. Low-frequency varactor multiplier/divider used by G3XVT. Varactor diode is the collector-base junction of a medium-power transistor

As varactor diode he uses a medium-power transistor, diode connected; the obsolete V30/20 seems particularly suitable but practically any medium-power transistor, including the OC35, seems to work. The collector-base junction is used—in fact strapping the additional emitter junction to the collector does not seem to have any significant effect. The direction of the "diode" is unimportant, and the two diodes of the transistor can be used in parallel opposition.

Efficiency as a divider seems to be about 50 per cent (1V in produces 0·7V out and it will work on lower inputs). Low-power transistors (OC44, etc), OA5 diodes, zener diodes and power rectifier diodes all work after a fashion; but the point-contact diodes and vhf varactors tend to be very inefficient in this application. The 47kΩ bias resistor is not essential but does seem to produce a smoother action when tuning the core of the 100kHz circuit, the output of which tends to "switch" on. Using larger pot cores, G3XVT has used a similar circuit for multiplying 19kHz signals to 38kHz (presumably in a stereo decoder). He suggests that the use of varactor dividers and multipliers at low and medium frequencies is not widely known, and he believes there may be many other useful applications. The divider will work as a divide-by-three system, and G3XVT points out that idler circuits do not seem so essential as at vhf.

It has been pointed out before in *TT* that this type of approach can also be used in hf transmitters: incidentally an extensive survey of different types of frequency multipliers, including the use of complimentary pairs of bipolar transistors or FETs, and broadband arrangements, is given by Hank Olson, W6GXN in *Ham Radio* (August 1971).

Aerial matching with transmission line sections

Before describing several practical hf aerials this month, we would like to draw attention to what could be an important development in the use of transmission-line matching transformers. For many years, the quarter-wave transmission line transformer has been a known and useful method of matching a transmission line to an aerial of a different feed-point impedance. For example, we can match a 300Ω line to a 600Ω line or aerial by means of a quarter-wave line of $\sqrt{(300 \times 600)}$ or about 425Ω impedance. The same technique can be used with unbalanced coaxial lines.

But generally, this technique has been useful only when matching into purely resistive loads and with simple transformation ratios. Now, Frank Regier of the American University of Beirut (who as OD5CG was responsible for the tri-band vertical aerial given in *TT* April 1970 and in *ART3*) has presented in *Proc IEEE* (July 1971 pages 1,133-34) a generalization of this type of transmission line transformer, showing how its use can be extended to match complex loads and provide a wide range of impedance transformations with a single combination of line impedances, when these differ significantly.

In effect, he shows that the electrical length of the matching section need not be restricted to 90°, provided that the section is placed at a specific electrical distance from the end of the line: see Fig 6. As an example of what can be done, he indicates how a 50Ω coaxial can be correctly matched to an aerial offering a feed-point impedance of 80 + 120Ω, by placing a section of 70Ω coaxial cable, with an electrical length of 15°, in the main cable at a distance of 27·4 electrical degrees from the aerial connection.

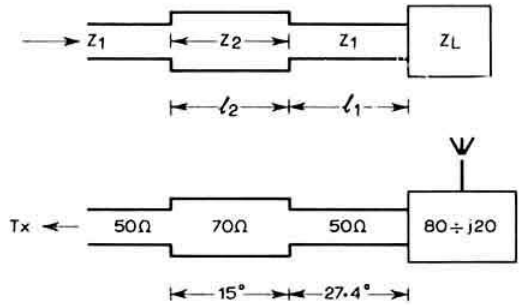


Fig 6. (a) Generalized form of the quarter-wave transmission line matching transformer. (b) Example of its use to match to a complex impedance, as described by OD5CG in "Proc IEEE"

The use of this general theory for matching coaxial cable to vertical or whip aerials of non-resonant lengths—and indeed for any other aerial offering a complex load—could clearly be very attractive.

Frank Regier gives detailed information on how to use this general theory in the form of a series of formulae. We would suggest that one of our aerial wizards might look carefully into his presentation to see if some down-to-earth guidance could be given in a form rather more suitable for use by amateurs.

On the subject of transmission line transformers, Barry Priestley, G3JGO, drew our attention some time ago to a hint in a Texas handbook: 61Ω coaxial cable can be made by removing the No 20 centre conductor from RG58/U cable and substituting a No 21 conductor. At vhf or uhf, G3JGO suggests this could be a useful way of making up a quarter-wave transformer to match 50Ω line to 75Ω.

End-fed multiband aerial

To judge from the stations we work, the two most popular simple multiband aerials these days are the W3DZZ trap dipole and the G5RV type of dipole. One of the reasons for their popularity is undoubted that they can be fed readily from coaxial cables without additional matching units. But both these are centre-fed systems, and the need quite often arises for an end-fed arrangement. In *Amateur Radio* (No 6, 1971), Tom Segalstad, LA4LN, reminds us that a simple but effective five-band aerial (offering 2dB gain on 21MHz and 3·5dB on 28MHz relative to a half-wave dipole) consists of a 132ft wire end-fed from coaxial line through a simple switched L-matching network: see Fig 7. The capacitor needs to be a high-voltage type.

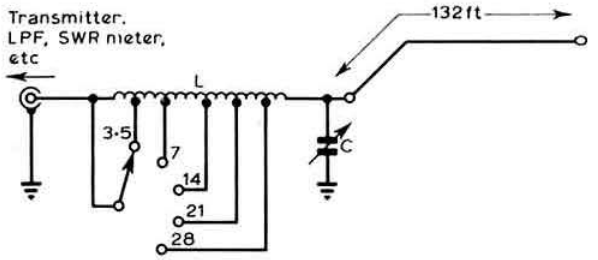


Fig 7. 132ft end-fed aerial used in conjunction with switched L-network matching unit. C is high-voltage 100pF capacitor. Diameter of L is uncertain but, typically, turns are 3·5MHz, 32; 7MHz, 15; 14MHz, 9; 21MHz, 4 and 28MHz, 3

Three-eighth wave aerials

The folded $\frac{3}{8}\lambda$ vertical aerial described recently in *TT* (May 1971) reminded several readers of other uses of this length. For example, *The Radio Handbook* has long pointed out that a $\frac{3}{8}\lambda$ Marconi aerial can be operated on its harmonic frequency as a $\frac{3}{4}\lambda$, thus providing a useful dual-band aerial. Fig 8 shows the system described in this handbook using 180ft for 1·8/3·5MHz and 90ft for 3·5/7MHz. An interesting feature is that this aerial can be fed directly from a low-impedance pi-network transmitter output or as an end-fed from a coaxial cable since on both bands the feed impedance is of the order of 40 to 60Ω. The series capacitor is in circuit on the lower band but short-circuited on the higher

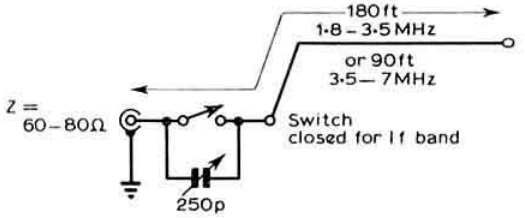


Fig 8. Two-band $\frac{3}{8}\lambda$ Marconi dual-band aerial. Typically 180ft for 1·8/3·5MHz or 90ft for 3·5/7MHz

band; the aerial can be adjusted for resonance on its harmonic frequency and then adjusted on the lower frequency using the capacitor. There also seems no reason why it should not be used on some other bands as a voltage fed aerial (for example a 90ft wire would represent a $1\frac{1}{2}\lambda$ aerial on 14MHz).

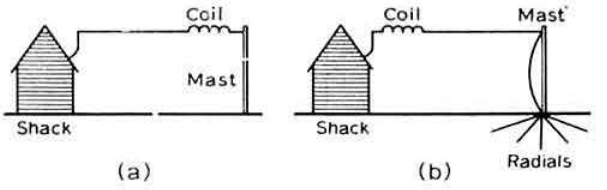


Fig 9. Use of electrical loading to provide $\frac{3}{8}\lambda$ Marconi on 1·8 MHz, (a) as used by GW3PJT, (b) preferred method

Dr R. C. Whelon, GW3PJT, comments that he and G3PLP have made effective use of a $\frac{3}{8}\lambda$ Marconi aerial on 1·8MHz, in the belief that this length should perform better than a $\frac{1}{4}\lambda$ wire since the current maximum can be where it does most good, and the higher feed impedance can make it a lot easier to feed. The technique can be used at sites where a full physical length of $\frac{3}{8}\lambda$ is not practicable by using a loading coil; GW3PJT used a loading coil about 6ft from the end of the wire as shown in Fig 9 (a). He suggests that a better technique might be to ground the far end as shown in Fig 9 (b). The earth system (as for other Marconi systems) should be as good as possible.

Perspex for looking through

Over the years, many of us have become a little lax in thinking of plastics as good rf insulators without troubling to remember that there are very significant differences between the different plastics. A note by Arthur Godfrey, ZL1HV, (*Break-in* March 1971) is entitled "Perspex is for looking through, not for use at vhf" thus successfully putting across his entire message by means of his title! He points out that Perspex is a poor insulation material even at hf (power factor of 2 at 1MHz) let alone vhf. The really good material remains ptfe with its 0·001 power factor at 100MHz (resistivity ohms-cm 10^{19}) although polystyrene (0·03pf, 10^{17}) and several other materials are usually adequate. ZL1HV sums it up by saying: "So be warned and place no faith in the vhf insulation properties of Perspex. For stand-off insulators and spacers why not use those odd inches and fractions of inches trimmed off the ends of coaxial cables?"

Remotely tuned mobile whip

After reading the interesting article on mobile aerials by E. L. Gardiner, G6GR, in the July issue of *Radio Communication*, Roy Eldridge, G3RAE, was prompted to describe his experiences in making a remotely tuned base-loaded whip for 1·8MHz mobile operation.

For some time he used a "Chinese copy" of a G3FIF-type whip, but tired of having to stop and get out of the car to extend or shorten the whip when changing frequency. In the end the following technique was developed to overcome this problem.

The whip is resonated in the normal manner to 2MHz, then to load the transmitter at any lower frequency a piece of B2 ferrite rod 10mm in diameter is pushed up inside the coil: see Fig 10. The rod can move upwards from the base a distance of 1in, sufficient to resonate the aerial anywhere in the band 1·8 to 2MHz, its position being controlled from the operating position by means of a length of Bowden cable.

Tests of this system over a period of some 18 months have shown that radiation is consistently good over the entire

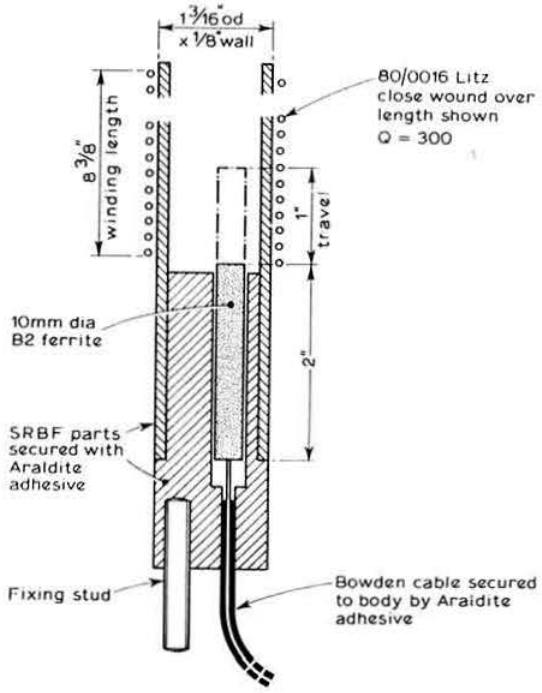


Fig 10. Remotely controlled 1·8MHz mobile as developed by G3RAE. The aerial is mounted on the vehicle 2ft forward of offside windscreen pillar

band with no difficulty in loading the all-transistor transmitter to the full 10W without a separate aerial tuning unit. The power is fed from the transmitter to the aerial using a short length of coaxial cable. With a fixed-length 4ft whip, good contacts have been made both locally and up to about 30 miles.

G3RAE admits that some difficulties may be experienced in duplicating his construction. The ferrite rod was cut with a diamond impregnated grinding wheel, and the hole required for fixing the operating cable was drilled by ultrasonic methods. For this reason no precise dimensions are given in Fig 10, as this is intended primarily to illustrate the principles involved rather than for exact duplication.

G3RAE also made good use of this aerial arrangement on a 30ft motor cruiser on the Norfolk Broads this summer.

G2HCZ and G8CBZ phase modulators

Some time ago (*TT* April 1969 and *ART3*) we presented a diode phase modulator arrangement based on a design by ZL4TAJ intended for use in conjunction with an 8MHz valve oscillator. There is growing interest in this technique—but also not a little confusion between frequency and phase modulation. An important advantage of phase modulation is that there is much less chance of producing some of the rather rough fm signals that stem from non-linear reactance modulation of oscillators.

The usual distinction made between fm and p.m. is that with fm deviation is proportional to modulation amplitude, whereas with p.m. the deviation is proportional to modulation amplitude multiplied by the modulation frequency. In effect, p.m. can be converted to fm by inserting a network with an attenuation of 6dB per octave with increasing frequency, in the audio frequency amplifier stages preceding the phase modulator. In practice, for most amateurs, the main distinction is that fm is usually produced directly by reactance modulation of the oscillator, whereas p.m. is obtained by varying the phase in the tuned circuit of one of the subsequent drive stages, without affecting the actual oscillator. By coincidence, two semiconductor phase modulator arrangements turned up recently, both of which have points of interest.

B. Sykes, G2HCG, suggests that one could not hope for a simpler arrangement than that shown in Fig 11. The voltage on the collector of the final audio amplifier is used to provide the standing bias on the BA102 tuning diode; in this case the voltage is about 8V, which puts the BA102 at about the centre of its capacitance range. The resistor-capacitor combination (R1.C1) provides the necessary tailoring of frequency response, as mentioned above, to provide a signal similar to fm. C1 also acts as by-pass for the 8MHz coil with the advantage that the audio is fed in at a point of zero rf potential. The capacitive divider to drive the first multiplier is deliberately chosen to allow the BA102 to provide a large proportion of the capacitance across the coil. The 2-8pF trimmer in the connection to the crystal oscillator provides a convenient means of adjusting the drive to the multiplier chain. The level meter is perhaps an optional luxury. The arrangement shown will produce full legal deviation on 144MHz from either a 6 or 8MHz crystal oscillator, G2HCG reports.

C. F. Robjohns, G8CBZ, provides a unit (Fig 12) designed to be placed in front of an existing a.m. or cw rig, with cw continuing to be available by just removing the audio input to the unit. The output from an oscillator which can be either crystal-controlled, a vxo or vfo is connected to the unit, together with about 500mW of audio; the output goes to the 8MHz crystal socket of the main transmitter. He uses

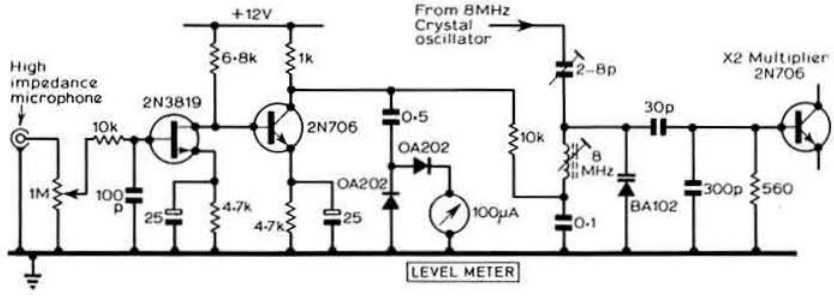


Fig 11. G2HCG phase modulator for 144MHz. R1 is the 10k resistor connected to the 8MHz coil, C1 is the 0·1μF capacitor also connected to this coil

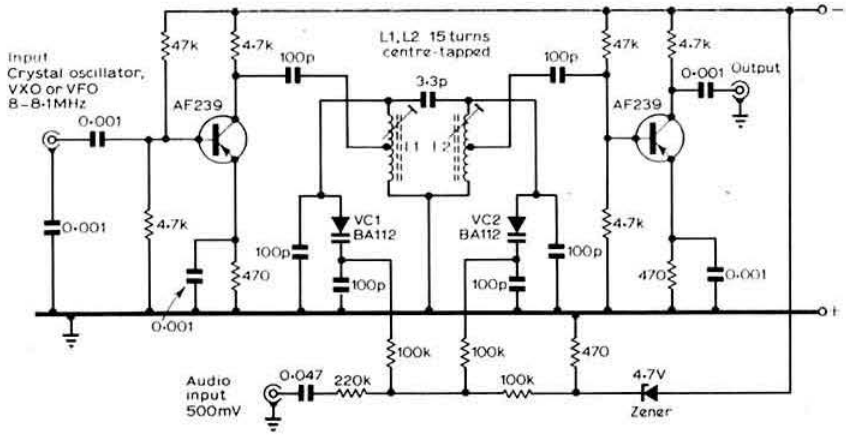


Fig 12. Phase modulator used by G8CBZ. Recommended dc supply is two L15 batteries. L1 and L2 are tuned for maximum output in the middle of the appropriate frequency zone

a rather more complex phase modulator than in the G2HCG arrangement. It is possible with these p.m. units to drive the pa of the main transmitter very hard for high efficiency (G8CBZ has a QQVO6-40A biased to 100V negative and pushed hard with some 6 to 7W of drive). L1 and L2 are each 15 turns 20swg, close spaced. He notes that some Pye mobile units contain all the units required, but tuned to 12MHz in which case the af input should be increased to 600mW. L1 and L2, together with their tuning capacitances and electronic tuning diodes, should be screened separately.

G8CBZ stresses that the distinction between p.m. and fm should not be forgotten; he prefers to think of p.m. as sideband with the carrier re-inserted 90° out of phase (of course, the other sideband is present). He suggests that instead of receiving p.m. with slope detection, dx capability can be much improved by receiving the signals as sideband, using a bfo or carrier re-insertion oscillator. This concept is new to me, but since it is possible to take an a.m. wave and shift one sideband by 180° (or both sidebands by 90°) and produce phase modulation (see Panter: *Modulation, noise and spectral analysis*), it could well be that G8CBZ has a valid point.

Pi-network topics

A few months ago (*TT* May 1971) a description was given of the work of Brian Rose, G3ULR, on the LCL approach to pi-networks for power amplifiers; he eliminated the need for any high-efficiency rf choke by adopting positive-grounding of the ht supply. This item prompted G. Bird, G3KOV, (who remains a little uneasy about the harmonic rejection of an LCL network) to point out that the same ht technique can be usefully applied to a conventional CLC pi-network: see Fig 13. He notes that although an rf choke is still required, this is now placed at the low impedance end of the network so that its design becomes much less critical. With transistor circuits we are becoming quite used to the idea of grounding either the emitter or collector line; from a safety viewpoint there is little difference *provided that the user is fully aware of the situation.*

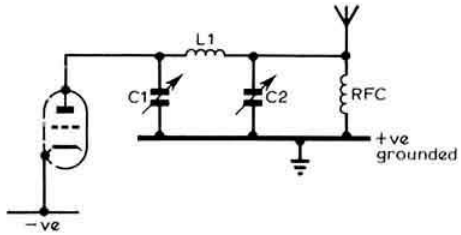


Fig 13. The use of positive-ht grounding can eliminate the need for a high-efficiency rf choke with conventional CLC pi-network

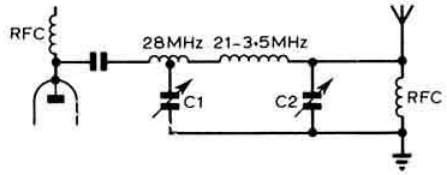


Fig 14. DL6WD's technique to avoid capacitance problems on 28MHz

On the subject of pi-networks, R. Fischer, DL6WD, suggests in *QST* (April 1971) that with the conventional pi-network capacitance ratio problems can often arise on 28MHz, leading to the need for a tuning capacitor of very low minimum capacitance or very small inductors on this band. He indicates how, by connecting the capacitor to a tap on the 28MHz coil, rather than the anode end of the coil, the reactance of the capacitor on this band is transformed up by the square of the winding ratio (Fig 14). For example, by putting the tap half-way along the 28MHz coil, the tuning capacitance can be increased by four times. On the other bands, the ratio of tapped-to-total inductance approaches unity, so that there is relatively little effect on the capacitance required on these bands.

Transmitting loop

James Taylor, W2OZH, writes to point out that his transmitting loop (Fig 1 of *TT* June 1971) should show a wire across each 1·5V penlight bulb—at least for high-power operation where the currents will be substantial. The old dodge of using a small flash-lamp bulb in conjunction with a varying length of shorting wire so that it provides a useful indication without constantly blowing is an old but still extremely useful dodge; it has long been used at G3VA.

FOUR METRES AND DOWN

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

Being gathered together

There are two ways in which the vhf worker can achieve maximum meaningful communication under normal conditions, either by hunting around or participating in local nets—or both.

In one or two areas, nets on 2m have been in existence for almost 20 years. Today net operation on 2m is probably at its highest level ever, not solely because more VFOs are around to give the needful spot-frequency grouping, but also because increasing numbers of operators are coming to realise that netting brings in a large amount of information in a minimum of time.

A net is not a net if stations operate on discrete frequencies: to many a vhf man this may not be obvious, for few even now possess VFOs. Yet a vfo is not a mandatory tool for net-setting. Getting on spot frequency, say the men who have been doing it on 2m for 20 years, is simple by buying crystals to a specified frequency in bulk with a nice bit off the price for quantity. Even this will not put you precisely on channel: a tiny trimmer across the crystal is no insult to its accuracy but simply a recognition of the fact that crystal oscillator input capacitances differ from station to station.

As nets grow bigger a time limit per over is necessary; two minutes a say is a fair ration. When a subject requiring extended debate emerges it is best left for discussion among those most concerned after the main net has finished. Local and regional customs will decide which is the best time at which to start a net, but if at all possible avoid weekends which are traditional contest times. Batting order? Adhere to alphabetical order of callsigns like this: G2DCI, G3ZOY, G5VH, G6CC, G8BEO, G8CYD, G8EAU (to quote a real-life example). If all can hear all it may not even be necessary to have a net controller.

Finally, do not establish nets outside the local zone. Much goodwill for exemplary nets has been lost because they clobbered weak signals in the adjoining zone which someone else was trying to hear.

All the foregoing envisages starting nets on 2m. But remember . . .

. . . the next band up

What has been said above about initiating spot-frequency gatherings on 2m applies equally to 70cm. The next band up is a natural for nets, with its capacity to meet the requirements of short-haul communication at high signal level.

Frequency setting on 70cm, three times up from 2m, need not have an inherent inaccuracy three times greater than 144MHz if the capacitor-across-the-crystal technique is observed here, too.

A couple of months back we offered a few simple suggestions about how to quickstart on 70cm in the interests of transferring to this band much of the local traffic at present loaded on to 2m. The "Two 2/6" transmitter design recommended then (see *Radio Communication Handbook* 4th Edn) is finding increasing favour. In Chelmsford, G8CUT was surprised by it when it got him a contact with North Wales during the September tropo opening, a 200-mile bonus well beyond the service area to be expected with 10W when conditions are normal.

At Nuneaton, G8CVD feeds 8W to a similar transmitter for the three-way (not yet a net, not yet spot frequency) which he operates with G3YQC and G8DLX of Rugby every week-night except Tuesday from 8.30pm. The trio check the band for other takers at 9pm; and by way of an indication of 70cm activity in the Midlands, 'CVD reports notching an average of five leisurely run-of-the-mill contacts on the band each evening (which explains the absence just lately of his mighty signal on 2m).

Groups and clubs already netting on 2m will find it profitable to undertake pilot experiments with, say, three of the locals transferring to 70cm to get the feel of the band before the complete change to the next band up is made.

Expeditionaries

Another of the thoroughly well organized 2m expeditions for which the G3BA-G3BHT-G3URV team is famous brought pleasure to hundreds of home operators on the night of 6 September by giving them the chance to collect Luxembourg, one of the rarer Continental prefixes, "the Rutland of Europe". And over NFD weekend G3BA/LX/P was a valuable catch-points for many of the men under canvas.

Although the Monday operations had been publicized as a one-night-stand, the signal was still to be heard clipping away next morning at breakfast time dishing out quick QSOs to 2m telegraphists as the sun rose.

* * *

As for VHF NFD itself, comments on this sunshine-blessed (for once!) event must wait until the VHF Contests Committee finishes its computing stint on the 30k or so contacts made during the weekend: December *Radio Communication* if the committee runs true to form.

As always in any portable event there was doubt in the minds of a few contesting groups as to where they actually were, QRA Locator-wise. No doubt the logs will show a few to have operated in The Wash or the Pentland Firth.

Radiating 432MHz NFD rf from the popular North Midlands eyrie of Merryton Low (low means high) G8AYY, Paul Gaskin of Birmingham, was amused to have his QRA Locator queried. He tells *FMD* for the benefit of future users of the site that Merryton Low, North Staffs, is ZN61F, and adds: "Anyone disputing this should refer to OS Sheet 111. I am getting a little tired of well-meaning people attempting to 'correct' my QRA Locator when they are operating portable nearby."

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

Any lurking "Where am I?" doubts can be resolved by buying a copy of the RSGB QRA Locator map of Western Europe, which at 47p post paid will make barely a dent in the bank balance, and at 2ft 5in by 3ft 2in will cover most of the dents in the shack wall.

On the m-s dx front

Meteor shower reminder: the Orionids are due 15-25 October, peaking on the 21st, offering a radio rate per hour of 30. Best times to QRV are midnight to 0900gmt.

* * *

During the Perseids shower in August—it gives a radio rate of 50—G3CCH, Johnny Stace of Scunthorpe, worked LZ1BW on 144MHz, and had a listener report a few posts later from OK1VHK stating that some of the bursts of signal off the meteor shower lasted as long as 45s—and a lot of cw intelligence can be passed in that space of time.

Telegraphists who have heard the machine-gun-like morse from G3CCH directed at TF3EA just inside 2m may not have been fortunate enough to detect the Icelander come back. High gain receiver systems, allied to low noise factors and "super narrow bandwidths", should pull him in. By now 'CCH has had a couple of dozen contacts with him, mainly on the Thursday evening schedules.

Now the effort is to be extended to 432MHz. Already TF3EA has heard enough pings to identify G3CCH positively, and in the long term given more power at the Iceland end a full two-way via m-s should ensue, but as Johnny Stace says: "It's a long way off yet. Previous attempts at 432MHz m-s in Europe have, as far as I can ascertain, never produced any results."

Listen for him on Saturdays 2000-2100gmt on 432·030MHz plus or minus 1kHz or better.

Key to long-haul

Looking back over his first year on 2m, spent wholly on A1, G3DAO of Selsey, on the south coast of England, records 10 countries and 31 counties that put him well in the running for an all-telegraphy Four Metres and Down certificate. It is just the cards he is waiting for: the return is 45 per cent.

In view of the reliability of 144MHz to produce long-haul contacts on the A1 mode, G3DAO is mystified why more Class A operators do not use it. His weekly schedule with G3BII at 70 miles yields S9 both ways irrespective of conditions, and for telegraphy this is a modest range: G3DAO would be surprised to know how many people, and BRS men brushing up their morse, eavesdrop on his Selsey signal penetrating much farther up country than 'BII in Bucks.

What is needed, he feels, is more activity at out-of-contest times: "A few CQs on what appears to be a dead band sometimes have really surprising results," he tells *FMD*.

And as for contests themselves, it does not do to wait until everybody has worked everybody, and then see what is doing on 144.0 to 144·15. Many VHF NFD contestants who did this missed out on EA1AB, who was a steady S7 at Selsey during the first couple of hours of the event but drew few takers.

G3DAO adds:

"Apparently EA1AB is on 2m every night at 1930gmt on 144·045MHz, and keeps a schedule with F8OB near Bayonne, in the SW of France."

A good "lift" would be required from the UK to work stations at their sort of range. What is certain, though, is that inter-UK contacts that would be dx to the A3 man are run of the mill to the brasspounder—and come to think of it, the equipment required is quite a bit less complex.

"Busyness" on low band

Activity begets activity. This philosophy applied to the 70cm band paid off with the Cumulatives results to be seen under Contest News last June. Now it is to be extended to 4m: there are a couple of two-hour Cumulatives this month (13 and 27 October), one next, and two in December. Thumb back to the August Contest News for rules.

Having the 4m Cumulatives on Wednesday Activity Nights was a bright idea, although to operators in Channels 4 and 5 television areas an onlooker status may be essential (unless they go out /P away from viewing conurbations—and October can be quite a promising month for portable work).

To spread a little additional happiness among 4m men two well-known Yorkshire operators come up on the band on Mondays regularly at 7.30pm for at least an hour, longer if contacts warrant. They are G8CB, who has a 1,000ft site near Bradford (yes, the same "Charlie Baker" who is RSGB 2m newsreader north), and G3ZIV of Selby, using 40W and 25W respectively.

* * *

As well as participating in special activity periods such as the above, members with 4m receiving equipment will find it rewarding to check the band regularly for anomalous propagation. Sporadic-E affects it much more often than 2m, eg Ron Ham in Sussex (BRS15744) has logged TF3VHF on 70·275MHz holding a steady 559 for 15 minutes on end, "E" assisted.

More VK e-m-e

News of some more Australian moonbounce activity to add to that reported from VK2 by G3LTF last month has come in from Bob Arnold, VK3ZBB. "I have just been listening," he says, "to a tape recording of VK3AKC of Geelong, about 40 miles SW of Melbourne, hearing his own cw signals bouncing from the moon on 1,296MHz."

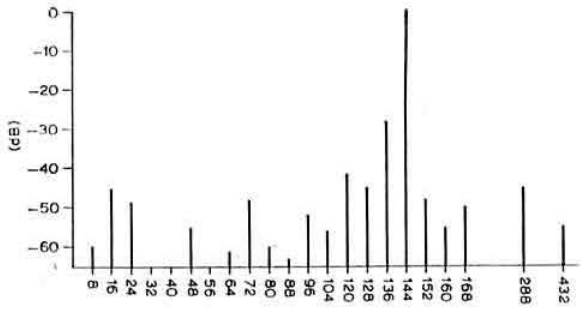
One of the pioneers of e-m-e in Australia, certainly so far as 23cm goes, VK3AKC employs a 7ft dish for the transmitter (about 20W out) and a 4ft dish for receiving.

About a dozen operators in Victoria currently use 1,296MHz, and of these VK3AKC has succeeded in working VK7 at a range of about 250 miles, which is comparable with the ranges achieved on 432MHz. Any of the 40 or so VK3 men active on 70cm would count himself fortunate to work Tasmania on that band.

Tech Corner

From G3JGO (B. Priestley of Slough, Bucks)

It so happened that I read the comments in *Radio Communication* about spurious outputs from transmitters on the same day I had been doing some checks on a commercially available 2m transmitter which had been causing serious QRM to an important professional service, apparently from the radiation of parasitics. The GPO specification for business mobile sets is not more than 2·5μW spurious, ie −66dB down for a typical 10W output rig. Nothing should show above the −65dB threshold. As will be seen from the accompanying diagram, many unwanted products exceeded this level in the tests I did.



A spectrum analysis taken by G3JGO of a commercial amateur transmitter for 2m discloses the presence of several unwanted products of an amplitude sufficient to be detected locally and possibly cause interference to professional vhf services.

A business mobile set tends to use higher frequency crystals than is customary with an amateur's (unless it is phase modulated), and often has double tuned circuits early in the system so that only the desired harmonics are passed on to the later stages. At an amateur station the aerial also might help a bit if it was a long Yagi, but a wide-band slot beam would radiate much of the spurious power.

It seems that the lack of complaints about amateur spurious emissions may be more lack of identification of unmodulated products than lack of trouble. Even so I suggest that some of the GPO's five cases of tvi per day are due to these. The following are details of some cases I have met over the years:

Manchester: An 8·1MHz crystal initially tuned up on 121·5MHz caused temporary interference to Northern Air Traffic Control.

West London: Colour tvi found to be due to mistuned doubler stage from 35MHz to 70MHz.

Middlesex: Tvi on Channel 9 due to unscreened 72MHz doubler. Putting a screen over the chassis cured it.

Devon: Tvi due to 192MHz radiation. This operator asked the TVI Clinic for a filter for the television set which would pass Channel 9 but stop his spurious emission!

In a fifth case a BRS man had a 435MHz converter with a 44·888MHz crystal oscillator in a weakish Channel 1 area. "As the crystal is near the 45MHz of Channel 1 this may be why I get tvi". Answer: it was not "near", it was "in"!

It seems to me that as the average life of an amateur licence is only a few years, the best way to minimize trouble from spurii is to repeat some basic home truths every six months or so. This I feel should be the job of the TVI Committee, but there are some facts peculiar to vhf which could stand alone, say:

1. Many older transmitter designs still in use (eg the SCR522, designed some 30 years ago) need extra double tuned circuits to meet the present amateur licence requirements.
2. Even so, filters are probably needed to suppress the 48 and 192MHz components that produce tvi.
3. Overtone crystal oscillators are unreliable only in a bad circuit. They are used in modern frequency standards because their stability is better than that of fundamental crystals.
4. When two frequencies f1 and f2 are fed into a mixer the output contains spurii like 3f1, 2f2, f1 plus 3f2, as well as the desired f1 plus f2. These products cannot be eliminated by reducing the harmonic content of the input, although they may be reduced.
5. A varactor multiplier is very liable to produce all sorts of odd frequencies.

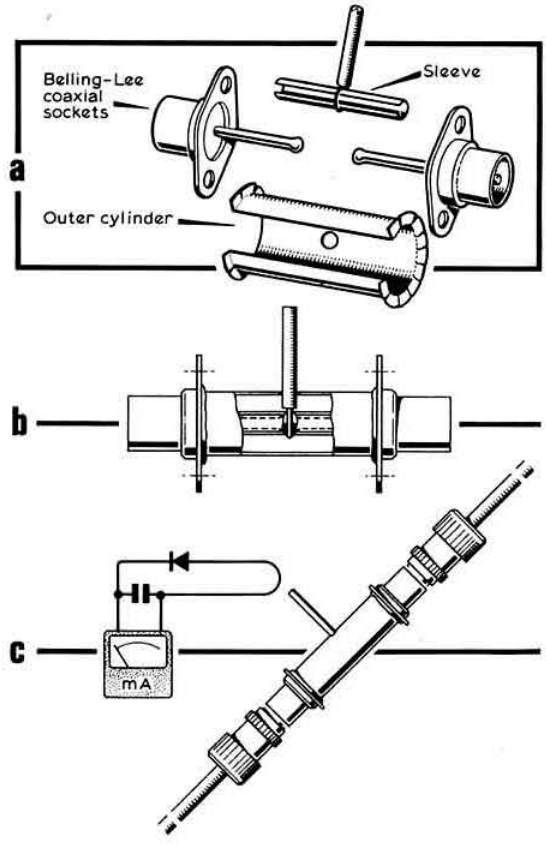
* * *

From G2WS (Bill Scarr of Weston super Mare)

On 1,296MHz and the higher-frequency bands, special care must be taken to ensure that the output stage of a transmitter is very accurately tuned; any change in the loading of the stage inevitably demands careful re-adjustment of the pa tuning.

As complete shielding is mandatory at these frequencies, resonance indicators are usually installed in the aerial lead or in the vicinity of the aerial elements. Any rf indicator placed close to the transmitter is liable to pick up energy from the input to the final stage (often at 432MHz) and so to give misleading information.

One tuning method often advocated is the rf sampler or "sniffer" which involves cutting a hole in the outer conductor of the coaxial aerial lead and soldering a wire to the inner conductor. This severing of the braid is, however, likely to have some effect on the efficiency of the feeder and the writer's experience is that this method of measurement



always results in some loss of strength in both the received and transmitted signals.

A simple device has been in use at this station for some months and provides a reliable and almost "loss-less" method of peaking-up the 23cm transmitter.

Two Belling-Lee coaxial sockets are soldered end to end into a tiny sleeve or trough made from thin brass sheet. A short length of insulated connecting wire, an inch or more in length, is soldered at one end to the centre of the brass sleeve as shown. A second piece of thin brass sheet is then bent to a cylindrical shape to serve as the outer coaxial conductor. A small hole is first made in this through which the "probe" of insulated wire projects. The brass cylinder is cut to fit between the flanges of the two coaxial sockets and the ends are splayed slightly to facilitate soldering to the flanges.

To give additional rigidity, small sections of polystyrene from a spare piece of coaxial cable may, if desired, be inserted between the sleeve and the outer conductor, but this is not essential. The edges of the brass cylinder are soldered together, making sure that no gaps are left

The device is inserted anywhere in the aerial lead well away from the transmitter. In the writer's case it is conveniently situated on the window-sill close to the feeder exit. A 0–1 milliammeter or a micro-ammeter provided with a small loop and uhf diode is placed near to the probe, the distance from the probe to the loop being adjusted to give a nearly full-scale reading when the transmitter is accurately tuned. Slight adjustments during periods of transmission are often required at these frequencies as the valves and metal parts warm up and the tuning device readily indicates such requirements.

Needless to say, the various parts, including the meter, could readily be assembled in a small diecast box if permanent operation is contemplated and only the relative position of the probe and the loop would need adjustment.

* * *

By G8BDO (Steve Norman, of East Leake, Loughborough) The diagram shows a method of deriving fm for a low power (40mW out) transmitter for 432MHz. The 72MHz oscillator is a BF115 and there is a BSX19 tripler to 216MHz. The classic G8ARV arrangement will be recognized, coils appropriately adjusted, and including only four new components.

The doubler to 432MHz is a BFY90 and the pa a ZTX327, ie 2N3866 in plastic.

* * *

From G3RFG (H. S. Brown of Henlow)
An n-p-n silicon planar transistor type BFW98G may be of interest to uhf experimenters. Primarily intended for Class B or Class C operation in mobile or portable transmitting/receiving apparatus, it delivers at least 500mW at 470MHz for 80mW of drive at a collector rail voltage of 13·5. A Development Sample Data Sheet about it can be had from Mullard and includes a useful diagram showing the device in common emitter application. A capacitor C3 is depicted from *base* to ground but the text emphasizes that this should consist of two 10pF ceramic capacitors, one of them connected from each *emitter* lead to ground.

Here and there

If you hold a distance record on any vhf/uhf band and have not yet notified the Society's VHF Committee, please do so to assist the compilation of appropriate tables for each band.

* * *

Mr D. M. Gray, G3YPL, reports that his callsign is being pirated on 2m ssb in the London area. The genuine G3YPL works only hf mobile and 4m Raynet.

* * *

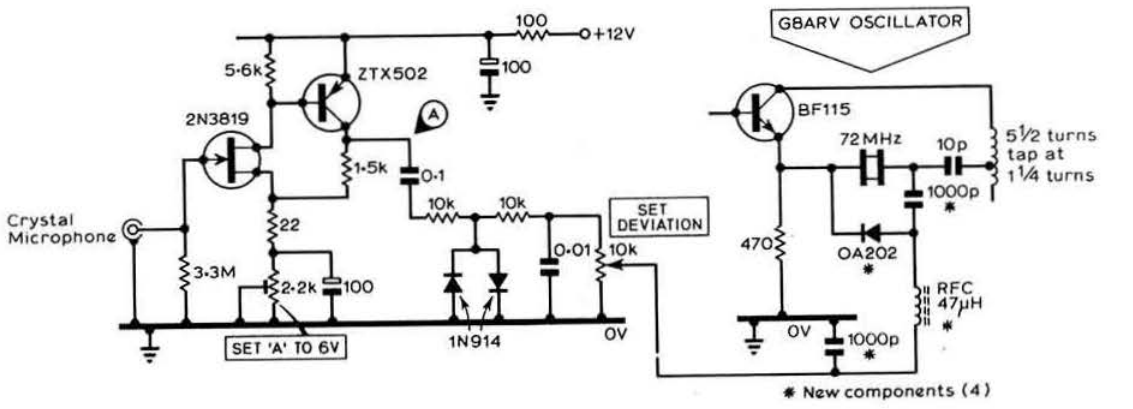
"Seen in Southampton—a Pye Telecommunications van bristling with vhf aerials. Registration number, FMD 528J!" —G8CPD.

* * *

"The only phone rig I have in the QTH is rented from the GPO and has an uncanny habit of ringing just when I am in the middle of a nice meaty cw QSO on 2m!"—G3DAO.

* * *

Any QSLs still required for contacts with EI2VBD/P, the callsign used by the late G8BRT during his holidays in Ireland, will be despatched on request if an sae is sent to Mrs Ivy Cliffe, 16 Moorbank Drive, Sheffield S10 3HT. In



reverse, Ivy would be most grateful to receive cards from operators who were QSLd by EI2VBD/P but have not yet replied. She is attempting to compile in memory of Bob Cliffe a complete record of his last visit to EI.

* * *

Note for late holiday-makers in EI-land: if you cross via Fishguard-Rosslare with the object of travelling south or west when you land in the Republic, put out frequent CQs on the 145·00MHz calling channel. You may well get a reply on 144·9 from EI5CD of Tipperary, who consistently monitors the channel.

* * *

A6812, Nicholas Richardson, 58 Grenville Avenue, Wendover, Bucks, wishes to hear from any member able to receive and resolve pictures from satellites. He will be QRV on 136MHz any moment now.

25 YEARS BACK

"As the result of further discussions which have taken place between the Society and the GPO, permission has now been granted for United Kingdom amateurs to use the band 2300-2450 Mc/s. Frequency modulation, not Pulse, may be employed. Input power 25 watts".—*RSGB Bulletin*, October 1946.

The metre-wave man's code

When operating his station the vhf and uhf metre-wave man:

1. Before transmitting, senses the band for conditions, level of activity and occupancy of his intended channel;
2. When sending CQ announces his location (if he is a newcomer his callsign may not be in the book, if he is an old hand he will not be egotistical enough to assume everyone knows where he is). He will also state beam-heading and intended direction of tuning for cw, using the accepted abbreviations (LH, ML, LF and so on);
3. When engaging in a QSO will give the other man's callsign first followed by his own; in net operation will call stations in "Callbook order";
4. Will keep within his geographic-frequency area unless calling a station on the latter's own frequency;
5. Remembers never to use phone in cw areas, though resorts to cw in any area when communication is difficult;
6. Observes gentlemanly microphone manners by avoiding irrelevant back-chat, refusing to allow "funny men" near the microphone (especially during contests), and abjuring all facetious callsign phonetics, having noted the recommendations written into the licence;
7. Avoids the pitfalls of duplex operation by announcing his and his correspondent's callsigns often, together with frequencies in use, not allowing the intimacy of the mode to tempt him to transgress 6 above;
8. At all times is considerate of others, especially the man in the next street or town by avoiding over-modulation, key-clicks or single sideband overspill;
9. At the end of QSO always pronounces his callsign distinctly for the benefit of distant listeners; and
10. Takes a last look round before closing in case others are calling him. If they are and time is short he suggests times for subsequent meetings.

YOUR OPINION

The Editor
Radio Communication

Sir—As a relative newcomer to the ranks of amateur radio, may I stick my neck out and comment on two topics raised in the July issue of the journal. Firstly, the question of tvi (and allied problems) which G3VA discussed under "Technical Topics", and, to my mind, the mutually opposing question which G3FKM raised, should the power allocations be raised.

The questions of power and interference in general are, of course, closely allied. The higher the field intensity that an amateur sets up around his house the more likely it is that interference (cross-modulation, blocking etc) is going to be caused. But what about the question of creating more QRM on the amateur bands themselves? We all experience the situation where we are copying a weak, or distant, station when somebody puts out his full legal power immediately adjacent to or, worse still, right on top of that station. The result, one lost QSO. Certainly, a more intelligent use of one's available power output is called for, or, put another way, why use a sledgehammer to crack a nut?

We hear every day "S-meter off the end-stop om-terrific signal." Yes, maybe, but under crowded band conditions would it have not been better to have turned down the wick until the signal, although weaker, was still intelligible? My point is, why use 400W p.e.p. (or equivalent on other modes) when 20W would have produced the same contact and made life pleasanter for other band occupants? If QRM is so bad that one needs to resort to full legal power to achieve a local or semi-local contact, then I suggest that another channel should have been chosen.

My plea, therefore, is this. Let us use our power with restraint, always excercising good manners (which seem sadly lacking at the moment). Let us not seek for an all-round increase in power—which can only make matters worse. On the contrary let us seek for an all-round limitation on power outputs so that we can say again, with some pride, that we have worked the world on 10W.

I can already hear people saying, "It can't be done". But look at the impressive list of contacts on, say, NFD (Yes—keep it to 10W, please!). I often run a Codar AT5 on 80m, I can usually work any G-station on a.m. and most of the Continent on cw. Please, do not let us resort to motorway madness on the amateur bands. My motto is, "Needle quiver—not needle bend". Anyone supply a latin translation?

Yours faithfully,
Gordon A. T. Bowhay, G3ZYL

The Editor
Radio Communication

Sir—If some mobile rallies were subject to the Trade Descriptions Act, the organizers would surely be prosecuted! My recent experiences show that a local club does a lot of hard work in organizing the event, but for whose benefit? Certainly the club stands to gain from the proceeds of the raffle. Presumably the traders gain, otherwise they would not use their weekends attending these events so regularly. But I fail to see how the mobileer benefits. He arrives and is jammed into a car parking area from which he subsequently cannot extricate himself if he wants to leave early. He is directed these days into a building, such as a school hall, which is full of "market stalls" upon which dealers display their wares. He is persuaded to participate in a raffle or two, the results of which are declared at the end of the event. He might meet friends and acquaintances, if the event is in his own area.

But, however desirable these happenings may be, where is the "mobile rally"? Years ago a mobile rally was an enjoyable event, with sundry competitions directed at and designed for the mobile radio operator. It was an outdoor event, as befits the title, and I have spent many a happy hour in such circumstances. All this has now gone. What is the point of going on a nice sunny day to a "mobile rally", only to be jammed in a school hall with inadequate ventilation, a temperature of at least 30°C, and a QRO public address system bellowing forth?

I am not advocating the demise of these events, but let them be properly named "Trade Fair", leaving the term "Mobile Rally" for outdoor events where the prime interest is mobileering.

Yours faithfully,
W. Farrar, G3ESP

THE MONTH ON THE AIR

A monthly feature by John Allaway, G3FKM*

REPORTS continue to arrive concerning interference being caused to coastal stations on the 160m band by amateur transmissions. It must be stressed that on this band amateur radio is only a secondary user—in other words, our presence depends entirely on non-interference with the primary users and compliance with any instructions to move frequency or close down. There are absolutely **no** frequencies where amateurs have priority and some of the wilful QRMing which has been reported could easily result in further curtailment of our privileges on 160 or even the loss of the band. A list of known frequencies to be avoided was published in *MOTA* recently—this was by no means exhaustive or even claimed to be entirely accurate and it is a "must" that *any* frequency to be used should be checked most carefully at all times. Special care should be exercised between 2000 and 2100.

From G2NJ comes the following—"Old timers will recall the gramophone music transmitted from PCGG (The Hague) on Sunday afternoons, and 2MT (The Marconi Company's experimental station at Writtle) on Tuesday evenings, before broadcasting commenced regularly from London on 14th November 1922."

PCGG operated on 1,050m and the concerts were sponsored by a British daily newspaper. In a 7MHz QSO with PE2EVO (operating at the Exhibition of Science at Eindhoven, Holland) on 13 July, G2NJ (Peterborough) remarked that he used to listen regularly to PCGG. Whereupon PE2EVO stated that the original PCGG transmitter was now in the Postal Museum at The Hague and what was more it was used for demonstration purposes on Sundays and "still works fb" . . .

This left G2NJ pondering on the fate of the 2MT transmitter. Captain P. P. Eckersley controlled the transmissions on 400m and they gave many their first introduction to "wireless" as it was then known. Perhaps there is someone who can complete this little story . . .

News from overseas

5N2ABG informs us that Nigerian stations have been authorized to use the 5N5 prefix during October to commemorate the 11th Anniversary of Independence. It is hoped that 5N5AAE, 5N5AAJ, 5N5AAK, 5N5AAU, 5N5AAV, 5N5ABG and 5N5ABH will be active and that 5N5BSN will be on for the Jamboree weekend.

The Sunshine Coast ARC (of Nambour, Queensland) is operating a special station, VK4SZ, from the grounds of the Sunshine Coast International Rodeo on 6 and 7 November. QRGs will be 14,175 and 14,275kHz and times of operation 1800 to 0700 each day (these may be modified). Special QSLs will be sent out and it is hoped to make this an annual event. Overseas QSOs are particularly sought for to create interest for visitors to the rodeo.

9J2ED would like readers to know that he is active on rtty and looking for UK contacts. After two years in Zambia he is still finding it difficult or impossible to work Gs on ssb as he rarely hears any. Experience on rtty shows that UK stations are not looking for African signals. He can work with either 170 or 850kHz shift and he is on every evening (1600 to 2200) on 14,090kHz using 45 and 50 bauds. Ed says that he has almost reached the stage of sending five IRCs and direct QSLs to G ssb contacts! He finds Europeans easy to work on 40 and 80m after 2100 and uses a beam which has two elements on 80 and three elements on 40m.

Dave Hardy, VP8HJ, is now back in the Falkland Is following his leave in England. There are already over 14,000 of his QSLs in circulation and now that W2CTN has ceased to act as his QSL manager, cards should be sent via the RSGB QSL Bureau—in future Dave will QSL only on receipt of incoming cards. His QTH is Box 89, Port Stanley, Falkland Is.

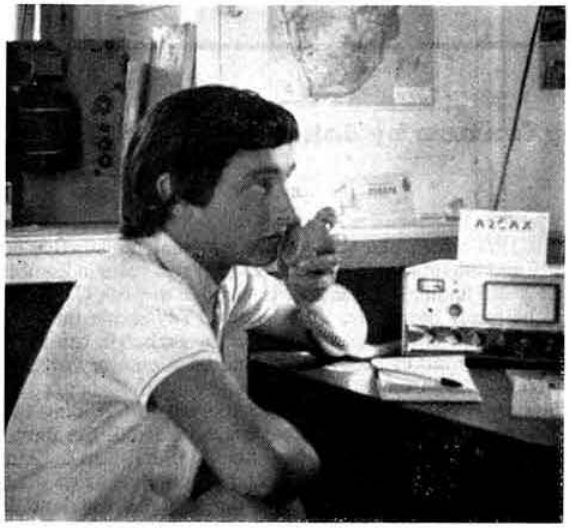
Dr Mike Eccles, G3PPE, is now in Palo Alto, California, and operating as G3PPE/W6. He is very active on 80m and would be happy to set up skeds for cw contacts on that band; he will also be on 160m and trying to work into the UK.

Iain McKeracher, GM3RSI, is now in Saudi Arabia and hopes to be on the air soon. He has a Sommerkamp FT277 transceiver, TA33JR beam, and 40 and 80m dipoles, and he will be looking for contacts with the UK from 1200 daily. Iain will be in HZ for at least a year and all QSLs should be sent to PO Box 1484, Riyadh, Saudi Arabia.

A2CAX operated /P from the Botswana bush on 80 and 40m (3,670 and 7,070kHz) and has worked most of the countries in Southern Africa. The equipment used consists of a Racal TR38 solid-state ssb transceiver which operates off the truck battery, and half-wave dipole aerials. The only QRM heard when operating in the Kalahari Desert came from lions roaming around the camp! Kim will be returning to the UK to become G3XUE later this year.

Darlene (3B9DK etc) visited Perth, W Australia, this summer and compared notes with VK6OV (on right)

* 10 Knightlow Road, Birmingham B17 8QB.



A2CAX/P in his caravan "shack" in the Botswana bush

A letter from MP4BJA (G3XNF) who is secretary of the RAF Muharraq Radio Club station (MP4BBA) says that due to events in the Gulf the station is now closed down. MP4BBA originally came on the air in 1956 and at that time used a DX100U, since then a multitude of equipment has been used by hundreds of operators. At close down there were only six members—MP4BJA himself, MP4BIP (G3XEC), MP4BIM, MP4BIY (G3SLI), MP4BIX and MP4BIZ. During the last few years the club has been very active and has achieved DXCC, but it seems that MP4 will very soon become a rare country on the amateur bands. Both G3XNF and G3XEC expect to be on the air from the Cambridge area by October.

Keith Kahn, G3RTU, President of the Israel DX Club, (4Z4IX) arrived in the UK recently having completed a trip around Europe operating as F0JS/M, HB9XVI/M, G3RTU/LX/M, ON8KG/M and HB0XVI and hopes to be C31EO soon. He will be in the UK for some time and anyone requiring information on 160m operation from Israel is invited to contact Keith at 12 Cliffdale Drive, Manchester M8 6QF.

Top Band news

The Transatlantic 1971/72 160m DX Tests

Dates: 28 November, 26 December, 9 and 23 January, and 13 February.

Times: 0500-0730.

Frequencies: W/VE 1,800–1,810kHz. Europeans 1,823–1,830kHz.

Procedure: Call "CQ DX Test" for alternate five-minute periods, W/VEs leading off. Keep accurately to periods unless in QSO.

Indications are that this winter will be an excellent one for 160m dx and your scribe would be grateful if readers would let him have reports of achievements on the band. Stew, W1BB (36 Pleasant Street, Winthrop, Mass, 02152, USA), who is responsible for organizing these tests and to whom should go much credit for the current world-wide interest in 160m working, would also appreciate notification of results.

Summer dx reports received from W1BB show that G3PQA, who came on the air from Bahrain as MP4BJI early in August, managed to work GW4AEC and several other European stations. It seems that 4X4NJ has managed to obtain temporary Top Band operating permission to use 1,800–1,830kHz and 1,870–1,900kHz during contests only. He has a crystal for 1,837·5kHz. 4Z4HF is also hoping to be on the band. KV4FZ worked MP4BJI, GW4AEC, PY1DVG, ZD8AY, VK6HD and WA4PXP *within a 24-hour period* in August and thus achieved WAC!

INDXA

INDXA (International DX Association) has now completed a year in operation and in July had over 1,750 members representing 85 different countries throughout the world. During the year some $6,500 was received from all sources and directed towards activating a number of rare countries, and over 40,000 QSLs were despatched on behalf of AP2KS (E. Pakistan), EP2CC, FY7AF, FR7AE/E, K3QOS/KB6, KP6AL, ST2SA, TY7ATF, VE8CB, VK9NP, VK9NP/W, VK0TM, XT2AA, ZK1AJ, ZK1MA, ZK2AH, ZM7AG and 8Z4A. Help has been given to a number of other successful operations during the same period, including the OH2BH/ZA and 3C0AN efforts. The association intends to continue with its good work and the $2 annual fee seems to go to a very worthy cause. Contributions of $2 (or more!) should be sent to Bud Kellam, K3RLY, PO Box 125, Simpsonville, Md, 21150, USA.

Expeditions

G3RZI and G3WJN will be on the air from the Isle of Man between 27 October and 3 November, mainly to operate during the phone section of the CQ WW DX Contest. They will be using the Albert Tower and have mains power available. Aerials will include quads for 10, 15 and 20m, and inverted-Vs for 40 and 80m. They should be operational for two days before and after the contest, mostly on 40 and 80m. GD3RZI will use cw and GD3WJN ssb. All QSLs should be sent via G3WJN (see *QTH Corner*) to whom requests for skeds should also be directed.

Dxpeditions

Walt, DJ6QT, has plans to visit Mali for the duration of the CQ WW DX Contest and to use his TZ2AB call. He also hopes to be on the air from Upper Volta, Dahomey, Togo, Niger, Chad and Madeira, and all-band operation similar to that of last year will be attempted. This time a linear will be available. At the time of writing this is to be a solo effort, but other operators may join in. Frequencies will be the same as last year: 3,504, 3,785, 7,003, 7,085, 14,035, 14,185, 21,035, 21,285, 28,035 and 28,585kHz.

The administration of Parece Vela Is has changed since the operation by KG61D some years ago, and it now seems likely that a new DXCC country has been created. If this is confirmed by ARRL there is a possibility that an expedition to the area by JA1s AEA and KSO may take place soon.

There will be an expedition to Kure Is led by KH6HCM commencing about 25 October and continuing through the CQ WW DX Contest until 1 November. The group will be on the air from Midway Is from 22 to 24 October using the callsign W7UXP/KM6. Other operators will be KH6s

GMP and HGP, and on Kure they will all use the callsign W7UXP/KH6. Frequencies to be used are 3,805, 3,830, 7,205, 7,290, 14,210, 14,280, 21,260, 21,300 and 28,525kHz. There may be some special efforts to work into Europe on cw around 14,005kHz.

CT2AZ reports (in the *DXers Magazine*) that CT2s AA, BB, AP and himself will be visiting Madeira for about a week in mid-October and intend to operate on four or five bands.

A group of scientific workers from the US Virgin Is may be visiting Aves Is (YV0) in late October. Some amateur operation may take place.

Information received just before deadline concerning the Kure Is expedition indicates that special efforts will be made to work into Europe before the CQ WW DX Contest. The group will listen for Europe on 14,005kHz between 1700 and 2000, and on 21,005kHz after 2000. QRGs to be used in the contest are 14,210, 14,280, 21,260, 21,300 and 28,525kHz. All QSLs must be sent to the address in *QTH Corner* and not via the bureau. Please include sae and IRCs.

The Mali Is expedition promised by the Finnish dx group has been postponed until next spring.

There is a rumour of forthcoming activity by VK3JW from Frederick Reef in early October. This reef would count as Mellish Reef for DXCC purposes. VK3JW was with VK9NP on the abortive trip to Mellish a few months ago.

DX news

K6KA has received a letter from AC5PN confirming that he is in fact genuine. Thuji Yonten is using the call formerly used by the former Chief Signal Officer and hopes to be using the call AC5TY soon. He has a transmitter capable of 400W input and is presently using a dipole running N—S some 30ft above ground.

The latest "banned list" published by *Long Skip* shows that VE amateurs may now communicate with Syria and Jordan, but they are still prohibited from talking to those in Gabon, Iraq, Pakistan, Khmer Republic, Turkey, Libya, Yemen and Vietnam.

VP2LY is ex-VE3EWY and is using a Galaxy V with LK2000 linear. Other St Lucia stations include VP2LI, who has an HW32 and ground plane and prefers 14,180kHz; VP2LAW has a 20m inverted-V (as has VP2LF) and VP2s LAN and LK are also currently active.

A cutting from the *Los Angeles Times* kindly forwarded by WA6AUD describes the situation affecting the Spratly Is. Claimants include both Vietnams and both Chinas, while the Philippine authorities contend that the area is a trust territory of the allied nations victorious against the Japanese in 1945. France, Portugal and Japan also have claims, but the UK and the Netherlands have notified that they have no interest. The islands are thought to be a possible oil source and both Nationalist Chinese and Philippino troops are at present stationed there. The situation would seem to be most unfavourable for amateur radio expeditions.

AC3PT has been reported active on 14,300kHz from time to time, and has also checked in the SEANET. 9M2IR has recently visited Cambodia and obtained permission to operate as VE7IR/XU. He hopes to demonstrate the value of amateur radio and to get the country removed from the "banned" list. During a visit to Burma he was told that it is unlikely that any foreign amateur will be granted an XZ licence.

The Georgia Southern College ARC will operate KY4CD from the Ogeechee Fair site from 16 to 24 October. All bands/modes will be used with favoured frequencies of 14,050, 14,210, and 14,300kHz. All QSLs should be sent to the address in *QTH Corner*.

Bob, formerly MP4BCC/MF2AA of a few years ago, is on the air again, this time from the Seychelles Is. He has been worked on 14MHz ssb and his call is VQ9MC.

4J0DI and 4J0BF are located on Shikotan Is in the Kuril group. These were formerly part of Japan but are now part of the USSR. QSLs should be sent via Box 88, Moscow.

K2DDK, who acts as QSL manager for 8R1J, says that in future only cards accompanied by SAEs and IRCs will be answered.

The latest "most wanted countries" poll conducted by *DX News Sheet* shows that the top 10 most sought after dx countries are Clipperton (FO8), Bouvet Is (3Y), S. Sandwich Is (VP8), Maria Theresa Reef, China (BY), Spratly Is, Cambodia (XU), Minerva Reef, San Felix Is (CE0X) and Iraq (YI).

Owen, VR2DK, has now left Fiji. VK6HD reports that ZL3PO/C has been worked on 7MHz and will be active on 3·5MHz soon.

More strange prefixes from the US—KQ0NEB (Nebraska State Fair), WX2MAO (Miss America Pageant and Atlantic City), WO8HIO (Ohio State Fair), WD6WD (SW Div ARRL Convention) and WS9UCI (Union County Sesquicentennial station). Swaziland, formerly ZD5, now has an official 3D6 prefix. According to the *West Coast DX Bulletin* the Argentine Embassy staff (? amateur) in New Delhi are using the callsign AZY22 on 14,103 and 14,182kHz.

1971 Countries Table

	1.8MHz	3.5MHz	7MHz	14MHz	21MHz	28MHz	Total
G3YHB	—	12	26	104	98	34	274
G8VG	1	17	39	41	60	28	186
G3YWX	—	12	18	70	22	—	122
BRS27263	—	90	77	206	143	95	611
BRS27880	1	36	40	87	81	39	284
A7082	6	16	42	81	84	15	244
BRS30694	5	9	17	69	60	35	195
A7511	2	36	13	18	—	—	84

Awards

The P-75-P Award

This certificate is issued for working specified numbers of ITU zones since 1 January 1960. Class 3 requires 50, Class 2 60, and Class 1 70 zones confirmed. Applicants should send a certified list of QSLs (showing QTHs of stations worked) plus 10 IRCs to CRC, PO Box 69, Praha 1, Czechoslovakia. A map and detailed list of ITU zones may be obtained from the same address in exchange for an irc. In a world of proliferating awards—some of whose worth one is sometimes inclined to doubt—this certificate seems to the writer to represent a sensible challenge! It is not, unfortunately, available to listeners.

The DAF Award (Diplome des Ameriques Francaises)

For QSOs with two FP8, two FG7, two FY7, and either an FS7 or an FM7 since 1 January 1966. Send certified list plus 10 IRCs to VE2AFC, PO Box 382, Quebec 4, Que, Canada.

QTH Corner

C31DS	via F6ARV, 164 Av Charles de Gaulle, 33 Bordeaux Cauderan France.
ET3USD	via K9HJS, 918 N Third Av, Wausau, Wisc, 54401, USA.
ET3USE	via K8IRC, 1310 Stockbridge Av, Iron Mountain, Mich, 49801, USA.
ET3ZU/A	Umberto A. Zumbo, Box 379, Asmara, Ethiopia.
FP0BG	via VE1AIS, F W. Killam, Waterville, RR2, Kings, NS, Canada.
FP0BT, FP0RP	via WB8BTU, 24963 S Sylbert Court, Detroit, Mich, 48239, USA.
G3PPE/W6	Dr M. J. Eccles, 30 Roosevelt Circle, Palo Alto, Calif, 94306, USA.
GD3RZI, GD3WJN	R. Bennett, 58 Evesham Rd, Headless Cross, Redditch, Worcs.
HB0XVN	via DK3ST, Mozartstr 7, 7083 Wasseralfingen, Germany.
HK0AA	via K3RLY (see VR1AA).
JW4LN	via LA4LN, PO Box 31 Sm, Oslo 3, Norway.
JY9BI	via DK2BI, Bergstr 57, 55 Trier, Germany.
KY4CD	Larry Price, W4DQD, PO Box 2067, Georgia Southern Branch, Statesboro, Ga, 30458, USA.
MP4MBL	via G3ZYP, Andy Matheson, Paradise Wood Cottage, Hartfield, Sussex.
VK3UV/VK9	via W7VRO, Dick Moen, Box 981, Bellingham, Wash, 98225, USA.
VK9XX	Box 21, Christmas Is, Indian Ocean.
VP2LY	via VE3BMV (new QTH), Box 292, Don Mills, Ont, Canada.
VQ9MC	M. Carragher, Beau Vallon, Mahe, Seychelles Is.
VR1AA	K3RLY, PO Box 125, Simsonville, Md, 21150, USA.
W7UXP/KH6, W7UXP/KM6	KH6HCM, G. Elliott, 5952 Gannel Av, Ewa Beach, Hawaii, 96706, USA.
3A0FX	via K9KRZ, 425 Greenfield, Oak Park, Ill, 60302, USA.
3V8ZK	via F5ZK, 51 Av de L'Agt Sarre, 92 Colombes, France.
4W1AF	via DJ9ZB, Carl Kistner Str 19, 78 Freiburg, Germany.
5Z4NE, 5X5NF	via VE6AKV, 7612 23rd St SE, Calgary, Alberta, Canada.
9X5VA	PO Box 30, Butare, Ruanda.

RSGB QSL Bureau, G2MI, Bromley, Kent, BR2 7NE

Contests

Full results of the **1970 CQ WW DX Contest** (Phone section) have now been published. UK scores were as follows:

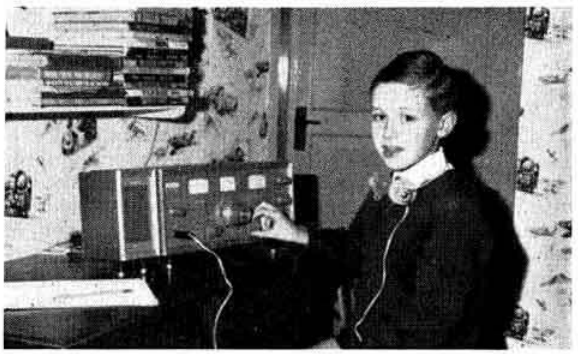
Single Operator

G3LNS	**(All band)**	**1,667,385 points**		G2BOZ	(28MHz)	251,086 points	
G3KMA	,,	312,309	,,	**GC3YIZ**	,,	**54,944**	,,
G3YHB	,,	300,752	,,	**G3FXB**	**(14MHz)**	**361,534**	,,
G3YBH	,,	205,313	,,	G4JZ	,,	243,294	,,
GM3BCL	,,	**202,852**	,,	G3KWK	,,	165,977	,,
GW3NWV	,,	**167,240**	,,	G3NSY	,,	52,724	,,
G2AJB	,,	69,768	,,	**GM3VEY**	,,	**23,214**	,,
G3WOU	,,	20,160	,,	**GM3WOJ**	**(7MHz)**	**1,560**	,,
GI3RXV	**(28MHz)**	**300,580**	,,	**GM3VTB**	**(3·5MHz)**	**9,460**	,,
G3YBM	,,	**293,328**	,,	**GM3YCB**	**(1.8MHz)**	**1,204**	,,
G3WJN	**(28MHz)**	266,122 points					

Multi-operator single transmitter

G3WYK	**2,150,685 points**		G3YXR	532,656 points	
G3SSO	1,976,469	,,	G3CXX	486,920	,,
G3KMI	612,864	,,	G3ZBI	117,040	,,
G3FVA	578,248	,,	**GW3VBX**	81,396	,,

Congratulations to the winners (printed in bold type).



Philip West, junior, son of G3JPN, having learned the morse code characters in three days, attended classes with his father and passed his code test at Portishead on 12 June. At nine years of age he was the youngest applicant ever in Britain. Philip's younger sister Pauline can also copy cw—she is eight! The receiver was a 10th birthday present

The International OK DX Contest

0000 to 2400 14 November

CW and phone may be used, but no cross-mode or cross-band QSOs may be made. A station may only be worked once per band. QSOs with one's own country count only as multiplier, not for QSO points. Exchanges consist of RS/T plus number of ITU zone in which station is located (all UK is in Zone 27). QSOs with OK count three points, with other countries one point. Final score is total QSO points multiplied by total of ITU zones worked on each band added together. Separate logs should be submitted for each band and should show time, station worked, numbers sent and received, points claimed and ITU zone, (if multiplier). The log must indicate into which category it is being entered: A = Single-operator multi-band, B = Single-operator single-band, or C = Multi-operator multi-band. It must contain a signed declaration that local and contest rules were observed and that it is a correct record. Logs should be sent to: CRC, PO Box 69, Praha 1, Czechoslovakia, before 31 December.

The "100 OK Award" and "S6 Award" will be issued to contestants who have worked 100 OK stations and all six continents respectively if a request is included with the log. In the 1970 event only one UK station entered—**G3NSY**—who made 252 QSOs and scored 10,741 points.

The Ninth Annual Illinois QSO Party

1600 6 November to 2200 7 November

Same station may be worked on each band and mode for QSO points. QSOs with stations in Illinois count one point. Multiplier is total number of different Illinois counties worked, and each group of eight stations worked in any county counts as extra multiplier (10 QSOs = 1 point, 16 = 2). Exchange RS/T, QSO number and country. Activity will centre around 3,560, 3,735, 7,060, 14,060, 14,275, 21,060, 21,360, 28,060 and 28,660kHz. Logs should show date, time, station worked, number sent and received, band, mode and claimed score. A separate summary sheet should be submitted giving details of entrant and scoring; this should be sent to Radio Amateur Megacycle Society, 3620 N Oleander Av, Chicago, Ill, 60634, USA, no later than 1 December.

A reminder that the **RSGB 7MHz DX Contest** takes place on 6-7 November—full rules appeared on pages 412 and 413 of June *Radio Communication*.

Band reports

Conditions during the period under review seem to have been reasonably good, but 28MHz has produced only occasional dx openings interspersed with frequent short skip from Europe. The 21MHz band now fades quite early in the evening and 14MHz is closing for part of the night. The latter band has produced some good openings into the Pacific between 0700 and 0900. Both 7 and 3·5MHz are improving.

Many thanks to all correspondents and especially to the following: G2BJY, G2HKU, G3HB, G3AAE, G3GVV, G3YHB, G3YWX, G3ZBA, G4MJ, G6GK, G8VG, BRS 2098, BRS17567, BRS19682, BRS25901, BRS31231, BRS31301, A6148, A7056, A7082, A7120, A7176, A7555 and A 7768. All stations listed in italics were on cw, the rest on ssb.

1·8MHz 2100 *GC5APA* (Sark), *GD3TNS*, *OKs*. **2200** GM3VIT/P (Orkney).

3·5MHz 0000 FP0CA, VEs, VOs, 3V8ZK. **0400** VP9GO, W1, 3, 8. **0500** ZL3LE, ZL4JF/A. **0600** VP9GE, YN3AAA. **1800** G5AVY/A (*Chamaru* in port). **2000** OD5FA, 5Z4s KL, LW. 9K2AL. **2100** C31DM, JY9DX, OD5BA, ZB2CC. **2200** CR7IC, ET3ZU/A, 4X4YM. **2300** CR7FM, ET3USA, KP4AN, KV4AM, LU7AAC, PY2PE, ZP3AQ, 3A0FW.

7MHz 0000 FM7WE (on a.m.), YVs. **0100** *EL2CB*. **0400** *YN1CW*. **0500** CXs *1AA*, *4AQ*, *FM7WU*, HR1KAS, YS3FH, *ZL4JF/A*, ZP5RL, 9Y4KR. **0600** CP1JB, *FP0RO*, OB8V, *K2YGM/VP7* (QSL to K2YGM), *K4BZH/VP7*, *XE1IIJ*, *ZL2IR*, ZL4BO, **0700** VP9GE. **1800** JA6CFW. **1900** ET3ZU/A. **2000** ZS5LB. **2100** LU7AAC. **2200** JX2HK, VK3MR, ZS1MH, 3V8ZK. **2300** CE3HUW.

14MHz. 0600 ET3ZU/A, JY4MA, KH6BB, YK1AA, 5W1AU. **0700** FK8BT, FO8CS, KH6, ZM7AG. **0800** WB5DJM/KC4, KS6s DH, DU, DY, ZK1AJ, *5W1AK*. **0900** VR5LT, ZK1CD, ZL1AFW/ZK1, ZK2AF. **1000** VK9LV. **1100** *KS6CG*, KW6HB, VK0JM (Davis Base). **1200** M1B. **1300** VK9FH. **1400** *TA6AF*. **1500** KG6SI, VK3UV/9, *WA7GWU* (Utah), **1600** VK9XX. **1700** AP2KS, KH6HJF, VQ9YL. **1900** DU1EJ, FP0LK (QSL to WB2RLK), ZS3KG (QSL to K4TXJ), 5Z5KL (Lamu Is—counts as Kenya). **2000** *FB8ZZ*, *FP0BT*, JY6RS, LU1ZAB, VP8MH. **2100** *HS1ABD*, VP8s LX, HZ, *3F1IE*. **2200** CR5SP, HK0AA. **2300** KS4DX (QSL to K3RLY). **2400** VP1BH (QSL to VE2AKZ).

21MHz. 0800 TJ1AW, 7Q7AA. **0900** *VK6SA*. **1000** FR7AJ. **1100** ET3ZU/A. **1300** FP0RO, *FR7AL*, HM1AQ. **1400** AP2KS, VP8MM, 5X5NA. **1500** HS5AFJ. **1600** VS9MF, 9G1YA (QSL to W5EGH). **1700** YB0BY (Box 2761, Djakarta.), 9M8OEA. **1800** KL7s, OB8V, *ZD8CW*, 4W1AF, *9LIRT*. **1900** CR4BS, *FY7AE*, VQ9R (PO Box 193, Mahe), VU2HLU, 9X5BA. **2000** HC6JB (QSL to DJ9ZB), HK0AA, WA5KPL/HR, 5N2AAN. **2100** LU3IV, TY1ABE.

28MHz. (European signals from 1000 to 1800) **0900** 7Q7AA. **1300** ZS3AK. **1500** *HB0ACP*, *ZD8CW*. **1800** CR6s EF, NO.

Many thanks to the authors of the following publications for items reproduced: the **West Coast DX Bulletin** (*WA6AUD*), the **Ex-G Radio Club Bulletin** (*W3HQO*), **DX'press** (*PA0TO*), **DX News Sheet** (*Geoff Watts*), the **29 DX Club Newsletter** (*VK6PG*), **QUAX** (*G3DME*), the **DXers Magazine** (*W4BPD*), **NARS Newsletter** (*5N2ABG*), **Long Skip** (*Nick Sawchuk*) and **CARS Newsletter** (*ZC4RS*).

Please send all items for **November** issue **to reach G3FKM** no later than **11 October,** and for **December** issue by **15 November.**

MOBILE RALLY NEWS

Torbay Rally report

The Torbay ARS mobile rally on 15 August attracted 35 mobiles, over 100 cars and about 350 people. The longest travelled on the day was G3PMC/M from Aldershot. GB3TMR, the exhibition station, was interesting to the many visitors, and various competitions were well supported.

A proportion of the amount raised will be paid into a fund for radio equipment for a new Cheshire Home being built at Brixham.

Swindon Rally report

Swindon & D ARC's annual rally had a larger attendance than last year, with approximately 300 cars and 1,000 visitors. G8CNP travelled furthest to the rally, G3ONX/M had the longest 160m talk-in, and G3WJJ/M had the longest 2m talk-in.

There were also special prizes for the ladies and a lucky dip for the children, and in addition to the usual raffles and competitions there was a df hunt with prizes to G3NDN and G3ORI.

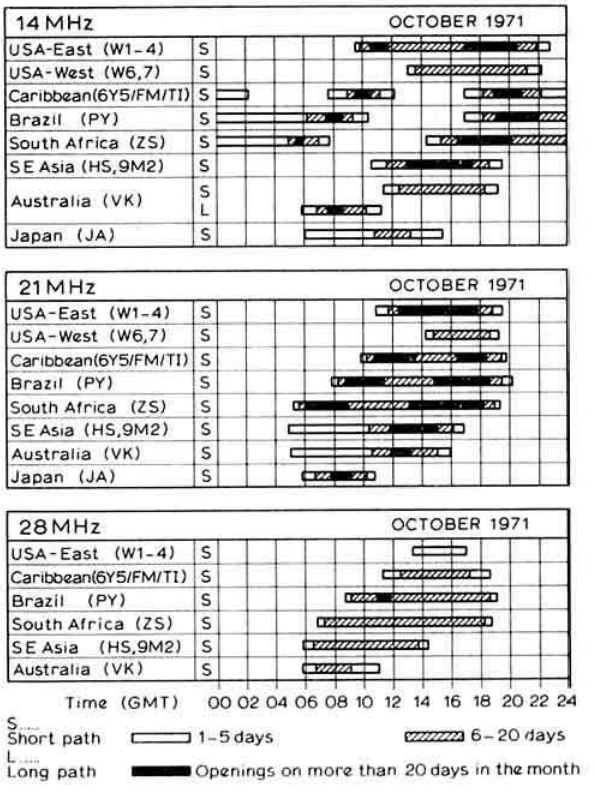
Propagation Predictions

After a longish summer break, propagation conditions will improve on the higher hf bands, **28** and **21MHz.** The present activity of the sun should just facilitate contact on 28MHz with Central and South America, Africa, South-East Asia and parts of Oceania on favourable days (days with above average MUFs). Eastern North America will probably only be heard in exceptional circumstances, chances being better for stations in Southern Europe. Short skip conditions will occur very rarely from this month onward on **28** and **21MHz.**

All continents should be heard on **21MHz.** This should last until spring of next year. **21MHz** will be the main carrier of dx-traffic in daytime, **14MHz** during the first half of the night and **7MHz** during the latter half. During forenoon there will be possibilities of dx traffic with Central and South America, Africa and via the indirect path with Australia.

Distances on **7MHz** will increase during October compared to the previous months and there will be no interference by the dead zone during daytime. Consequently this band will be ideal for local and European traffic in daytime. DX contacts on this band and on **3·5MHz** will always be possible when most of the path lies in darkness: this applies mainly to 3·5MHz. Interruption by the dead zone on 3·5MHz will occur repeatedly during the second half of the night.

The mean sunspot number for August 1971 was 59·9, with the period of highest solar activity occurring between the 20th and the 27th of that month. The predicted smoothed sunspot numbers for December 1971, January and February 1972 are 51, 49 and 47 respectively.



THE SPACE CONFERENCE

World Administrative Radio Conference for Space Telecommunication

Geneva, 1971

(Part 2)

The first part of this article dealing with the recent Space Conference comprised a factual record of the progress of events in so far as they concerned the amateur service. This second part deals with the day to day events concerning the various meetings of committees and working groups. It should be made clear that the views expressed are those of the writer and were not necessarily shared by the UK delegation.

Representation

The headquarters and the three regional organizations of the IARU had for sometime been fully aware of the necessity to bring the future of the amateur service both to national telecommunications authorities and later to the conference itself. To this end many documents had been circulated providing details of what were the agreed amateur views on proposals to be submitted to the conference and seeking the co-operation of national societies to ensure that these views were adopted by the national administration. In Region 1 during the 18 months preceding the conference, letters and documents in four languages had been distributed in an effort to ensure a unified approach to questions affecting the amateur service. It is correct to say that the preparation for this event was more thorough and better organized than for any previous ITU conference.

Representatives of the International Amateur Radio Union who attended the conference in whole, or in part were: R. W. Denniston, W0DX, (president, IARU); J. Huntoon, W1RW, (secretary, IARU headquarters); R. L. Baldwin, W1RU, (IARU headquarters); N. B. Eaton, VE3CJ, (treasurer, Region 2); T. R. Clarkson, ZL2AZ, (director, Region 3); W. J. L. Dalmijn, PA0DD, (treasurer, Region 1); and Dr P. I. Klein, K3JTE, (adviser). In addition, R. F. Stevens, G2BVN, (secretary, Region 1), attended as a member of the UK delegation.

Initial meetings

After the initial formal plenary meetings of the conference which established the committee structure and allocated the work of the conference, the various committees were broken down still further into working groups which, in turn, were allocated specific subjects for consideration. Amateur service matters came under the jurisdiction of Working Group 5C, and the first three meetings of this committee, which comprised representatives from more than 50 nations, dealt with the proposals that had previously been circulated to all conference participants.

The first to be dealt with were the proposals to allow space techniques in the 7, 14, 21, 28 and 144MHz exclusive amateur bands. These relatively straightforward proposals occupied a considerable amount of time and it was clear from the start that there was a definite division of opinion among delegates as to the desirability of extending the existing facilities of the amateur service. The discussion eventually ended with approval of the use of space techniques on the bands mentioned but not before there had been an unsuccessful proposal to prohibit the use of amateur radio satellites using a geostationary orbit. The meeting agreed not to allow space communication facilities in the segment 14,250 to 14,350kHz which, in the USSR, is shared (by a footnote in the radio regulations) with the fixed service. The basis on which this latter point was decided was not agreed by the delegations supporting the amateur proposals but it was believed that to make an issue on this relatively unimportant matter would be unwise.

The initial discussions concerning amateur space techniques had been far from agreeable, but even more conflict was evident when the proposals concerning the 432MHz band were discussed. This was the first shared band to be discussed in relation to the amateur service, and despite vigorous support by the UK, USA, Canada, Australia and New Zealand it seemed that there would be no possibility of obtaining space technique facilities in this band. In view of the well advanced plans for the next OSCAR satellite, such a decision would be a severe handicap to amateur participation.

During the discussions concerning the 432MHz band it was obvious that the countries of the CEPT organization: (Conference Europeene des administrations des Postes et des Telecommunications) comprising Austria, Belgium, Cyprus, Denmark, Finland, France, Germany (Fed Rep), Greece, Ireland, Iceland, Italy, Luxembourg, Malta, Monaco, Norway, Netherlands, Portugal, San Marino, Spain, Sweden, Turkey, United Kingdom, Vatican and Yugoslavia; which is basically a body of representatives of western European administrations, had decided to adhere to a decision taken at a previous CEPT meeting in Berne not to allow space techniques in bands shared by amateurs with other services.

The basic objections to the use by amateurs of space techniques in the 432MHz band stemmed from the remote possibility of interference to other services using this allocation. The band 430-440MHz is allocated on a primary basis (subject to various footnotes) in Region 1 to the amateur service with radiolocation as the secondary user. In Regions 2 and 3 radiolocation is the primary service.

By footnote 320 to the existing radio regulations the band 430-440MHz in Greece, Italy and Switzerland is also allocated to the fixed and mobile services. This position also occurs in other countries and it was this group that provided the most outspoken condemnation of amateur activities. France spoke against the proposal and reiterated on several occasions that amateur satellites could cause interference to radiolocation. This attitude ignored the findings of the special joint meeting of the CCIR which concluded that sharing with amateur space activities was feasible. After a prolonged discussion, during which a number of delegates expressed their dislike of amateur radio activities, it was proposed by Switzerland that space techniques should be allowed

The IARU stand at the Telecom 71 exhibition held at Geneva during part of the Space Conference

in the segment 435-438MHz, subject to the UK wording regarding non-interference. Support for this proposition was greater than for the use of space techniques in the whole of the allocation, but no clear majority could be established and the chairman ruled that the matter should be referred to a plenary meeting of Committee 5.

The next set of proposals to come before Working Group 5C related to the amateur bands at 1,215, 2,300, 3,300, 5,650 and 10,000MHz. The chairman ruled that these proposals should be taken as one block, which obviously restricted discussion and prevented any compromise proposal being tabled for a specific band. Opposition to amateur service space activities in these bands was considerable, with delegates from France, India, Nigeria, Norway, Portugal, Sweden and the USSR voicing complete opposition. At the third working group meeting on 22 June amateur allocations in the region of 20GHz were considered.

The existing radio regulations provide for an exclusive amateur band between 21 and 22GHz. This allocation was deleted and replaced by an allocation of 24·0-24·050GHz devoted exclusively on a world-wide basis to the amateur service, with a further allocation in the segment 24·05-24·25GHz where the amateur service would be the secondary user. A footnote was added allowing the use of space communication techniques by the amateur service in the exclusive 50MHz portion between 24·000 and 24·050GHz.

At this stage the working group terminated its consideration of amateur service proposals that had been circulated before the commencement of the conference. It will be seen that the results from the working group were almost completely unsatisfactory to the amateur service and pointed to the necessity of a considerable amount of work by the representatives of the amateur service before the matter was considered by a plenary meeting of Committee 5.

The attitudes adopted by certain of the countries which had voiced their opposition to amateur space activities came as a considerable surprise to the amateurs present at the conference. Nations which in the past had co-operated with the national amateur society were now seen to be wholly against extending the present facilities and thus providing the means for progress in the years ahead. While some opposition to the amateur service proposals had been expected, the amount and intensity came as a disappointment.

The next step was, therefore, to attempt to regain some ground at the plenary meeting of Committee 5 when the results of the working group would be considered. An intensive period of lobbying with the intention of providing guidance regarding amateur activities was embarked upon. It was felt that almost all of the opposition was due to (a) lack of information concerning past and future space activities, or (b) a blind illogical approach to all amateur activities. In an effort to remedy the first point the IARU prepared conference document No 182, "Space techniques in the amateur service", which was distributed through the official conference document service on 22 June.

It subsequently transpired that due to the delay in holding the plenary meetings of Committee 5, the timing of this document was such that it did not obtain the maximum effect. However, this factor could not be foreseen at the time. As a follow up to the IARU document a distribution of the IARU Region 1 booklet containing the article by P. I. Klein, K3JTE, and G. Jacobs, W3ASK, entitled "Satellites in the amateur service", was made to all Committee 5 spokesmen of the national delegations.

The reading of the documents produced daily during the period of the conference was a major, but necessary, task. Without warning, document 244 of 29 June contained a proposal by Sweden to allocate 432·00 to 434·25MHz to space techniques for maritime mobile service and to suppress all existing allocations, including a segment of the 70cm band. This would have been a disastrous step but one which was fortunately averted in Working Group 5D-3 by the

opposition of many countries. However, this particular proposition may be renewed at the next maritime mobile conference and due note should now be taken of this possibility.

As indicated in the first part of this report several committees or their working groups met simultaneously and at one period matters affecting the amateur service were being considered in three separate meetings. Sufficient to say that a proposal by Argentina to reduce the frequency of 144MHz, above which licences may be issued without a cw test, to 50MHz, was overwhelmingly defeated. In another committee the new definition of "amateur satellite service" was adopted without discussion.

When the amateur proposals, rejected by the working group, came before the plenary meeting of Committee 5 on 6 July there seemed to be a reasonable chance that they would be accepted. A great deal of work by the amateurs of IARU and national delegations had, it was believed, uncovered some new support for the amateur case. However, the meeting got off to a bad start when the chairman indicated that as the proposals for bands above 420MHz had already been rejected once, the committee should dispose of these without delay. The proposals relating to the bands up to and including 144MHz were accepted but considerable argument developed around the 420MHz allocation. Opposition again came from some of the CEPT countries together with Cuba, Syria and the USSR. Denmark, Italy, New Zealand, Phillippines and the USA spoke in support but the vote showed 25 for, 31 against and 9 abstentions. Several delegations reserved the right to raise this matter again at the conference plenary.

Proposals for amateur satellite operation in the 1,215, 5,650 and 10,000MHz bands were treated simultaneously. The suggestion for this method came from the chairman and it was supported by several delegations, including France and Greece. This resulted in the most cursory consideration being given, culminating in the rejection of the proposals by 38 votes to 26. Among the delegations who spoke strongly against the amateur service were France, Mexico, Pakistan and Poland.

The results of the committee plenary meeting were almost completely unsatisfactory. Opposition to amateur activities had been voiced by a number of delegations, but it is felt that many countries who might have given support had been influenced by the attitude of the chairman who, if his words and actions are judged correctly, was completely opposed to any extension of amateur space facilities above 420MHz. Several countries, including the United Kingdom, Israel and Italy, reserved the right to bring the proposals to the conference plenary.

After this setback it was necessary for those supporting the amateur proposals to redouble their efforts in preparation for the conference plenary meeting which would be the last chance for the acceptance of any proposals. As part of this effort the United Kingdom and Italian delegations, in co-operation with the IARU observers, prepared new papers in support of amateur radio. These were reproduced as Appendices 2 and 3 of the first part of this report.

These papers were brought to the attention of many countries by personal contact with the heads of delegations or their spokesmen. It seemed that in some cases fears regarding harmful interference from amateur satellites had been allayed but generally the reactions gave no optimism for the final meeting. It was noted that some delegations would discuss the proposals with one of the amateurs present at the conference and would apparently be satisfied as to their validity, despite this the delegation would later indicate a contrary vote at a subsequent meeting. This was a most frustrating and disheartening experience.

Following delays due to the overloading of the hard-pressed conference document service and a lag on the conference schedule leading to problems with printing contractors, the amateur proposals (including the new United Kingdom and Italian papers) came before a special meeting of the conference plenary on 15 July. The first agenda item related to the United Kingdom proposal concerning 435-438MHz. The proposals made by Italy for the 1,215, 5,650 and 10,000MHz bands formed the second agenda item.

After a spirited introduction by Mr D. E. Baptiste, head of the United Kingdom delegation; France, Greece, Philippines, Saudi Arabia and Uganda all spoke in favour of the proposal, while Malaysia registered objection. After 35 minutes of discussion the conference approved the United Kingdom proposal by 63 votes to 3 (Indonesia, Iraq and Iran) with 14 abstentions. This result was some slight compensation for the many previous disappointments and reflected the intensive preparatory work undertaken in support of the proposal.

Unfortunately the proposals by Italy which formed the second agenda item were less favourably received. Greece made a proposal, which was accepted, that the 20MHz segment should be split into two 10MHz segments. Italy agreed to this modification of the original proposal and it was supported by Australia, Israel and the USA. However, France, Sweden and the USSR spoke against the proposal which was eventually rejected by 25 votes to 42. The treatment accorded to the two remaining proposals by Italy was similar to that given to the first proposal, although there was more support for an amateur satellite service segment in the 10MHz band. France claimed that amateur satellites would cause interference to radiolocation, mentioning the aeronautical safety service. They also claimed protection for a radio navigation service operating in the 10GHz band, but it was pointed out to the French delegation that this service was not named in the radio regulations and protection for it could, therefore, not be claimed. The third Italian proposal relating to the 10GHz band was finally rejected by 30 votes to 36.

This meeting was the last at which matters concerning the amateur service were discussed. Subsequent plenary meetings of the conference ratified the proposals which had already been accepted. These will now form part of the radio regulations with a commencing date of 1 January 1973.

Future conferences

The intense opposition to the amateur proposals provides a clear warning that at a future administrative conference all or any of the amateur allocations could be altered or suppressed. The experience of the Space Conference indicates that the two areas where intensive work by amateur representatives is necessary are in the CEPT countries and the newly-developed countries of Africa. On the one hand there is opposition said to be based on technical grounds, although many of the reasons were incorrect, while on the other, so far as Africa is concerned, the opposition appeared to be based on a complete lack of information and understanding. To some delegates the amateur service appeared to have sinister possibilities.

The next scheduled ITU conference will take place in 1974 when matters affecting the maritime mobile service will be discussed. In this connection the proposals made by Sweden at the Space Conference to re-allocate part of the 432MHz band should be noted. It is likely that there will be similar proposals made in the future affecting this part of the frequency spectrum. A future world administrative radio conference, with powers to alter all or any frequency allocations, could prove disastrous for the amateur service. Whatever the support provided by delegations of those countries where amateur radio has been established for many years and is respected and accepted, their views could be completely ignored by an unfavourable vote in a conference session. The lesson for all national societies and the International Amateur Radio Union is therefore clear, there must be a logical and unified approach to national administrations to ensure that at future conferences the amateur service will receive the support to which it is entitled. The three regional organizations of the IARU are in a favourable position to co-ordinate the approaches by national societies and to ensure that this vital work is commenced without delay.

The presence at the conference of an IARU observer team representing all regions proved to be worthwhile, and with the support of amateurs who were members of national delegations ensured the proper attention to matters concerning amateur radio.

However, many delegations came to the conference with their viewpoints already established and it would be unrealistic to expect that these could readily be changed. The work of amateur representatives at a conference must be preceded by effective liaison between the national society and the administration. This preparatory work is vital if the amateur service is to maintain its status and increase the facilities available.

No account of the conference would be complete without expressing the thanks of the amateur service to those persons and delegates at Geneva who provided so much assistance and advice. It is quite certain that without the efforts and assistance of the delegations of Italy, New Zealand, United Kingdom and the USA the case for amateur radio would have been virtually unheard and the proposals dismissed with the minimum of discussion.

On behalf of the RSGB, the writer would like to express appreciation to Mr D. E. Baptiste, head of the United Kingdom delegation, and to Mr A. Fortnam, the United Kingdom spokesman in Committee 5, who carried their support of the amateur service to a point far beyond that which one might reasonably expect in the difficult circumstances of the conference. *G2BVN*

Tackling tvi

AMATEUR radio has been plagued by tvi ever since television broadcasting began, and while improvements in amateur equipment and in tv receivers have helped to solve some specific troubles, they have not reduced the total problem. The number of cases of tvi continues to rise and is giving cause for concern, so the RSGB TVI Committee has been reconstituted to encourage members to deal with their tvi problems. There is already plenty of information available to any amateur who wishes to study the literature and work on the problem, which is, of course, a two-part one as there are two sets of equipment involved.

The television receiver

Unlike the amateur signal, which is one modulated carrier not more than 8kHz wide, the television signal contains two carriers, sound and vision. The sound signal is about 50kHz wide, and the vision signal is some 3½MHz wide on 405 lines and about 5½MHz wide on 625 lines. To receive all this the tv set must be a broadband receiver, which makes it rather susceptible to any strong signal. Its r.f. stage may be overloaded by the amateur signal and generate many spurious signals which break through in the form of sound bars, cross hatching and/or audio interference. The fact that the interference affects all channels will suggest that the fault lies with the tv set, which needs assistance to sort out the signals it should be receiving from those it ought to reject. This can be given by adding a rejection filter as near to the first stage as possible.

If the amateur owns his tv set the filter can be put inside the back of the cabinet, but it is more usual to fit it on the outside of the cabinet on the end of the aerial feeder. A high-pass filter will attenuate all signals below its cut off frequency but will have a frequency of maximum attenuation. In commercial filters this is usually about the i.f. of the tv set (35MHz). Ideally the maximum attenuation should occur at the frequency giving trouble, so an amateur who works 14 and 21MHz only, for instance, could make himself a more effective filter by following an amateur design or by designing his own from the details in the *Radio Communication Handbook* [1].

With a vhf transmitter the situation is more complicated because the tv set may need to receive signals above and below the amateur signal, say at uhf Channel 9 (190-195MHz), Channel 2 (48-53MHz), when the transmitter is at 145MHz. In this case a notch filter for 145MHz, as supplied by some tv firms, or a coaxial stub is the obvious answer. When the tv receiver is uhf only a high-pass filter is adequate, and this can take the form of a vhf/uhf diplexer with the vhf output terminated in 75Ω.

Some amateurs have found that a high-pass filter does not solve all their troubles at the tv set, as the amateur signal sometimes enters by the mains or on the outer braid of the coaxial lead. The former can be inhibited by a mains filter [1] at the tv set, and the latter by a braid filter or a quarter-wavelength stub and/or by earthing the braid [2]. The braid filter will either make a break in the aerial feeder or add impedance by coiling coaxial cable around ferrite toroids. A quarter-wavelength of insulated wire connected to the outer braid at the set end will sometimes be effective against a particular frequency. Earthing the braid without breaking it, and so providing the interfering signal with an alternative

route, is another answer. The solution to any particular problem is very much a matter for experiment.

The amateur transmitter

Particular attention has to be paid to the spurious outputs generated by the transmitter which fall in the tv channel [3]. The basic rule here is not to generate them, but if this cannot be avoided they should be kept at home. Many amateurs now buy commercial transmitters and so have little say in what frequencies are used, though this is something to be considered when buying a new rig. Try to find out what frequencies are produced and work out which ones might cause trouble [4]. One thing is certain— the transmitter will have harmonics, so as a matter of course a low-pass filter to reduce the level of any which fall in the local tv channels will be needed.

The amount of attenuation required depends on the strength of the harmonics in relation to the tv station's field strength at the receiver. In an area of weak field strength, radiation from the amateur transmitter wiring can also cause interference so that the transmitter will need to be housed in an rf-tight box [5]. In this respect some commercial transmitters are better than others, and when buying one look out for large holes in the front or back panel and badly fitting inspection doors which may cause trouble. All the leads into and out of the box should be bypassed and all connections between boxes in the transmitting system, ie low pass filter, Z match etc, should be of coaxial cable with proper connectors at both ends of each length, however short [6]. It is not safe to assume that a commercial rig is adequately screened and filtered, almost certainly it is not. In some cases a great deal of work is required to make it harmonic proof.

In many cases though, all these precautions are not necessary and simply installing a low-pass filter will effect a cure. A low-pass filter is needed to ensure that only lower frequency signals can get out to the aerial and any accidental frequency above the cut-off frequency of the filter is attenuated. In a Channel 1 area it is obviously important to have a low-pass filter with a cut-off below 41MHz. A vhf transmitter may also have sub-harmonics when a band-pass filter is more suitable [7].

An amateur transmitter is also capable of producing any number of odd spurious frequencies, most of which will be at such a low level as to be completely unnoticeable, but there could be one or two odd mixer products which would be sufficiently strong to cause trouble, or even a parasitic oscillation. Again, these will be substantially attenuated by a filter, but if the specific frequency can be tracked it is better to attack it at source.

The only way to be sure that the transmitting system is clear of tvi is to test it, [8]. A simple and useful gadget for detecting rf leakage is a search coil. Make a small coil, say a couple of turns about 1in diameter in 16swg, and solder one end to the inner and the other to the outer of a length of coaxial cable. Fix an appropriate coaxial connector on the end. Make a T junction box with a tobacco tin and three coaxial connectors, one on each end and one somewhere in the middle, inners connected inside the box. Then connect the search coil to the tv set and tv aerial lead by means of the junction box. If the tv picture is much weakened, prune the line to the search coil a little. After installing the transmitter and television receiver in the same room the loop can be used to search over the transmitter cabinet while it is working into the dummy load and any hot spots where rf is leaking out of the cabinet will be revealed on the tv screen. Test the leads, knobs, meter holes, filter boxes etc, and make a note of any places that need attention.

Next test the transmitter on open aerial with transmitter and tv receiver in their usual places. If they are in different rooms it will be most helpful to have a fellow amateur to assist with the observation. Repeat the tests at both ends and in the middle of each amateur band for each channel on the tv set and make a note of the results. If this can be done when trade transmissions are being made, so much the better.

Sometimes at this stage the amateur finds his transmitter is clean on, say, every band except the hf end of 21MHz on every channel except Channel 5. That is an easy one, $21 \times 3 = 63$. So it is the third harmonic of 21, and either a low-pass filter that has maximum attenuation covering the third harmonic of the 21MHz band, or a tighter box, or more lead filtering, or a combination of these is needed. But whatever the results, look for a pattern. See if a harmonic relationship between some frequency in the transmitter and the frequency in trouble can be traced. Oscillator and mixer frequencies are usually given in equipment manuals, so if in doubt read the book. Work on the rig as seems appropriate and then re-test. Do not be downhearted if it is not clear on a second test, there is always something else that can be done. Interference is curable, even if it takes a lot of work to do it [5].

Tvi can be caused or made worse by over-driving the final amplifier, by over-modulating [9] and by key clicks, and it may be possible to clear it simply by taking it a bit easier, by using a speech clipper or a click filter. It has also been cured by using less power, but the same effect could often be achieved by turning the microphone gain knob back slightly.

When all the test results are negative the transmitter can be put on the air at any time with confidence. Neighbouring tv sets may need high-pass and/or braid filters, but it is usually wise to wait until neighbours raise the subject. If the amateur can demonstrate that his own receiver is clear it will be a powerful argument in his favour, and if he has a spare filter at the ready he can soon prove to his neighbour that his trouble is easily curable. If a friendly relationship can be maintained with neighbours and problems sorted out with them, the good name of amateur radio will have been promoted and a case of tvi kept out of the official statistics.

This will reduce the total problem and the amateur will have reached the happy state where he will feel a justifiable pride in having used his licence to learn something, and he will be in a position to encourage and assist other amateurs to do the same.

References

[1] *Radio Communication Handbook*, chapter 18.
[2] "Which filter?", *Radio Communication* July 1969, p470.
[3] "How much harmonic?", *Radio Communication* May 1969, p328.
[4] "TVI Tips", *Radio Communication February* 1970, p108
[5] "Where TVI is a problem", *Radio Communication* February 1970, p74.
[6] "TVI Tips", *Radio Communication* June 1970, p383.
[7] "Band pass filters", *Radio Communication* December 1969, p867.
[8] "TVI Tips", *Radio Communication* April 1970, p245.
[9] "TVI Tips", *Radio Communication* September 1970, p609.

COUNCIL PROCEEDINGS

A brief report of the Council meeting held at Society HQ on 6 August 1971

Present: *Mr R. J. Hughes, G3GVV (Executive Vice-President, in the Chair), Dr E. J. Allaway, Dr J. A. Saxton, Messrs E. G. Ingram, G. R. Jessop, W. F. McGonigle, A. C. Morris, C. H. Parsons, J. R. Petty, A. W. Smith, R. F. Stevens, G. M. C. Stone, E. W. Yeomanson (members of Council), D. A. Findlay, general manager, A. W. Hutchinson, editor.*

Mr J. O. Brown, director, Lambda Investment Co Ltd, attended the meeting by invitation to advise Council on financial matters.

Apologies for absence were received from Messrs F. C. Ward, J. Bazley, L. E. Newnham and W. A. Scarr.

Correspondence
A letter dated 30 July 1971 had been received from Mr Baptiste of the MPT, in which he expressed his appreciation of the work carried out by Mr Stevens at the Space Conference.

A letter dated 22 July 1971 from Shozo Hara, JA1AN, President of JARL, asked the RSGB to support an application to the Ministry of Posts & Telecommunications, Japan, by JARL for increased phone allocations in the 80m band.

It was agreed that the Society would support an application for phone operating facilities in the first frequency band mentioned, 3,780–3,790kHz; support could not be given for the second frequency band, 3,840–3,860kHz, as this was outside the UK allocation.

Accounts
The Honorary Treasurer submitted provisional figures in respect of Income and Expenditure for the year ended 30 June 1971.

"Radio Communication"
Mr Stevens reported that the print cost of *Radio Communication* had increased by some £8,000 per annum since 1967 and postal charges had increased by some £5,000 per annum in the same period.

Membership and affiliation
It was resolved:
(i) to elect 126 corporate members and 31 associates;
(ii) to waive the subscriptions of two members on the grounds of blindness or other disability;
(iii) to accept a reduced subscription from one member;
(iv) to grant affiliation to the North East Amateur Radio Group; Standard Telephones Amateur Radio Society, Basildon; and Lancaster University Radio Club.

Space Conference
Mr Stevens reported that the Space Conference in Geneva ended on 17 July. Authorization was obtained for the Amateur Satellite Service (a new definition) to operate in the 7, 14, 21, 28 and 144MHz bands and also between 435 and 438MHz and 24 and 24·050GHz.

Intruder Watch
Council agreed that an approach be made to the MPT with a view to having a special callsign issued to the Society for use by the Intruder Watch Organizer, Mr Colin Thomas.

RSGB President, 1972
It was decided unanimously that Mr R. J. Hughes, G3GVV, Executive Vice-President, be President for 1972.

Council nominations
In accordance with the Articles of Association, Mr J. R. Petty, G4JW, Zone A, and Mr John Bazley, G3HCT, Zone B, would retire at the end of 1971, and Messrs G. R. Jessop, G6JP, and G. M. C. Stone, G3FZL, having completed a period of three years as Council members in December 1971 would also retire, but all were eligible for re-election.

It was noted that Dr J. A. Saxton, Immediate Past-President, would retire at the end of December.

Nominations for the two vacancies that would arise for ordinary members in December 1971 were made as follows: Mr G. R. Jessop, Dr J. A. Saxton, and Mr G. M. C. Stone. On a ballot being held, Dr J. A. Saxton and Mr G. M. C. Stone were declared nominated for election.

Trophies
It was agreed to make the following awards:
Calcutta Key—for outstanding service to the cause of international friendship through the medium of amateur radio—to Mr E. M. Wagner, G3BID.
ROTAB—for outstanding and consistent dx work—to Mr T. Higginson, GW3AHN.
Founders—for distinguished services to the Society—to Mr G. T. Peck, BRS15402.

Finnish national society (SRAL)
It was reported that the Finnish national society, SRAL, would be celebrating its 50th Anniversary on 11 September next and it was agreed to send a congratulatory telegram to the President of SRAL on this occasion.

QSL Bureau
Dr Allaway asked that publicity be given to the fact that £sd stamps would not be usable after next January. Members who had envelopes stamped with the old style stamps with the QSL Bureau submanager would have to make arrangements to collect these envelopes while the stamps were still valid.

It was agreed that suitable publicity should be given in *Radio Communication* and over GB2RS.

Honorary Treasurer
The Honorary Treasurer, Mr Morris, advised the Council that due to increased business commitments he would not be able to continue as Honorary Treasurer after the AGM and that he would relinquish the position earlier if a substitute could be found. Mr Morris stated that he would be prepared to serve on the Finance & Staff Committee for a further year in order to ensure continuity in the financial affairs of the Society.

Mr Hughes expressed the Council's appreciation of all the work that Mr Morris had done for the Society.

OBITUARIES

Mr. B. E. Cliffe, G8BRT, EI2VBD
Bob Cliffe of Sheffield died on 29 August at the age of 54. He was a very keen worker on 2m and on his annual visits to Ireland gave many a G and GM their first EI contact. A member of both the Sheffield and Derby radio clubs, he was also a mobile rally enthusiast.

Mr E. A. Dedman, G2NH
Ernie Dedman died suddenly at the age of 67 on 5 September. He was an active member of Thames Valley ARTS, honorary treasurer of RAOTA, and a former RSGB Council member.

He was particularly interested in quartz crystal transmitters and began his experiments in the early 'twenties in collaboration with G5MA. This association led to the formation of the Quartz Crystal Company.

Mr. J. Illingworth, G3EPL
Jim Illingworth of St Bees, Cumberland, died on 13 August, aged 64. Having used ssb exclusively for 20 years, he was well known on the 80m band. He was presented with the Mullard Award in 1964 for his fortitude and devotion to amateur radio.

We are also advised of the deaths of:
Mr. B. C. Bennett, G3WMW, of Twickenham.
Mr Edgar Walker, G2LT, of Sheffield.
Mr F. W. Goodwin, of Ashstead, Surrey, on 12 August.
Mr A. B. Chadburn, of Bodmin, Cornwall.

CONTEST NEWS

BERU 1971

The 34th BERU Contest was held on 13-14 March in possibly even worse conditions than last year. This, coupled with the UK postal strike which prevented the rules being sent to many overseas countries and would-be entrants, may account for a very low entry. A total of only 66 acceptable entries were received for the transmitting section as against 76 in 1970 and 96 in 1969. The receiving section also took a knock and only produced four entries as against nine last year; such a poor response hardly makes it a proper contest.

It is a sad story and one that will be given a lot of attention by the HF Contests Committee before next year's rules are made. A lot of suggestions have come in from entrants and these are most welcome.

The Senior Rose Bowl was won by Michael Bazley, VK6HD, with a score of 5,362 points from 498 contacts. Runner-up and winner of the Junior Rose Bowl is David Courtier-Dutton, G3FPQ, with a score of 4,414 points from 223 contacts. G3FPQ also wins the Colonel Thomas Rose Bowl as the leading UK station—quite a reward for a lot of hard work and a really excellent log. In third place was G5WP with 4,396 points, closely followed by VE1TG with 4,390 points.

For the fifth time running the Receiving Rose Bowl goes to Eric Howell, BRS24775, with a score of 3,500 points, which is quite a drop from his 1970 score. Second place goes to BRS15822, R. W. Thomas, who did not enter last year but who was second in 1969. Third place goes to Eric Trebilcock, BCRS195, with another excellent entry of 1,360 points; Eric who is the most consistent and often the only entrant from outside the UK lives in Victoria, Australia.

TRANSMITTING SECTION

Posn	Callsign	Points	Posn	Callsign	Points
1	VK6HD	5,362	33	G3JVJ	1,655
2	G3FPQ	4,414	34	VK3ZC	1,595
3	G5WP	4,396	35	G5VU	1,460
4	VE1TG	4,390		VP7DX	1,460
5	9HIBP	4,300	37	G2FYT	1,330
6	G3FXB	4,269	38	G3WSL	1,310
7	VE2NV	4,150	39	G2HLU	1,300
8	3B8CR	3,915	40	7Q7AA	1,295
9	ZL4BO	3,705	41	G3VDL	1,290
10	VO1AW	3,520	42	VE2LY	1,245
11	9HICG	3,479	43	VE5PM	1,200
12	G5RI	3,255	44	G3UFY	1,180
13	VE7UZ	3,210		VE1EK	1,180
14	VE2WA	3,205	46	G3APN	1,140
15	G6CJ	3,105	47	G2AJB	1,065
16	VK3MR	2,965	48	VO1CA	1,025
17	8P6DR	2,900	49	G3ZOQ	955
18	9HICB	2,845	50	G3VYI	945
19	G3HZP operated by G3DVF	2,70[illegible]	51	G3JKY	940
			52	G8KU	935
20	VK2BPN	2,680	53	VK2NS	880
21	G2QT	2,610	54	G8QZ	780
22	ZC4CB	2,570	55	VE5SC	770
23	VE2AYY	2,455	56	VK2BJL	725
24	VE7HQ	2,440	57	G2BLA	705
25	9VIPV	2,350	58	GM4GK	695
26	9HICH	2,200	59	G3ICH	665
27	G3KMA	2,170	60	G3MWZ	590
28	G3KSH	2,135	61	G3ZEN	565
29	G3GGS	2,050	62	G3RJB	425
30	G2DC	2,000	63	G3ZDD	255
31	G3VW	1,985	64	G3WP	250
	G3ESF	1,985			

Entries Disallowed

G3GNS No separate log sheets Rule 6
VK2VN No separate log sheets Rule 6
VK3AXK No separate log sheets Rule 6
VK2RA No separate log sheets Rule 6

RECEIVING SECTION

Posn	Callsign	Points	Posn	Callsign	Points
1	BRS24775	3,500	3	BRS195	1,360
2	BRS15822	1,995	4	A6966	300

T. F. Evans, VK2NS, who took part in the first and latest BERU contests

Equipment

VK6HD used a KW Viceroy, SX117, 2-el quads for 10, 15 and 20 at 70ft, a 40m inverted-V at 65ft, with a ground plane for 80m.

G3FPQ used a Central Electronics 100V transmitter and a home-built receiver. Aerials were a home-built 4-band quad for 40, 20, 15 and 10m with two quarter-wave verticals for 80m.

G5WP's transmitter and receiver were home-built, with ground planes for 80 and 40m and quads for 20, 15 and 10.

VE1TG used a Drake T4XB and an NCL2000 linear for transmitting, and a Drake R4B with an Ameco pre-amplifier on the receiving side. Aerials were 10m 7-el Yagi, 15m 5-el Yagi, 20m 5-el Yagi, 40m 5-el curtain with all elements driven, and on 80m a full-wave semi quad element; all these aerials were home-designed and built.

9H1BP used a KW2000B and a Trio JR310 with a trap-dipole on 80/40m and ground planes for 20, 15 and 10m.

Comments on the rules

As usual there were quite a lot of comments on the rules, all of which will be considered by the committee before the rules for 1972 are finalized.

The clash of dates with other contests was a major factor in many letters and this is always a problem.

VK6HD asks for 24 hours only, he feels that Gs are at a slight disadvantage and suggests no bonus points for G QSOs for overseas stations. He does not want a January contest because 95–105° temperatures in VK make it difficult to keep equipment cool.

G5WP is sorry that erstwhile Commonwealth countries are not eligible and suggests a revival of a phone section.

VE2NV does not like separate log sheets for each band with continuing serial numbers; he is not alone in this and suggests starting each band at 001.

8P6DR finds 48 hours a bit too long and suggests a compulsory rest period.

VE2AYY complains of lack of publicity of the rules in *QST* and *CQ*. In fact, ARRL does get a copy of the rules and could publish them.

VE7HQ does not want 3·5 dropped.

Comments from the HF Contests Committee

An evaluation of all RSGB cw contests over recent years was recently carried out and this showed a steady decline—is it that ssb is taking over as the most used mode?

Regarding dates, this is a great problem with contests sponsored by so many countries and private organizations, many of whom do not give any notice to IARU: the RSGB gives at least one year's notice on its programme.

A 24-hour contest is attractive but could be a little difficult with timing to be fair to all, even the 48 hour one is not really fair.

The suggested dropping of bonus points for G QSOs is interesting but Gs take second and third place even though a long way behind the winner.

Regarding erstwhile Commonwealth countries taking part, this is a problem, as the old British Empire Radio Union no longer exists and the title of the contest, BERU, is only retained for sentimental reasons.

There has been a phone section before and it could well be that if re-introduced it would be the larger of the two sections.

On the question of separate log sheets for each band it must be said that this is not the only contest where this is done. The question of a separate series of serial numbers is being considered. The reason for separate logs for each band means that one group of judges can handle one band in checking while others get on with the remainder. This makes checking much easier and ensures a much more complete check can be made.

Logs by and large were very good and easy to check but entries such as that composed of pieces of yellow paper stapled together will not be accepted again.

Activity

This was down on previous years by quite a bit but there were at least three other contests running at the same time, which made things difficult, and conditions in some parts of the world were also very poor. It is a pleasure to see so many of the old timers continuing to give their support, and there is a regular hard core of more recently licensed amateurs regularly taking part.

It was also pleasant to get an entry from VK2NS, who writes that he is too long in the tooth to send in anything but a token entry. VK2NS took part in the first BERU contest in 1931, just 40 years ago; he may well not be the only one.

Check logs

The committee thanks VP9BK, VE4MF, G5QJ, VE1AIH, VE1AE and ZL1HY who sent in check logs, as these are most useful. It is hoped that next year they will find time to enter the contest and swell the entries.

Posting of logs

The requirement of getting the logs to the UK by a certain date caused some concern, and in fact it was quite an expensive item for some who sent them by air mail. Surface mail from some parts of the world takes a very long time, months rather than weeks, and if surface mail was used the delay in the commencement of checking would be very severe.

Also it does appear that a lot of entrants seem to delay sending logs until the last possible minute. Please, next year make an effort to post logs as soon after the contest as possible.

August 70MHz CW Contest Results

Although 19 entries in the August 70MHz CW Contest reflects a welcome increase of 10 per cent on last year, it is difficult to say whether this was due to more stations being active, or to the much better propagation conditions which prevailed over the whole country. The general view of all contestants was that the conditions were good, with GC3WMR/P, G3TTG/P and GI3TLT audible to most throughout the morning. However, as only one GI was actually heard to be working over water, one must conclude that either the remainder were not interested in dx, or that they just were not listening. Continental fm was in evidence from the start, and caused some annoyance to the east coast stations.

The start and finish of the contest was satisfactory to most contestants, few raising any serious objection to the early start. G3KSU/P, however, was one of the few and attributes his giving an incorrect QTH (5km north of Ryde, IOW) for the first seven QSOs to this factor. It is interesting to note also that the first six stations which G3KSU worked apparently accepted his "wet start" and did not notice anything unusual about operating /P in the middle of the Solent at seven o'clock in the morning. G2WS/P, who was one of the late starters, also criticises the 7am start on the grounds that it is difficult to get a /P station operational by so early an hour. He makes a strong plea for 8am to 2pm; a point which must be noted for next time.

The general standard of logging was good, although there are still one or two competitors who are failing to comply with the rule which requires all entries to be submitted on RSGB VHF Contest Log Sheets with a 427 Cover Sheet. The task of adjudication could be made considerably easier if everyone would adhere to the standard format, and fewer points would be lost if contestants would pay more attention to their fair copy printing, particularly with regards to U and V, M and H, and D and O.

This year's winner is Roger Hargreaves, G3OHH, with Bryan Turner, G3RLE, making a strong challenge as the runner-up. Subject to confirmation by the Council, both stations will receive certificates.

Posn	Callsign	Score	QSOs	Posn	Callsign	Score	QSOs
1	G3OHH	238	35	11	G3UES/A	83	21
2	G3RLE	227	26	12	G5UM	75	19
3	GC3WMR/P	214	20	13	G3ZMF	71	21
4	G3VPK	162	28	14	G2WS/P	69	10
5	G3DOV	143	22	15	G8LY	68	12
6	G5NU	130	30		G3VFD	68	18
7	G3KSU/P	128	25	17	G3TVW	61	15
8	G3SEK	104	28	18	G3VPS	28	8
9	G6HD	96	24	19	G4AGQ	16	5
10	G3WOS	93	22				

The check log from G3ZRH is gratefully acknowledged.

High Power HF Field Day 1971 Results

The fourth High Power Field Day Contest held on 10 - 11 July was poorly supported, with only 16 entries. This low entry was very disappointing, particularly in view of the promised support from a number of non-entering groups for a mixed phone/cw event. The introduction of phone together with a spell of good 14MHz conditions produced some high scores with half of the entrants returning logs with scores in excess of the 1970 winning total of 1,200 points for a cw only event.

A group from Newbury, Berks, operating under the call G3NKR/P was the winner with 3,080 points made entirely on ssb. The Addiscombe Group, G3UFY/P, which was sixth last year and moved up into second place with 1,902 points, also used 100 per cent ssb. In third place is the Adur Contest Group with a score of 1,824 obtained from mixed cw/ssb operation.

Commercial transceivers, with or without linears, were used by the majority of entrants. Aerials ranged from the quads used by the leaders, through an assortment of trap-beams, multi-band dipoles and inverted-Vs, long wires, trap-verticals, to the rhombic used by Guildford.

The Doncaster College of Technology Group had some bad luck with its generator and was forced to finish the contest using a mains supply. While the group did quite well during the period that the generator was working, it asked for the whole entry to be regarded as a check log. G3JKY/P, using his bicycle low-power portable (6W all transistor), came on for part of the contest to give other portables points but could only find a few to work on cw.

From the comments of competitors it is clear that the majority do not like the mixed-mode type of operation and would prefer either a phone or a cw only type contest. Several entrants would like to see the contest replaced with a phone section of NFD, while others suggest that the contest should be moved to the autumn or run in March to correspond with the second week-end of the ARRL phone contest. All the comments are appreciated by the HF Contests Committee and as they are at present considering the overall concepts of NFD, the various suggestions will be taken in account in formulating rules for the future hf portable events.

Posn	Club/Group	Callsign	Score 3·5MHz	7MHz	14MHz	21MHz	28MHz	Total
1	—	G3NKR/P	771	42	2,267	0	0	3,080
2	Addiscombe	G3UFY/P	441	84	950	427	0	1,902
3	Adur	G4ACG/P	687	200	937	0	0	1,824
4	North Riding	G2KK/P	650	306	736	42	3	1,737
5	Bedford & D	G3WTP/P	558	126	903	141	0	1,728
6	Guildford	G3TLM/P	504	93	760	171	9	1,537
7	35th Sig Reg (V)	G3RPJ/P	459	114	729	6	0	1,308
8	Northumbria	G4AAX/P	375	285	561	0	0	1,221
9	Southgate	G3BWQ/P	732	168	261	33	0	1,194
10	Crystal Palace	G3VCP/P	667	33	210	91	0	1,001
11	—	G6YB/P	529	62	400	9	0	1,000
12	Ariel	G3AYC/P	621	114	30	6	0	771
13	Newark	G3PAW/P	399	246	114	3	0	762
14	Wimbledon	G3WIM/P	144	9	141	57	0	351
15	DK Group	DK5KY/P	105	9	0	0	0	114
16	—	G3JKY/P	48	0	0	0	0	48

Check logs received from G3UER/P, UB5NG, SWL Hall (ss *French Mariner* in North Atlantic), BRS1019 and OK-9812L.

December 1971 144MHz Fixed Station Contest

0900 to 1700 on 5 December 1971.

All entries and check logs must be sent to the adjudicator and addressed to: VHF Contests Committee, c/o G3SEK, 89 Arthur Road, Wimbledon, London SW19 7DP.

The following general rules, as published in the January 1971 issue of *Radio Communication*, will apply: 1, 2, 3, 4b, 5a, 6a, 7a, 8b, 9a, 10a, 11, 12, 13 to 24.

July 1971 432MHz Open Contest Results

The July 432MHz Open Contest was very well supported with a total of 44 entries and nearly 200 stations known to have been active.

The winning station in Section A was GD2HDZ who had a very good average of just over seven points per QSO, closely followed by G3ZYC. Once again Section B was poorly supported, there being only two entries. The leading station in this section was G8ERW. There was also a very closely-fought contest in Section C with G8AWS/P slightly ahead of GW3OXD/P.

Conditions were generally thought to have been average, although comments on conditions ranged from very poor to above average.

In the Listeners' Contest there were only two entries, with BRS28005 ahead of BRS26431.

Subject to Council approval, certificates will be awarded to the respective winners and runners-up.

A check log is acknowledged with thanks from G8BGC/P.

SECTION A

Posn	Callsign	Score	QSOs	Cty	Best dx	km	Pwr	Rx 1st rf	Ft asl
1	GD2HDZ	161	21	IM	G8BBB	355	40	AF279	150
2	G3ZYC	151	43	DY	G5QA	255	50	AF279	500
3	G3EHM	125	41	SD	GD2HDZ	240	100	BF180	800
4	G3PMX	89	24	EX	GW3OXD/P	250	7*	AF139	200
	G8BGQ	89	40	HF	GW8APZ/P	230	150†	BF180	400
6	G4AHN	85	29	DY	GD2HDZ	232	35	ZN5245	350
7	G3OHH	73	28	SD	GD2HDZ	190	10*	GMO290	1,000
8	G8AVX	69	25	WK	GD2HDZ	—	60	GMO290	—
9	G5UM	62	24	LR	GW8APZ/P	155	15	AF186	560
10	G8CIT	61	30	MX	GW3OXD/P	212	25	BF180	53
11	G2RD	57	34	SY	G8BBB	125	30	AF139	625
12	G3LTN	54	18	NR	G3EFX/P	141	50	AF139	500
	G8DKK	54	22	OX	G3LQR	172	3*	BF180	250
14	G3MOT	49	17	OX	—	—	70	BF180	—
15	G8BII	42	16	OX	—	—	70	BF180	—
16	G8BCG	40	16	LE	GD2HDZ	165	100	MM5000	260
17	G8CTT	37	19	KT	G8ARL/P	110	30	GMO290A	240
18	G2WS	35	15	ST	GW8APZ/P	165	70	Nuvistor	300
19	G8BAV	34	18	DY	G8BBB	140	23	AF239	—
20	G8DBW	26	10	GR	GW3OXD/P	78	0·8	BF180	45
21	G8BKR	23	13	GR	G3EEZ/P	107	25	GMO290A	190
22	G8BVF	18	8	LE	GW8APZ/P	115	3*	BF180	425
23	G8BDO	11	9	NM	—	—	0·04	AF239	—
24	G8DIU	10	8	LN	G8ARL/P	90	16	—	—
25	G8AGQ	9	5	YS	—	—	—	AF279	—
26	G8CBZ	6	2	DN	G8BCH	80	11	GMO290	200

SECTION B

Posn	Callsign	Score	QSOs	Cty	Best dx	km	Pwr	Rx 1st rf	Ft asl
1	G8ERW	85	37	HF	G8AWS/P	195	26	BF180	—
2	G8BQH	44	28	BS	G8BBB	110	55	BF180	—

SECTION C

Posn	Callsign	Score	QSOs	Cty	Best dx	km	Pwr	Rx 1st rf	Ft asl
1	G8AWS/P	306	70	SD	G3DAH	280	10*	K5001	1,630
2	GW3OXD/P	295	60	RN	G3DAH	350	20	BF180	1,900
3	GW8APZ/P	262	52	MR	GD2HDZ	232	35	BF790	2,700
4	G8ARL/P	245	65	BE	GW8APZ/P	214	25	BF180	937
5	G3EFX/P	205	57	SX	GW8APZ/P	312	30	BF180	770
6	G8AFA/P	123	34	WE	G8AWS/P	205	25	AF742	755
7	G8DDC/P	121	45	BD	GW3OXD/P	188	14	BF790	650
8	G8TA/P	104	41	SD	GD2HDZ	236	35	ZN5245	600
9	G3EEZ/P	94	34	WR	G8AFA/P	131	25	ZN3819	1,000
10	GW3ITZ/P	85	27	DB	G3VNQ/P	148	27	TI588	—
11	G3WDG/P	83	30	HE	GW8APZ/P	260	3*	BF180	750
12	G8DLX/P	77	27	NH	GW8APZ/P	170	10*	ZN5245	700
13	G3VNQ/P	65	14	LE	GW3OXD/P	218	20	BF180	1,000
14	G8AKT	62	26	BD	G8AWS/P	175	25	AF239	250
15	GW8ADP/P	60	22	MH	G8AWS/P	156	30	AF239	1,000
16	G8CLW/P	38	16	SX	G8ERW	90	25	GMO290	700

* Output
† ssb also used

LISTENERS CONTEST

1	BRS28005	53	20	SX	G3LQR	195	—	—	200
2	BRS26431	45	27	DY	G6GN	150†	—	—	339

RSGB HF Contests Championship 1971-72

In an effort to stimulate increased entries in RSGB hf contests, it has been decided that a HF Contests Championship will be instituted.

Rules

1. RSGB General Rules for hf contests do not apply.
2. No entries for the championship are required.
3. The championship will be decided on the basis of RSGB hf single-operator contests held between 1 October 1971 and 31 March 1972.
4. Points will be awarded to the leading 10 UK stations in the results tables published in *Radio Communication* as follows:

	Position									
Contest	1	2	3	4	5	6	7	8	9	10
21/28MHz Phone	80	70	60	50	40	30	20	15	10	5
7MHz cw	70	60	50	40	30	25	20	15	10	5
7MHz phone	70	60	50	40	30	25	20	15	10	5
2nd 1·8MHz 1971	60	50	40	35	30	25	20	15	10	5
1st 1·8MHz 1972	60	50	40	35	30	25	20	15	10	5
BERU 1972	100	90	80	70	60	50	40	30	20	10

5. Points gained by stations using the same callsign entering two or more of the six individual contests will be totalled and a table published in the October 1972 issue of *Radio Communication*.
6. Awards will be made to the leading station and to runners-up. Details of these awards will be announced at a later date.

Derby DF Qualifying Event

On 18 July 18 teams, from Manchester to as far south as Chichester, assembled in the legendary Robin Hood country to take part in this event. Both stations put out adequate but rather weak signals, a point which aroused comment from those who thought their receivers were beyond reproach. However, a little assistance enabled everyone to proceed on time.

The "A" Station, G3ERD/P, on approximately 1,920kHz, was located deep in a forest (NGR 676603) eight miles from the start, but it was necessary to negotiate the last threequarters of a mile on foot, a task not easily accomplished with a df receiver in heavy undergrowth.

The "B" Station, G2DJ/P, on 1,980kHz was another exhausting rendezvouz perched on a bank high above the south bank of the River Trent (NGR 690437). In some respects this station gave more trouble than "A" due to sense reversals throwing the indications to the far bank, an unintentional but interesting trap into which several competitors were drawn for a time.

However, nothing daunted M. Hawkins who, travelling solo, managed to find both stations in excellent time.

At the end of the contest the party attended an excellent meal at the "Old Elm Tree" at Hoveringham. Derby & District ARS would like to thank Brian, G3WSM; Richard, G3WYH; Charles, G3LIC; and Rod for their help, and Mrs Bradley for the most enjoyable tea.

Posn	Competitor	Club	Times of arrival "A" Stn	"B" Stn
1	M. Hawkins	Colchester	1440	1534
2	Mr Mahony	Rugby	1448½	1553
3	Mr Simmons		1447	1558
4	J. R. Vickers	Faringdon	1454	1600
5	Mr Newman	Rugby	1602½	1511
6	Mr Gage		1447	1603½
7	R. Pearce-Boby	Oxford	1606½	1440
8	W. North	Chiltern	1607	1508
9	E. Mollart	Oxford	1457	1613
10	Mr Holland	South Manchester	1447½	—
11	Mr Lennard		—	1515
12	Mr Whenham	Coventry	1535	—
13	Mr Clarke	South Manchester	1536	—
14	Mr Reid	Derby	1542	—
15	Mr Tyler		1618	—
16	P. Williams	Slade	1629	—
17	Mr Clamp		—	—

Subject to confirmation, Mr Simmonds and Mr Newman qualified

Salisbury DF Qualifying Event

Twenty-six teams assembled for the start at a road and track junction on high ground 1½ miles south of Wilton on 8 August. Weather was ideal—cool and fair, signals were strong, and all seemed satisfied with bearings as they left in various ways.

The "A" station, G3OBW/P, first choice for most teams, was located on Clearbury Rings 450ft asl and five miles SE of the start. Approach from any direction meant at least a 700yd walk (or run) over rising ground—although we understand from an observer that just one of DF's "old-timers" did manage a track which we had considered only suitable for the larger type of tank!

G3ZNH/P operating the "B" station was concealed at the top of a very steep and stony track in thickly wooded ground near Fovant four miles NW of the start.

Most teams found both transmitters, and some did so in a remarkably short time.

Seventy people sat down to an excellent tea which was again organized by the wives and parents of club members. Results and prizes were given by Sir Evan Nepean, G5YN, chairman of the Salisbury and District Short Wave Club. He thanked all those who came, many from considerable distances, to make the afternoon such a success. Being a club organized event, no local teams took part in the hunt, which probably makes the number of 26 entries and all "away teams" something of a record.

T. Gage and I. Butson, who had not previously qualified, go forward to the National Final.

Posn	Competitor	Club	Time of arrival "A" Stn	"B" Stn
1	T. Gage	Oxford	1455½	1423
2	W. J. North	High Wycombe	1458	1421½
3	R. J. Pearce-Boby	Oxford	1459½	1421
4	I. Butson	Colchester	1416	1502
5	M. P. Hawkins	Colchester	1414	1503
6	R. Vickers	Oxford	1522½	1422
7	B. M. Bristow	Oxford	1438½	1523
8	A. Simmons	Oxford	1439½	1523
9	G. Whenham	Coventry	1433½	1523½
10	D. E. Newman	Rugby	1544½	1423
11	P.Woollett	Dartford Heath	1551	1440
12	P. G.Wells	Dartford Heath	1439½	1552
13	B. J. Mahony	Rugby	1555	1505
14	E. L. Mollart	Oxford	1439½	1602
15	P. J. O'Connor	Bournemouth	1443½	1602½
16	R. Worbey	Dartford Heath	1441½	1604
17	A. L. Brown	Bournemouth	1447	1605
18	P. T. Tyler	Oxford	1504½	1606
19	D. Nasey	Newport, Mon.	1437	1607
20	A. Hitchcock	Derby	1609	1437
21	M. Gee	Oxford	1500	1618
22	M. G. Easterbrook	Dartford Heath	1625	1453
23	P. Howell	Bournemouth	—	1427
24	A. R. Burchmore	Dartford Heath	1550½	—
25	M. Edwards	Chippenham	1552	—
26	G. T. Peck	High Wycombe	1556	—

The Welsh 80m Contest

0900 to 1100gmt and 1700 to 1900gmt 24 October, ssb and/or a.m. and/or cw on 80m only.

Contestants enter one section only. Single-operator station QSOs count as one point only, except QSOs with Welsh stations which count as two points (this does not apply to Welsh stations). Exchanges consist of RS/T and serial number beginning at 001. Duplicate QSOs do not count. Cross-mode QSOs, ie ssb or a.m. to cw or vice versa, do not count. Full rules from (sae please) and logs to G. Maggs, 3, Thorley Close, Cardiff, S. Wales.

NB. There is also an award for SWL entries.

Contests calendar

9–10 October—21-28MHz Telephony (Rules in May issue)
9–10 October—VK/ZL Oceania CW
13 & 27 Oct—70MHz Cumulative (Rules in August issue)
23–24 October—7MHz (cw)
24 October—Welsh 80m Contest
30–31 October—432MHz Fixed (Rules in September issue)
30–31 October—CQ WW DX phone
6–7 November—144/432MHz CW (Rules in September issue)
6–7 November—7MHz (phone)
6–8 November—CHC/FHC (phone and cw)
14 November—OK Contest
13–14 November—2nd 1·8MHz (Rules in September issue)
27–28 November—CQ WW DX CW
5 December—144MHz Fixed (Rules in this issue)

Looking ahead

23-24 October—Region 12 ORM.
3 December—RSGB AGM and EGM, Royal Society of Arts, John Adam St, London WC2.
6 December—Radio Amateurs Examination.
10 December—RSGB Dinner Club, Kingsley Hotel, London WC1.

RADIO AMATEURS' EMERGENCY NETWORK

by S. W. LAW, G3PAZ*

There is still much to be done in connection with liaison with certain authorities, while bearing in mind the terms of the licence which control our operation. We are continually discovering documents issued in connection with disaster procedure which contain no reference to the service which we can provide via our three user services.

This is a matter for group controllers to consider, since it is manifestly impossible for the Raynet Committee to be aware of local conditions in every corner of the UK. May we therefore again ask all groups to ensure that every organization or authority which is likely to be involved in work connected with civil disaster is made aware of our availability through the proper channels.

Raynet Committee

At the meeting on 4 September great satisfaction was expressed at the number of enquiries resulting from our representation at the RSGB mobile rally at Woburn. However, it was emphasised that the very success of the operation placed a very heavy load on the helpers on this occasion and that more volunteers should be called for at any future events.

Some concern was expressed at the position of the Northern Ireland groups in view of the present situation, but it appears that progress is still satisfactory despite the obvious difficulties. We hope to hear more when things return to normal in that troubled area.

A new draft of the Raynet rules was examined and discussed; the draft is to be submitted to the RSGB Council for approval. It was suggested that in due course a copy of the rules might well be issued with each membership card. The content and format of the new manual was discussed, and it was agreed that the content should not be considered mandatory but that groups should use the information as a guide toward their own local problems of operation.

In view of recommendations from certain quarters it was decided that, subject to confirmation, the Raynet Trophy be awarded this year to the Glasgow group and that a certificate of merit be given to Cumbria in appreciation of the work involved in surmounting the difficulties of group formation in that area.

The honorary registrations secretary announced that 57 new members and 71 re-registrations had been entered since the last meeting on 10 July.

Around and about

It is understood there is a revival of interest in Southampton; which is good to hear in view of the excellent work done there in the past. G3UFO is believed to be moving things in the Wirral area of Cheshire. G8BSJ is to replace the retiring controller, G3LQI, in West Sussex, and G8DQY has been confirmed as controller for Burton-on-Trent. There is also some interest in Bolton resulting from a recent Raynet lecture. In the Torbay area G3YBG has changed QTH to "The Quarries Bungalow", Barley Lane, Exeter.

We extend our sympathy to G2AYQ in his protracted ill health and trust that he may soon be fit enough to take up the reins once more in the west.

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

Honorary secretary, RAEN Committee; **Mr E. R. L. Bassett, 57 Upper St Helen's Road, Hedge End, Southampton, SO3 4LG. Tel Botley 4462**

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

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**

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

Ainsdale (ARC)—Members should contact N. Horrocks, G2CUZ, QTHR, for details of the changed meeting arrangements.

Allerton (Liverpool)—Scout Amateur Radio Society—North West Region—Thursdays, 8pm, 1st Allerton Group Headquarters, Aigburth Vale, Liverpool 17. All Scouts interested in amateur radio are welcome.

Blackburn (East Lancs ARC)—First Thursday in each month, 7.30pm, Edinburgh House, Shearbank Road, Blackburn. Further details from G4JS.

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

Bolton (B & DARS)—First and third Wednesdays in each month at Bolton Recreation Club, Kensington Place, Bolton. The first meeting each month is allocated for discussions, with a principal meeting on the third Wednesday. Further details from G3ZQS.

Bury (B & RRS)—12 October (Junk sale), 8pm, George Hotel, Bury. After the EGM an effort is being made to swell club funds, a start being made on the monthly subscriptions which are now 10p per member, 5p for full-time students. Members have been asked to donate unwanted items for monthly raffles. A club net has started on 2m on 145·8 and is working quite well. A start is also being made on a club project to build a 2m converter, members should contact G8DHT for details. Secretary G3VVQ, 411 Holcombe Road, Greenmount, Bury.

Carlisle (C & DARS)—Mondays, 7.30pm, Currock House, Lediard Avenue, Currock. Secretary G3FZG, QTHR.

Cheshire (Mid-Cheshire ARC)—Wednesdays, 7pm, Technical Activities Centre, Winsford Verdin Comprehensive School, Grange Lane, Winsford. Details from G3JWK.

Chester (C & DARS)—Tuesdays, except for the first Tuesday in the month which is net night; 8pm, YMCA, Chester. Further details from G8AYW, QTHR.

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

Douglas (IOM) (D & DARS)—Every Monday and Thursday, 7.30pm, rear of Douglas Holiday Centre, Victoria Road, Douglas. Club callsign is GD3ZCM, the secretary J. Parnell, Cronkbane, Quines Hill, Port Soderick, IOM.

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

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

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

Liverpool (NLRC)—8, 22 October and 5 November, 8pm, Labour Party Headquarters, 13 Crosby Road South, Liverpool 22. Secretary M. Graham, G3XMG, 14 Albert Road, Waterloo, Liverpool 22.

Manchester (M & DRS)—Wednesdays, 7.30pm, 203 Droylesden Road, Newton Heath, Manchester 10. Secretary G3I0A, QTHR.

Manchester (SMRC)—Meets every Friday, 1 October ("Constructional techniques", by D. Holland, G3WFT), 8 October ("A history of radio"—tape/slide lecture), 15 October ("Practical aerial design", by H. V. Pierson, G3MXV), 22 October ("Active and passive filter design", by P. Stewart), 29 October (Showing of colour slides received from VP8LK (Ron Smith)). The vhf/uhf activity night is Mondays, with operation of G3UHF from the club shack at 8pm, "Greeba", Sandy Lane, Baguley, Manchester 23. Visitors welcome on both Mondays and Fridays. Club meets at 8pm, Sale Moor Community Centre, Norris Road, Sale, Cheshire.

Manchester University (ARS)—The society operates hf and vhf stations and is organizing a programme of lectures and visits. Tuition for the RAE and morse test is also available. Those interested should contact any one of the following: G8BVF, G3ZNS or GM3YOK at the University Union in Oxford Road.

Preston (PARS)—14, 28 October, 11 November, 7.30pm, Windsor Castle (private room), St. Paul's Square, Secretary G. Windsor, 26 St Gregory's Road, Preston.

Members of Bolton & District ARS at an exhibition station on 10 July. On the mike is G3XUM; standing l to r, G4ADW, G8CVO, treasurer Chris; standing centre, Sec G3ZQS; seated l to r, Steve (A/Sec), G3YTC, G3ZPL, G3LVX and G3SPB
Photo by courtesy of *Bolton Evening News*

Salford (Dial House RS)—A society of GPO engineers who meet on Wednesdays, 6pm, 8th floor (river end) Dial House, Chapel Street, Salford 3. Further details from the secretary at the above address.
Stockport (SRS)—Second Wednesday in each month—discussion night. Fourth Wednesday in each month—lecture night. 8pm, Blossoms Hotel, Buxton Road, Stockport. Secretary G8BCG.
Thornton Cleveleys (TCARS)—First and third Wednesdays in each month, 8pm, St John Ambulance Brigade Hall, Fleetwood Road North, Thornton, Blackpool. Secretary G3YWH. ASR G3ZBO.
Warrington (Culcheth) (CARS)—Fridays, 7.30pm, Chat Moss Hotel, Glazebury. All visitors welcome. Secretary K. Bulgess, 32 Hendon Street, Leigh, Lancs.
Westmorland (WRS)—Members will be contacted when a new meeting place is arranged. Meetings are likely to be once a month. New chairman G3UEC; secretary E. P. Goonan, Jnr, "Longridge", Storth, nr Milnethorpe, Westmorland.
Windscale (Cumberland) (WAR & ES)—Fridays, 7pm, c/o Falcon Club, Falcon Field, Egremont. Further details from N. Ramsden G3RHE.
Wirral (WARS)—First and third Wednesdays in each month, 7.45pm, Sport and Indoor Recreation Centre (Old Drill Hall), Grange Road West, Claughton, Birkenhead. Secretary G3WSD, 34 Glenmore Road, Oxton, Birkenhead.
Wirral (Wirral DX Association)—Last Thursday in each month at members' homes. Further information from the secretary G3OKA, 219 Prenton Dell Road, Prenton, Birkenhead. Visitors are welcome.

REGION 2 **RR K. Sketheway, BRS 20185**

Barnsley (B & DARC)—8, 22 October, 7.30, King George Hotel, Peel Street, Barnsley. *G3LRP.*
Fulford (York) (FARS)—Tuesdays, 7.30pm, Scout HQ, 31 George Street, York. *G5KC*
Halifax (NHARS)—6 October (Ragchew), 13 October ("Lasers, etc", by H. Lahmers of Huddersfield Polytechnic), 27 October ("Demonstration of rtty", by G8AFV and G3TQA), 3 November (Committee meeting), 7.45pm, Peat Pitts Inn, Ogden. *G3MDW.*
Hull (H & DARS)—1 October (Musical evening arranged by swl E. Spence), 8 October (Weather and vhf propagation by guest speaker Mr. J. Hargreaves, G5VO, of Bempton, 15 October ("Printed circuits", by G3PQY), 22 October (Open night and junk sale), 29 October ("Simple test gear", by G3MVO), 7.45pm, 592 Hessle Road, Hull. RAE classes commenced on 24 September and are being held at 9.30pm, every Friday at the above address. *M. Longson.*
North Riding (NRARG)—Meets at the Railway Hotel, Seamer Road, Scarborough. Details from the secretary, J. E. Ager, G8AZA, 88 Rothbury Street, Scarborough, Yorks. *G8AZA.*
Otley (ORS)—Otley Radio Society are holding their annual open night on Tuesday 26 October starting at 7.30pm when the doors will be open to visitors. The usual trade stand (J. Birkett, Lincoln) will be there and refreshments will be available. Open night takes place at the society premises, 14 Back of Court House Street, Otley, Yorkshire. All are welcome. *H. S. Johnstone.*
Scarborough (SARS))—Thursdays, 7.30pm, c/o RAF Association, 3 Westover Road, Scarborough. Hon secretary J. Cutter, G3VAN. Club callsign G4BP. *G8KU.*
South Shields (SS & DARC)—Fridays, 8pm, Trinity House Social Centre, Laygate, South Shields.
Spen Valley (SVARS)—7 October (An evening of music by kind permission of Richard Allen Radio Ltd), 14 October (Visit to Basinghall Telephone Exchange, 7.15pm), 28 October (Visit to Yorkshire Post Newspapers Ltd), 7pm, Club meets at 7.30pm, The Grammar School, High Street, Heckmondwike. Visitors and friends welcome to all meetings. *G8DSB.*
Sunderland (SARS)—Meetings on the first and third Tuesdays in each month, 7pm, Sunderland Polytechnic. *G3XID*
York (YARS)—Thursdays, 7.30pm, The British Legion, 61 Micklegate. York. *J. A. Rainbow.*

REGION 3 **RR R. W. Fisher, G3PWJ**

Birmingham (MARS)—19 October (AGM), 8pm, Midlands Institute, Margaret Street, Birmingham 3.
(South)—7 October (AGM), 8pm, Hamstead House, Fairfax Road, West Heath, Birmingham.
Coventry (CARS)—1 October (AGM), 8 October (Club night on the air), 15-17 October (Participation in Scout Jamboree on the Air), 22 October (Night on the air), 29 October (Lecture on vhf/tv by G6MXW/T), 5 November (Bonfire Night social), 8pm. City of Coventry Scout HQ, 121 St Nicholas Street, Radford Road, Coventry.
Dudley (DARC)—12 October (AGM), 26 October, 8pm, Central Library, St James' Road, Dudley. *G3PWJ.*
Hereford (HARS)—1 October (Talk by G3NUE on rtty), 15 October (Final expedition to Westhope Common on 2m). Civil Defence HQ, Gaol Street, Hereford.
Leamington Spa (MWAE & RS)—Every Monday, 8pm, 28 Hamilton Terrace, Leamington.
Redditch (RRC)—14 October (Talk and slides lecture, "Life in VR2 (Fiji)", by G3HZG), 8pm, Old People's Centre, Park Road, Redditch. *G3EVT.*
Solihull (SARS)—19 October (AGM), 7.30pm, The Manor House, High Street. 2 November (informal), 9pm, The Malt Shovel, High Street, Solihull. *G3ZXO.*
Stourbridge (STARS)—5 October (Vhf talk by B. Kennedy), 2 November (Annual junk sale), 7.45pm, Longlands School.
Stratford (SoA & DARC)—15 October (Discussion and preparation for Jamboree on the Air), 29 October ("Simple computer programming", by G3XTI), 8pm, Halls Croft, Stratford. *G3OOQ.*
Sutton Coldfield (SCRS)—11 October ("A conducted tour of ARRL", RSGB slide lecture), 25 October (Natter nite), 8pm, Club House, Sutton Town FC, Coles Lane, Sutton Coldfield. *G8CZM.*
Wolverhampton (WARS)—4 October (AGM, Neachells Cottage, Stockwell End, Tettenhall, Wolverhampton.
Worcester (W & DARC)—Third Saturday in each month, 8pm, Crown Hotel, Broad Street, *G3WUI.*

REGION 4 **RR T. Darn, G3FGY**

Derby (DADARS)—6 October (Surplus sale), 13 October (Film show), 20 October (Natter night), 21 October (UHF/vhf night), 27 October ("Hi-fi demonstration by G. Hooley), 3 November (Surplus sale). Club meets at 7.30pm. 119 Green Lane. Derby, The 14th Derby Mobile Rally was the biggest and best yet. Over 4,000 people attended this most popular event. At one time there were 100 cars in the school car park. The usual programme was enjoyed by all and the trade stands reported a good day's business. The 1972 Rally will be held on Sunday 20 August.
Grimsby (GARS)—Club meets on Thursdays. 14 October (AGM), 28 October (Junk sale), 7.30pm, everyone welcome. *G8DEN.*
Heanor (SEDRS)—Meetings recommenced in September and are held every Tuesday during school term at 7.30pm, South East Derbyshire College of Further Education, Wherton, nr Heanor, Derby. *W. Clarke.*

The committee of Derby & District ARS on the eve of G2CVV's visit to the USA in August. l to r: Ted Avery; Ken Griffin; Bob Haes; F. C. Ward, G2CVV; Tom Darn, G3FGY; Bill Mead, G5YY; Martin Shardlow, G3SZJ

Lincoln (LSWC)—Meetings held every Wednesday, 7.30pm, Club HQ, Off Westcliffe Street, off Burslem Road, Lincoln. Visitors are always welcome. *G. O'Connor.*
Mansfield (MARS)—Meetings on the first Friday in each month, 7.45pm, the New Inn, Westgate, Mansfield. *G8HX.*
Melton Mowbray (MMARS)—The AGM was held on Friday 17 September and the future programme will be published next month.
Nottingham (ARCON)—7 October (Forum—members of the club will answer questions on a wide variety of topics, and members' problems will be discussed by all the membership), 14 October (Film night—title to be announced), 21 October ("On the air night" using the recently acquired Sommerkamp gear), 28 October ("Why 2m?", by Ken Viler, G2FUB), 7.30pm, Sherwood Community Centre, Mansfield Road, Nottingham. *G3AFJ.*

REGION 5 **RR S. J. Granfield, G5BQ**

Bedford (B & DARC)—7 October (Scientific lecture by Joe Farley), 9-10 October (RSGB 21/28MHz Contest), 14 October (Development of an all band vertical aerial", by G3RFG), 21 October ("Receiver trends with ICs", by G4AHE), 28 October (AGM). Club meets at "The Dolphin", Broadway, Bedford. Hon Secretary John Bennett, G3FWA, 47 Ibbett Close, Kempston, Bedford.
Cambridge (C & DARC)—1 October (Informal), 8 October (Transparency evening—please bring a dozen of your slides), 15 October (Informal), 22 October ("Modulation", G8CKU), 29 October (Film evening). Club meets at Club HQ, Corporation Yard, Victoria Road, Cambridge. Hon Secretary Dennis Unwin, G8CKU.
Cambridge University (CUWS)—12 October ("Loudspeakers", by Dr A. R. Bailey), 8.15pm, King's College. Hon secretary D. I. Field G3XTT, Selwyn College, Cambridge.
Shefford (S & DRS)—7 October (Annual dinner planning and junk sale), 14 October ("Antenna talk", by V. Hartopp of J Beam), 21 October ("The station rx", by G3VMI), 28 October ("Transistor circuit design", G3XTO). Club meets at the Church Hall, Ampthill Road, Shefford, Beds. Hon secretary Arthur Sullivan, G2DGF, 12 Glebe Road, Letchworth, Herts.
Stevenage (S & DARS)—Meetings held on the first and third Thursdays in each month at Hawker-Siddeley Dynamics Ltd, Gunnels Wood Road, Stevenage, Herts. Hon Secretary F. Collett, G3OVT, 8 Silam Road, Stevenage, Herts.

REGION 6 **RR L. W. Lewis, G8ML**

Cheltenham (RSGB Group)—First Thursday in each month, 8pm, "Royal Crescent", Clarence Street, Cheltenham. *G2FWA.*
Gloucester (GARS)—First Thursday in each month, 7.30pm, RAFA Club, Spa Road, Gloucester. Each following Wednesday at the Drill Hall, Chequers Road, Gloucester. *G3MA.*
Mid-Thames Raynet Group—11 October (AGM at Bassetsbury Manor, High Wycombe, 2000 hours BST). Further information from G3FSN, QTHR.
South Bucks VHF Club—5 October (Talk on uhf equipment), 3 November (Film show "Transistors", 8pm, Bassetsbury Manor, High Wycombe.

REGION 7 **RR P. A. Thorogood, G4KD**

If you change your secretary or affiliated society representative please let me know. If your area representative has changed or not please let me know now.
Acton, Brentford & Chiswick (ABCRC)—19 October ("Aerials and matching devices"—discussion), 7.30pm, Chiswick Trades & Social Club, 66 High Road, Chiswick.
Addiscombe (AARC)—Second and fourth Tuesdays, 7.30pm, Prince George Hotel, High Street, Thornton Heath.
Ashford, Echelford (ARS)—7.30pm. St Martins Court, Kingston Crescent, Ashford, Middlesex. An inter-club quiz has been arranged with Ealing and Harrow radio societies every month until 9 November. Each team of four will play two matches at the QTH of the non-competing club.
Barking (BRES)—Thursdays. 21 October (Film show), 7.30pm, Gascoigne Recreational Centre, Gascoigne School, Morley Road, Barking. Entries for the Constructors' Award must be in by 30 October, judging will be on 11 November.
Bexleyheath (NKRS)—Second and fourth Thursdays. 14 October ("W1BB dxing on top band (the hard way)"), 28 October (Talk on wine making by Len Randall, G4ACQ), 7.30pm, Congregational Church Hall, Chapel Road, Bexleyheath.
Cheshunt (CDRC)—First Friday in each month, 7.30pm, Methodist Church Hall, opp Theobalds Station, Cheshunt.
Chingford (RSGB Group)—Fridays, telephone 01-524 0308.
Chingford (SRC)—Fridays, 8pm, Friday Hill House, Simmons Lane, Chingford E4.
Croydon (SRCC)—Third Tuesday in each month, 7.30pm, Swan & Sugarloaf, South Croydon.
Crystal Palace (CP & DRC)—16 October ("Components and materials—Part 3. Insulators, inductors and wire"), 8pm, Emmanuel Church Hall, Barry Road, SE22.
Dorking (DR & DRS)—Second and fourth Tuesdays, "Wheatsheaf", Dorking.
Ealing (E & DARS)—Tuesdays, 7.30 pm, Northfields Community Centre, Northcroft Road, W13.
East London Group—Meetings are now being arranged, details from the chairman.
Edgware & Hendon (E & DRS)—Second and fourth Mondays, St George's Hall, 51 Flower Lane, Mill Hill, NW7.
Farnham, Bucks (Burnham Beeches RC)—Fortnightly on Mondays, Farnham Common, Victoria Road.
Gravesend (GRS)—Mondays, 8pm, Northfleet Recreation Centre, Springhill Road, Northfleet, Kent.
Greenford (GARS)—15, 29 October, Greenford Community Centre, Oldfield Lane. (AGM 29 October).
Guildford (G & DRS)—Second and fourth Fridays. Guildford Engineering Society, Stoke Park.
Hampton Court (TVARTS)—First Wednesday in each month, 7.30pm, The Three Pigeons, Portsmouth Road, Long Ditton.
Harlow (DRS)—Tuesdays (General and cw practice); Fridays (Junior), 8pm, Mark Hall Barn, First Avenue
Harrow (RSH)—Every Friday. 8 October (Practical), 15 October (Junk sale), 22 October (Practical), 8pm Harrow County School for Boys, Sheepcote Road, Harrow.
Havering (H & DARC)—Fortnightly, 8pm, British Legion House, Western Road, Romford.
Hemel Hempstead (HH & DARS)—First and third Fridays, 7.30pm, "Addmult" Sports Club, Hemel Hempstead..
Holloway (GRS)—Mondays (RAE), 7pm; Fridays: (Lecture), 8.30pm; (Morse class), 7.30pm.
Hounslow (BEAARS)—Last Wednesday in each month, 7pm, BEA Training Centre, Southall Lane, Heston, Hounslow. (This club is open to non-BEA employees by invitation—contact David Evans, G3OUF, telephone Amersham 3257 for details).
Ilford—Every Thursday, 8pm, 50 Mortlake Road, (off Ilford Lane), Ilford.
Kingston (K & DARS)—Second Wednesday, 8pm, Penguin Lounge, 37 Brighton Road, Surbiton.
Loughton—Fortnightly on Fridays, Loughton Hall, Rectory Lane (near Debden station).
New Cross—Wednesdays and Fridays, 8pm, 225 New Cross Road, SE14.
Paddington (P & DARS)—Wednesdays, 8pm, Beauchamp Lodge, 2 Warwick Crescent, W2.
Purley (P & DRS)—First and third Fridays, 8pm, Railwayman's Hall, Side Entrance, 58 Whytecliffe Road, Purley.
Reigate (RATS)—First Wednesday, 7.45pm, George and Dragon, Cromwell Road, Redhill.
Romford (R & DRS)—Tuesdays, 8.15pm, RAFTA House, 18 Carlton Road.
Scouts (ARS)—Third Thursday in each month. 16-17 October (Jamboree on the Air), 21 October ("Balons over Texas", by A. Watts), 18 November (Jamboree in Japan—Martin Milner and John Waters), 7.30pm, Baden Powell House, Queensgate, South Kensington, SW7.
Sidcup (CVRS)—7 October ("30MHz and above", by Chris Whitmarsh, G8CIU), 21 October (Surplus sale), 4 November 25th Anniversary Celebration. Dinner and dance on Saturday 9 October, 8pm, Congregational Church Hall, Court Road, Eltham, SE9.
Southgate (SRC)—Second Thursday in each month, 7.30pm, Civil Defence Hut, Bowes Road, N11. New winter programme to be announced. Congratulations to P. Godfrey and T. Roberts for passing the RAE.
St Albans (Verulam ARC)—20 October ("Some hf design and construction projects", by R. C. Marshall, G3SBA), 17 November (KW Electronics new equipment— display and talk), Town Hall, St Peter's Street, St Albans.
Sutton & Cheam (SCRS)—Third Tuesday in each month. 19 October (Visit to Croydon Computer Centre and Lotts Road Power Station), 16 November (Junk sale), 8pm, The Harrow Inn, High Street, Cheam.
Welwyn (Mid-Herts ARS)—Second Thursday in each month. 14 October (AGM), 8pm, Welwyn Civic Centre, Welwyn.

Wembley (GECARS)—Thursdays, 7pm, c/o GEC, Hirst Research Centre, Wembley. (This club is open to non-GEC employees by invitation, telephone Dain Evans, G3RPE, at 904 1262 for details.
Wimbledon (W & DRS)—Second and last Fridays in each month, 8pm, St John Hall, 124 Kingston Road, South Wimbledon, SW19.

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

Brighton (BTCARC)—Fortnightly meetings resume this month. Further details from the honorary secretary, G2CMH, QTHR.
Canterbury (EKRS)—21 October (Junk sale), 18 November ("Semiconductors", by G3JIX, 16 December (Constructional contest).
Crawley (ARC)—22 September (Junk sale), 27 October ("A sideways look at radio conundrums", by G6YJ), 8pm, Trinity Congregational Church Hall, Ifield, Crawley.
Dover (SEKYMCAARC)—Meetings held every Thursday, YMCA Leybourne Road, Dover.
Eastbourne (SARS)—Meetings held every first Monday in the month, Victoria Hotel, Latimer Road, Eastbourne.
Horsham (HARS)—6 October ("Mirror in the sky", film—at the "Swan", West Street), 17 October ("Informal" at the "Star" Roffey). Further details from G3PYC.
Maidstone (MYMCAARS)—Club shack open Tuesdays and first and third Fridays in each month, CW practice, 7.30pm; Radio theory, 8pm.
Mid-Sussex (MSARS)—Meetings held at Marle Place, Leylands Road, Burgess Hill.
Thanet (TRS)—1 October (Bring and buy), 8 October (Talk by G3JIX), 15 October (Vhf meeting at Wye College), 22 October (Inter-club contest), 29 October (Club station on the air).
Worthing (W & DARC)—12 October (Junk sale). Club meets at the Rose Wilmot Youth Centre, Littlehampton Road, Worthing.

REGION 9 **RR J. Thorn, G3PQE**

Bristol (City & County, RSGB Group)—25 October, 7.30pm, Becket Hall, St Thomas Street, nr Bristol Bridge. (Film show on general interest topics, the annual evening when you are invited to bring your friends, wives, girl friends to a social evening). *G3ULJ.*
(University ARS)—Every Saturday afternoon from 2.30pm at the Dept of Physics, Royal Fort, Tyndall Park Road, Bristol 1. Freshers should join during "Freshers squash" at which there will be a 3cm link using club calls, G8CXH and G3KAC. G8ADP, C. G. Elliott, 37 Seymour Road, Bristol 7.
Burnham-on-Sea (BoSARC)—This club is holding a meeting for the first time in months at the Crown Hotel, Burnham, on Saturday 10 October at 8pm. Will those interested please attend, or contact J. Robertson, G3ZOR, telephone 2333.
Exeter (EARS)—12 October, Club HQ, Community Centre, St David's Hill, Exeter.
North Devon (NDRC)—13 October (Technical talk), 27 October (Natter night), "Grinnis", High Wall, Sticklepath, Barnstaple. *G4CG.*
Plymouth (PRC)—5, 19 October, Virginia House, Batter Street, Bretonside, Plymouth. A successful picnic was held in August and an excellent junk sale and good NFD contest in September. The next highlight is the annual dinner to be held on 20 November at the Davie Hall, Plymouth.
Saltash (S & DARC)—1, 15 October, 7.30pm, Burraton Toc H Hall. *G3XWA*
Torbay (TARS)—Meets every Tuesday and Friday. 30 October (Business meeting and junk sale. This is an EGM), Club HQ, G3NJA, Bath Lane, rear of 94 Belgrave Road, Torquay. *G3NQD.*
Weston-super-Mare (WSMRS)—1 October ("Radio Bristol", by Mr J. B. Hawley, BBC station engineer), 7.30pm, Ground floor Lecture Theatre(2), Weston-super-Mare New Technical College. The following meetings will be on Fridays—12 November, 10 December, 14 January, a change to the second Friday in each month. *G3GNS.*

Other societies that meet in this region are Bristol ARC, Bristol Shirehampton Society, Bath RS, Cornish ARC, South Dorset RS, Taunton RS, Wells RS and Yeovil ARS but no details have been received of their activities.

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

Blackwood (ARC)—Fridays, 7.30pm, Oakdale Community Centre, Oakdale, Mon. *GW3TUG.*
Barry College of Further Education (ARS)—Thursdays, 7pm, Barry College of Further Education, Colcot Road, Barry, Glam. *GW3VKL.*
Cardiff (RSGB Group)—11 October, 7.30pm, BBC Club, Llandaff, Nr Cardiff. AGM and constructors contest. *GW3GHC.*
Glamorgan Raynet Group—Details of meetings and activities from GW3ZFG. Telephone Cardiff 62411.
Haverfordwest (ARS)—Tuesdays 7.30pm, HQ Rosemary Lane, Haverfordwest, Pembs. Club callsign GW3XZT. *GW3YBB.*
Hoover (ARC)—Mondays, 7.30pm, Hoover Social Club, Hoover Works, Pentrebach, Nr. Merthyr, Glam. Hon secretary Mr F. E. Tribe, c/o Club HQ.
Port Talbot (ARC)—Second Tuesday in each month, 7.30pm, Trefelin Club & Institute, Trefelin, Port Talbot, Glam. *GW5VX.*
Pontypool (ARC)—Tuesdays, 7pm, Educational Settlement, Rockhill Road, Pontypool, Mon. *GW3JBH.*
Pembroke (ARC)—Last Friday in each month, 7.30pm, Defensible Barracks, Pembroke Dock. *GW3LXI.*
Sully & District Shortwave Club—Tuesdays, 7pm, The Annexe, Sully Bowls & Social Club, 59 South Road, Sully, Glam. Mr Glyn Maggs, 3 Thorley Close, Cyncoed, Cardiff.
Rhondda (ARS)—Meets at Rhondda Transport Employees Club & Institute, Porth, Rhondda, Glam. Details of meetings from GW3PHH.
Swansea Telephone Area (ARS)—Tuesdays, 7.30pm, Telephone Engineering Centre, Gors Road, Swansea. Hon secretary Mr D. E. Connor, 7 Glanmon Road, Sketty, Swansea, Glam.
University College, Cardiff (ARS)—New students should contact the secretary of the society at the Students Union, Dumfries Place, Cardiff.
University College, Swansea (ARS)—The secretary of the society should be contacted through the Students Union during the first week of term.

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

Special regional event: Region 12 Official Regional Meeting to be held on 23-24 October. See advertisement elsewhere in this issue.

Aberdeen (AARS)—Fridays, 7.30pm, 6 Blenheim Lane, Aberdeen. GM3HGA, telephone Aberdeen 33838.
Inverness (IRS)—No formal meeting until the autumn but the clubroom is open most Thursdays. The clubroom is situated at 4 Falcon Square (nr Railway Station), Inverness. Miss A. Veith, telephone Drumnadrochit 266.
Lerwick (LRS)—Tuesdays and Thursdays, 8pm, Annsbrae House Lerwick. GM3XPO, telephone Bixter 249.
Lhanbryde (MFARS)—Wednesdays, 7.45pm, St Andrew's School, nr Lhanbryde, Elgin, Morayshire. GM3UKG, telephone Clochan 225.
Thurso (CARS)—Second Tuesday in each month, 7.30pm, contact GM3JUD who will give QTH.

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

There is still a vacancy for an Area Representative for Fife following the posting abroad of Mr Ross. Will any member interested in taking up this appointment please contact GM3OWU as soon as possible. This matter will also be discussed at the Zone G Meeting which precedes the Scottish VHF Convention.
Berwick (BARS)—First Sunday in each month, 3pm, Tweed View Hotel. Further details from C. H. Crook, G3YOG, 19 Hatters Lane, Berwick on Tweed, or from the AR, G. Shakie, GM3WIG, 8 Ettrick Terrace, Hawick, Roxburghshire.
Glenrothes (GDARC)—First Sunday in each month, 7.30pm, Old Nursery Buildings, Leslie, Fife. Further details from K. Home, GM3YBQ, 14 Liss Way, Kirkcaldy.
Edinburgh (LRS)—Second and fourth Thursdays, 7.30pm, 66 Hanover Street, Edinburgh. Further details from R. Manners, GM3ZVB, 165 Mayfield Road, Edinburgh.

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

Ayrshire (Ardeer Recreation ARC)—5, 7, 12, 14, 19, 21, 26, 28, October, 7.30, Ardeer Recreation Club, Amateur Radio Section, Stevenston. Details from J. F. McCreight, GM3DJS, 10 Auchenharvie Road, Stevenston, Ayrshire.
Falkirk & District RSGB Group—9 October, 7.30pm, Temperance Cafe, Lint Riggs, Falkirk.
Glasgow University (GURC)—15, 29 October, 7.30pm, George Service House, University Gardens, Glasgow W2.
Greenock & District (G & DARC)—1, 8, 15, 22, 29 October, 7.30pm, James Watt Library, Union Street, Greenock.
Mid-Lanark RSGB Group—15 October, 7.30pm, YMCA, Brandon Street, Motherwell.
West of Scotland (ARS)—1, 8, 15, 22, 29 October, 7.30pm, 81 Virginia Street, Glasgow C2.

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

No programmes have been received for this issue of *Radio Communication*, and the undermentioned information is the latest received regarding meetings, venues and secretaries.

Chelmsford (CARS)—Marconi College, Arbour Lane, Chelmsford. *G3VCF.*

Haverhill (HDRS)—Leiston Hall Community Centre, Haverhill. *G3WQF.*

Ipswich (IRC)—Gippeswyk Hall, Ipswich. *G3YWN.*

Norwich (NARC)—Crome Community Centre, Telegraph Lane East, Norwich NOR 36T. *G3XLL.*

The RR occasionally receives requests for information regarding the RSGB and clubs in the area. This information will gladly be sent to any enquirer, as will information on membership of the RSGB. G3FBA is not at present on the telephone, but the exchange and number will be publicized when known.

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

Basingstoke (BARC)—Club meets on the first and third Saturdays in each month, 7pm, Chineham House, Shakespeare Road, Popley Basingstoke, Hants *G3CBU.*

Chippenham (CDARC)—Club meets every Tuesday. 5 October (Rowde Hamfest, 8pm, the George and Dragon, Rowde, Nr Devizes. Talk-in by G3UFW on 160m. Refreshments will be available at a modest charge). 26 October (Film show at the club presented by G8BXG), Boys High School, Hardenhuish Lane, Chippenham. Further details from the secretary P. J. Tuck, telephone Bromham 274.

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 welcome. *G8BVM.*

N Berks (AERE, Harwell, ARC)—Club meets on the third Tuesday in each month, also informal gatherings and junk sales every Friday lunchtime. 19 October, 7.30pm, Social Club, AERE, Harwell, Didcot, Berks. *G3NNG.*

Southampton (RSGB Group)—9 October (Monthly meeting at the Lanchester Building, Southampton University). Club also meets every Wednesday at the Kent Road Clubroom. RAE course on Friday evenings. Further details from G3ZKR, telephone 73378.

MEMBERS' ADS

These advertisements are accepted free of charge as a service to members of RSGB. They must be submitted on the Members' Ads order form printed on the penultimate page of each issue of *Radio Communication*, or on a postcard similarly laid out. Each **must** be accompanied by a **recent** *Radio Communication* wrapper addressed to the advertiser, as proof of membership.

The closing date for each issue is the 7th of the preceding month, but no guarantee of inclusion in a specific issue can be given. Valid advertisements not published in the issue following receipt will be held over until the next issue and should not be resubmitted.

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

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

No correspondence concerning this free service can be entered into.

See the current order form for further details.

FOR SALE

Elizabethan 50W am/cw 80–10m tx + modulator and psu, gd cond, £15. G3XZO, 199 Queensgate, Bridlington, Yorks.

CR100, exc paintwork nearly all new valves, re-peaked, S meter, in full wkg order offered with outboard preselector. Pref buyer coll but can del short distances, £18. G4AEZ, 48 Morley Hill, Enfield, Middlesex.

Woodson Spey transistorized marine rx, 15MHz—150kHz, exc cond, £27.50 ono. Brenell Mk 5 series 3 tape recorder, many spares and as new, £55 ono. Prices inc hndbk circs etc. Inglis, 48 North Gyle Road, Edinburgh EH12 8EP. Tel 031-334 1428.

Heathkit RG1, gd cond with internal spkr and aerial trimmer, hndbk, £25 ono. G3AHO, 65 Warlingham Road, Thornton Heath, Surrey. Tel 01-684 4405.

2,800V 1A mains trnsfmr, unused and suitable for QRO linear amp, £12. Buyer coll from Deal, Kent. G3YMP, c/o "Kimberley", Trefusis Terrace, Redruth, Cornwall.

FT DX100 absolutely perfect cond, £170 inc factory hndbk and mic. 12AVQ Hygain vertical aerial, only two wks old, £13, comp with radials of thick braided copper. G3KLF, 12 Aveland Road, Ketton, Nr Stamford, Lincs. Tel North Luffenham 241 extn 406 (work).

1155 rx (not top band), ls, psu, £7. G2DAF Mk 2 rx in wkng order but needs attntn, separate psu, no circ diag or ls, £40. Nombrex No 63 audio gen, £6. DX40 mains trnsfmr and smoothing choke, new, £3. 50–0–50μA meter (3in sq), £1. Philips Ultraphil health lamp, new, £6. G30HS, 26 Brixham Gardens, Seven Kings, Ilford, Essex. Tel 01-594 1852.

100W modulator, £3. Trnsfmrs 1200–0–1200 500mA, £2, 2000–0–2000V 500mA, £3. Lt trnsfmrs, h/r hdphns, MHz meters, 50p ea. *SWM* + *Radcom*, 75p doz. TT21, £1. CV187, 832A, 75p. Morse key, 75p. G6NB, QTHR. Tel Whitchurch, Bucks 508.

Two Radiospares de luxe output trnsfmrs cost new £15, rated output 30W £7.50 the pair. Buyer coll. Parker, 50 Sherbourne Close, Hove 4, Sussex BN3 8BE.

Bulls, SWMs + 1965 to date *ARRL* and latest *RSGB Hndbk*. PCR2 rx cnvtd to 240V, sig gen, odd valves, trnsfmrs, meters, drives etc. BRS30083, 16 St Clair Avenue, Giffnock, Glasgow.

Rtty, two teleprinters 7B, £15, 8B £10. FSY unit, psus. Wanted : Codar AT5/T28. Cambridge Vanguard. Why. G3JGC, QTHR.

Valves. Set new valves for AR88 rx. U19, 12E1, 805, 6AS6, ACO44, 77, 78, 6D6, 85, 84, 6SG7, 6AC7, 6AG5, 6H6, 6AK5, 6SU7, 6Q7CT, 6K7G, 6K8GV, 6N7, KT8, 12K8GT, 12SN7, GZ34, 6V6. G3DFS, QTHR. Tel 021-354 7769.

KW2000B, comp psu Q mult, low-pass filt, 6146B in power amp, Shure mic, £180. Mint Hartley 33A scope, £20. Command rx, 1·8–2MHz, £5. GM3NCS, QTHR.

SB301 with cw filt, 18 mnths old, some spare valves, £95. J36 bug key, £2. G3FXB, QTHR. Tel Brighton 593382.

Lafayette HA350 rx with calib and spkr, £50 ono. KW low pass fltr, BBC Ch 1, 52Ω, £4. G3VMY, 3 Stanlake Park Cottages, Twyford, Nr Reading, Berks. Tel Twyford 5621, w/ends.

HW12A, 80m with gd homebrew ac psu, also FRIOOB rx with 160m, both with manuals. Offers. GM3WOJ, The Manse, Glenluce, Wigtownshire. Tel Glenluce 319.

KW2000A with ac psu and Shure mic, £150, homebrew 4–400A passive grid linear, 80–10m, 600 p.e.p. with spare, 4–400A, but no case, and huge 3,000V psu, £70 ono. Del 100 miles. G3TQS, QTHR.

Heathkit tx SB401, £130. RCA rx, 8516L, £130. Heathkit audio gen AG9U £15. 50ft telescopic 2BXI mast with Ham-M rotator + 3 band quad. Del UK, £155. Heathkit fm 4U, £10. For full list sae, carr extra. G3TYT, QTHR. Tel Fordhouses, Staffs, 2161 or Penkridge 2464.

HA350 rx modded for top band and 240V with 100kHz xtal and operating manual, exc cond, £42 ono. Hp poss. G3BSW, QTHR. Tel Ascot 20992.

3 Carpenter type relays, £2.50. Mann, 45 Old School Lane, Milton Cambridge.

HW17 + dc psu, TW Mk 2 communicator (2m). LM14 + psu and charts. Lucas 11 ac alternator + control unit + ve earth. Eddystone, 830 series rx, imac, hndbk. All in 1st class cond and appearance, offers. Wanted : 19·333MHz HC60 xtal. 5MHz standing freq xtal + oven. Strumech tower + rotator. G3VGH, QTHR. Tel York 769245 after 8pm.

Heathkit /M psu HP13, £22. GM3MXN, 15 Earn Gardens, Larkhall, Lanarks.

Heath OS2 scope, £20. CT38 less case but with calib unit + all accessories, manual etc, £12. You coll. G3XWP, 1 Tudor Close, Chessington, Surrey, Tel 01-397 5552.

KW swr meter, £4 ono. G2DRT, QTHR.

2m tx, 25W hro + bndsprd coils, Three 19in cabs for sale or exch for scope rf or af sig gnrtr variverter (VHF Manual) 13A time switch or why. G8EDN, 24 Sunnybank Avenue, Whitley, Coventry. Tel Coventry 301494.

Heathkit SB301, £90. Codar PR30X preselector, £5. KW p.e.p. meter, £12. BC221-AK with charts, £13. BXI 50ft tilt-over tower, £90. G3WBN, QTHR. Tel 01-654 2761.

Mosley Lancer/M aerial comp all coils and coil caddy, mint cond, £20. CT54 vtvms, £5. All carr pd. G3XHX, QTHR. Tel St Tudy 357.

Heathkit HW12 tx/rx with homebrew ac psu/spkr and mic, exc cond, unmarked, £50. Also Hallicrafters SR500 Tornado with ac psu, new pa tubes, perf, £135. G3VMB, QTHR. Tel 0925 66738.

Bendix RA1B internal psu, EL85 af o/p, S meter, etc, £13 or exch stereo amp or why. 8mm cine camera, projector screen exch for why or £18. Gillen, 22 The Knole, Faversham, Kent.

Marconi No 9 Mk 1 4m tx, £10. Command Mk 18 cw vibrator, phones, key, tx 6MHz-9MHz, £7. Psu for Marconi, £3. AVO valve voltmeter, £10. Pye Galvo, £2.50p. 25W 2m tx, £12. Seymour, 25 Ryde Buildings, Webb Street, London SE1 4RX.

Eddystone 888A S meter, perfect, £40, plus postage. Also Heathkit Balun coil set model B-1U, £1 plus post. G3RUN, QTHR. Tel Deal 4276.

22 dural mast sectns 5ft by 2in ferruled, inc 13 brand new, in canvas bags, six 2ft dural stakes, two dural base plates, £15. EDC cnvtr in silence cab dc/ac, 200W 230/240V. Offers. Glenister, 37 Ashcombe Gardens, Weston-s-Mare, Somerset.

CR100/2, exc wkng cond, £12. Minimitter 120W 10–80m, fully wkng, £14. Cw tx—see *SWM* ad Sept. 160m atu, 50p Buyers coll. G3MEJ, QTHR. Tel 01-648 5895.

Moving QTH. AR88D, £40. R107/A, £15. Sphinx sideband tx, £45. Ring or write for details. All in gd cond with spare valves, hndbks + solid state psus. Leach, 20 Mersey Road, Heaton Mersey, Stockport, Cheshire. Tel 061-432 2985.

RCA rx monitor unit type MI-17144. RCA freq shift adaptor type FSC-1. RCA tone keyer type MI-17106. This eqpment matches and is intended to work with the AR88 rx rack mounting, £30. Boyd, 18 Meadows Road, Lower Willingdon, Eastbourne, Sussex. Tel Eastbourne 52721.

Trio 9R59DE with ht stab, exc cond, £25. Also 1st edition (1939) *RSGB Handbook*, ok for collector. Offers. Robertson, 31 Greenways, Bow Brickhill, Bletchley, Bucks. Tel Bletchley 2463.

Trio JR310 rx + ldspkrs and 2m cnvtr, less than 10 hrs use. £50. Mounter, 36 Roman Way, Felixstowe, Suffolk. 1P11 9NP. Tel Felixstowe 6822.

22 Set + 12V psu, wkng cond, £5 + pp. Wanted : dials for AR88D or If and flywheel. G8EZM, 22 Chislehurst Road, Petts Wood, Orpington, Kent BR5 1NR. Tel Orpington 33901.

Xtal calib No 10 modded for 3V filiament supply, £2.50 post free. G3TGY, QTHR.

Hallicrafters SX111 with manual, provision to work from batts, £59 ono. G8KU, "Roseacre", Irton, Nr Scarborough, Yorks.

Property of late G3MGT, comp station. 4 matching cabs consisting of SB101 tx/rx, SB600 ac psu and spkr, SB616E monitor scope, swr bridge, atu, dummy load, combined in SB series cab and electro voice, ptt locking mic, desk stand, £260. G3WNL, QTHR. Tel Tunbridge Wells 25615.

KW Viceroy Mk 2, £45 ono. HQ17OA, £60–£70. G3ROK, QTHR· Tel 77 55807.

Unused Heathkit SB1OU, £25. Codar AT5 + psu, £22. Katsumi cw monitor, £5. Unused Labgear wb mult, £3. Woden UM2 mod tx/rx, £3. All mint cond, carr extra. G8SP, QTHR, Tel Silchester 513.

Mags: *Practical Wireless* since May 1966, *Practical Electronics* since June 1968, *Radcom* since Sept 1968. Any rnsble offer for the lot or minimum of 12. South, Aberdare, Crowborough Hill, Crowborough, Sussex.

Skyrover comms rx, gd cond, 550–1, 600kHz, 1·5–30MHz, £9.50, inc pp. *Radio Servicing* Patchett Vols 2, 3, 4 £1 inc pp. *SWM* Dec 1970, May 1971, 20p. *WW* Dec 1970 inc pp. G3LOL, QTHR.

Atlanta and psu, perfect, offers. G8IX, QTHR. Tel 0782 24941.

Vibroplex Blueracer deluxe bug key and Burgess Craftsman engraver kit, both mint cond, offers. Lawrence, 53 Gleggside, Grange, West Kirby, Cheshire. Tel 051-625 5665.

Vintage (?) Ostar-Ganz valves (200V heaters), new unused, 20p ea with bases, postage extra. Other vintage parts (1920s), state wants, by Telsen, Lissen, sae pse. Jones, 24 Walters Road, Llanelli. Tel 3712.

Property of late G4TM : HRO coils, pp, £17. BC221, £10. LG300, pp rc, £15. Variac 1·65KVA, £5. G3VW, QTHR. Tel 01-205 1443.

2000A dc psu + earth, £25. 7B Creed teleprinter with partly assembled DL6EQ TU, £25 unit. G3LWL, QTHR. Tel 01-574 4651.

Star rx, SR6000 ham bands 80m-10m in 600kHz band + 5, 600kHz bands in range 3.5–30MHz. I.F. passband 0·5, 1·2, 2·5 and 4kHz, notch filter, readout to 1kHz, 100kHz calib, vgc, £45 ono. G8BCO, QTHR. Tel Walton on Thames 24122 extn 2.

HRO coils, 14–30MHz (3), £1.50 ea inc post. 3·5–7·3MHz, £1. 0.48–0·96MHz, 75p. 1131 modulator (100W audio), £3. Buyer coll. G3LPS, QTHR. Tel Mellor 2797.

R1155 in gd wkg order except bfo, offers about £5 or swap for a 4m cnvtr. Southam, Conway Cottage, Cornfield Road, Seaford, Sussex.

Heathkit RA1, gd order but req alignment, xtal calib fitted, £20. BC221 AH model, comp with charts but req psu, £10. Both prices inc carr—mainland only. G3WRN, 9 Portal Close, Barnham, Thetford, Norfolk.

Codar AT5 tx with control box and ac psus, G whip, Joystick and Joymatch, £35 ono. Will sep. G3ZKQ, QTHR. Tel 021-427 3088.

Vespa Mk 2 homebrew psu, offers or swap stereo amp, spkrs. G3NXQ, QTHR.

Trio 9R59DE with modifications and SP50 matching ldspkr, £35. Buyer coll or carr extra. Fisher, 110 South Mossley Hill Road, Liverpool L19 9BJ. Tel 051-427 6918.

Rolland Scott Digi Three radio control outfit, installed in super 6 aircraft, prop control on rudder, throttle and elevator, £60. Also model power boat, £10. Callum, 115B High Etherley, Bishop Auckland, Co Durham. Tel West Auckland 577.

/M psu for KW2000A, little used, comp with cable etc, £25.G3SCG QTHR. Tel 021-354 5921.

Mustang 3 ele beam, few mnths old, hardly used. Wanted : Tx/rx with top band. G3ZLN, QTHR.

LM14 freq meter, brand new, £23. Command rxs, new in carton, sae details. Manuals 51J3, 75A3, £3.50 ea. 75S3, £4.50. SX115, 13A scope, £2.50 ea. CT54 vtvm, £1.50. All items + carr. G3GUU, QTHR.

Ranger 2007 /M, fully modded inc remote tuner covering 2m band, inc transmit xtal for 145MHz, comp and ready for use, £17. G2XV, 165 Cambridge Road, Gt Shelford, Cambridge.

Heathkit HW30 2m trnscvr, factory built, ideal for /M or /P plus transistorized 12V inverter, 2 outputs, 200 or 300V at 150mA, will exch for Eddystone 750 rx with cash adjustment or sell, £28. G8AVP, QTHR.

DX100U, £32.50. Del 50 miles. G3ORI, QTHR. Tel Faringdon 3182.

TW2 + mic trnscvr, imac, any trial, first offer over £60. Also Novatech 3 bc + 1·8–5·5MHz, £15. Both must be seen. Robinson, 22 Severn Walk, Leighton Buzzard, Beds.

KW2000A comp with ac psu, manual etc, 1st class cond. Buyer coll, £170. G3BII, QTHR.

TF144G sig gnrtr, 85kHz-25MHz, £14.50. RCA audio freq meter, 5Hz–50kHz, £19. Cossor 1035 d/b scope, vgc, £18. CR100 rx, £15.50. Strobe unit, £5. Can del rnsble dist. G8AYN, 32 Ironmill Lane, Crayford, Kent. Tel Crayford 24625.

Creed 54 with reperf, £16. Creed 54, £12.50. Creed 7B, £10. Creed 54 rx, £7.50. Creed 7TR reperf, £7.50. Creed 6S/5M auto, £12.50. Siemens T Loch 15 printing reperf, £10. G6JF, Yabbacombe Farm, Kingsbridge, Devon. Tel Loddiswell 324.

EA12, exc, best offer over £130, + Securicor. Petts, Trezelah, Gulval, Penzance.

160m trnsvtr, match any tx/rx covering 40m, £20. G3OLB, QTHR. Tel Oldbury (Glos) 4559.

Halicrafters HT–46 tx, 175W ssb, 150W cw, 80–10m, new unused with guarantee and instrctn manual. G3JDG, 12 Cross Way, Harpenden, Herts.

DX100, gd cond, recently serviced, spare valves, hndbk, xtal mic ae c/o relay box + HE30 preselector convtr. The lot, £45. Buyer coll. G3VQR, QTHR.

KW2000 with ac psu, 6146B, £130. HT40, 80–6m am/cw, 75W xtal cont, £12 ono. G3ZNW, 341 Walton Road, West Molesey, Surrey. Tel 01-432 2343 (office).

Heathkit OS1 scope, £10. New HW100 with SBM102 mod, mic, homebrew psu, £100. Linear 2X572Bs, swr bridge, psu, £42.50. Ssb and cw rx, sim G2DAF, Philpots cab, Eddystone dial £42.50. 70cm cavity wavemeter, £2. G3KWK, QTHR. Tel Redditch 63817.

SB300 comp all filts + SB400, both in 1st class cond. G2DAF linear 2X4C250s + two spare tubes, £280. Buyer coll. G3JNX, QTHR. Tel Brixham 3142.

Trio TS500, fitted 100kHz calib, VFO 5, mic + spare 6146Bs. Offers G4HW, QTHR. Tel Sheerness 2782 (day).

JR500 rx, gd cond, no convns, £50. Pref buyer insp and coll. G8COM, 13 Hill Close, Arborfield, Nr Reading, Berks.

Creed 7B page printer, motor, psu, terminal unit and paper, £20. Pair valve vhf tx/rxs with psus, £5. 4m 40W tx, modulator and psu, £7.50. KW lowpass filt, £1. Carr extra or del locally. G3ZGZ, 5 Summerville Avenue, Staining, Nr Blackpool, Lancs.

KW Vanguard 160–10m, £25. Philips 4308 4 track tape recorder as new. Comp with quality N8301 dynamic mic and 2 7in reels, all for £40. W/end only. Mepham, 79 Woodland Drive, Hove 4, Sussex.

Galaxy tx/rx 300W p.e.p. 2X6HFS, incorporates digital clock etc, £80. TW 2m communicator, mint, £50 ono. HW32A tx/rx, fb cond, £45 ono. G3SUK, QTHR. Tel Rattlesden (Suffolk) 352.

Heathkit SB301 with all filtrs nearly new, £130. Eddystone 940, £90, exc cond. Del up to 50 miles. Cliffe, The Willows, Kings Bromley, Burton-on-Trent, Staffs. Tel Yoxall 241 evenings.

CR100, gd cond, £10. Cossor 103BE rx/tx fm modded for 2m, £10. Buyers to coll. G3MYX, 7 West View, Folkstone, Kent. Tel 57991.

AR88D manual, 75p. AR88 small steel drive cog wheel, 25p. Five AR88 tone knobs, 50p. BC453B, £1.25. BC221 162 page manual, £1, 10ft 6in collapsable whip, 75p. Ellett, 6 Lindsay Avenue, Hitchin, Herts SG4 9JA. Tel Hitchin 2381.

Collins 75A2 rx prof uprated to 75A4 spec at a cost of over £50, fitted genuine Collins mech fltrs ssb/am, £145. Vespa Mk2 and psu, latest model, had less than 6 hrs use, £80. G3UCV, QTHR. Tel Leeds 643788.

BC221, charts, manual, gd wkg order, built-in stblzd psu, £12. H/brew t/band am tx, £8. Minimitter 10–160m cnvtr, i.f. 1·5MHz, built-in stblzd psu, £8. All carr extra. Wanted : rsnbly sized gen cov rx. G3CDR, 157 Dartford Road, Dartford, Kent, Tel Dartford 26976.

Panda PR120V tx, £15, buyer coll or pays carr. G2HDT, QTHR.

Sig gnrtr, Marconi TF144G 8kHz to 15MHz immac, brand new cond 240V or 12V input, £19 ono. Each for 2m, 70cm gear. G8EEJ, 51 Ruskin Crescent, Crownhill, Plymouth, Devon.

£160; Sommerkamp FTD × 150 top band to 10m,/M or fixed, also Garrard 3 speed auto stereo deck, £6. Coll and test or post & packing. G3TFN, 1 Barker Street, Buckley Wells, Bury, Lancs, BL9 OTX.

Swan 350–C tx/rx, 550W am/cw/ssb 80–10m with calib, sidestone, agc defeat, in exc mechanical and electrical cond, inc matching 117–XC psu and spkr, £141 ($275), poe USA. G. B. Jordan, 7185 South Birch Way, Littleton, Colorado, USA 80122.

KW2000A with ac psu in exc cond, £150. Reslosound ribbon hi-fi mic, stand and input trnsfmr, £8. Douglas trnsfmr MT11 300–0–300 100mA etc, £1.50. G3XKA, QTHR. Tel Woking 3620.

National NCX5 Mk 2 VX501 vfo psu calib, £165. HRO–500 with LF10 preselector 5kHz to 30MHz 60 bands, £300. Phase 2 2m trnsvtr + psu, £55. Ten-Tec PM2 cw tx/rx, £28. AR88D new, £45. G3SRO, QTHR. Tel 01-462 2846.

Heathkit SB301 with ssb fltr, works aligned, in perf order, £95. Manfield, Corries, Green Lane, Churt, Surrey. Tel Headley Down 3326.

Eddystone EA12 rx, £130. G3YAS, QTHR.

Homebrew rx, 7360 mixers 3 half lattice xtal filts tunes 1MHz sections, sae, full details, £40 ono. G8BDO, 64 Castle Hill, East Leake, Loughborough, Leics.

AR88LF nearly new, will del up to 50 miles, £49. Brand new 4CX250 + base, £10.50. 2C39, £2.50. Hesketh, 4 Hill Farm Road, Chesham, Bucks. Tel Chesham 5557.

Codar PR30X preamp, £4. 7 valve top band cw tx/rx, no psu, untested, as bought, £4. Wanted : Katsumi EK-9X keyer, will buy or swop with either of above. Robertson, 31 Greenways, Bow Brickhill, Bletchley, Bucks.

KW Valiant, ac psu and CR100 rx, spares for all these, offers. GW3YVQ, QTHR. Tel Cardiff 561577.

Xtals suitable for fltrs, surplus to G3XCH sale. Approx QRG 1·4, 1·5, 1·6, 2·5, 2·7, 3·0, 3·1, 3·3, 3·4, 5·1MHz. Cost 5p ea plus post and packing, G3PQF, 6 Rye Close, Cove, Farnborough, Hants.

BC639A 80–150 rx, £12. BC348 rx, £12. 4 Hudson tx/rx on 72MHz, £3.50 ea. Base station on 72MHz, £8. Pye Ranger 6 channel tx/rx on 170-MHz, £7. G8EWO 24 Thornwood Road, London SE13 5RG.

HRO-mx ldspkr, psu, 4 bndsprd coils, 2 gen cov coils, all wax capacitors replaced, new cascode rf stage, gd cond, £21. Wavemeter Class D, cnvtd to mains operation, £5.50. Buyer coll. Hoult, 34, Beacon Road, Loughborough, Leics LE11 2BQ.

G3HBW fet rx vhf nearly comp except cnvtrs, Marconi test gnrtr TF1167 simulates rtty signals, 70cm tx, 20W output, am/fm/cw, Vox 10 xtal. Vxo psu 13in by 19in by 16in. Send for details. Nickalls, The Rectory, Nailsea, Bristol, BS19 2NG.

Pye ptc 144 low-band /M tx/rx QQVO3–20, final £3.50. Buyer coll, circ available. G3WYY, QTHR. Tel Eccleston 373.

Pye low band base station tx/rx comp, unmodded circ available. QQVO3–20, final £10. Buyer coll. G3YQQ, QTHR. Tel Eccleston (Lancs) 213.

Murphy B40 0–64–30·5MHz, gd cond, £18. BC348 1·5+18MHz, wkg order, £5, Batt tape recorder, two speed, 1⅞ 3¾, £6. G8CQE. Tel 01-777 4252.

AR88D, £40. SCR 522 mod trans, 50p. TR1986 rx, 30p. Valves : 807, G233, 6L7M, FW4/500, 6SK7M, 6S97M, 6SJ7M, 6AG7M, 6K8G, 6BR7, 30p. TA12 mod tx/rx, 75p. Cossor 1035 scope, £6 carr extra. G3WOM, 80 Albion Ave, Beckfield Lane, York. Tel York 73672.

HW100 with ac pp, worked HOJ, OIX, KNA etc, £110 ono. G3COI, 58 Springhill Park, Penn, Wolverhampton. Tel Wombourne 2288.

Metro Vick universal test meter type 214. Ranges 1,000V, 100V, 1V, 1mA, 10mA, 100mA, 1A ac/dc, switch to multiply by 3. RF range 0·5V, 2·5V, 10V, 50 Ω 10 KΩ and 10MΩ. Basic movement 250mA, comp with rf probe, no hndbk, £10 or 2m gear cons. Pref buyer insp or coll. G3WWL, QTHR. Tel 021-373 2121, extn 2635 (wkg hours).

Wireless World 16 Vols unbound 1955–70, *SWM* 1947-52 bound 6 Vols, 1953–59 7 Vols unbound. 1966, 1967, 1962 unbound *Bulls* 1948–59 bound 5 Vols *Heathkit Cotswold Senior Speaker Editors & Engineers* 10th and 11th editions. 1953, 1959 *ARRL Handbooks*. Offer for lot. G2AVR, QTHR.

Labgear LG300 tx and companion modulator/psu, exc external and electrical cond, covers 80–10m/150W, has worked over 90 countries on a.m. phone, can be seen on the air, sensible offers. Giddings, 24 Park Avenue, Formby, Nr Liverpool, Lancs. Tel Formby 71968.

Swan SS–16 xtal fltr shape factor 1·28. Ultimate rejection 140dB, unused but expensive, £50 ono. G3RUI, 17 Hillingford Avenue, Gt Barr, B'Ham (mail only), 1 Danethorpe Road, Wembley, Middlesex (at present). Tel 01–902 6535.

Novar-Tech df rx, bfo, 160-80m aircraft broadcast, £30. 160m tx, atu psu, £9. /M tx, £5. 160m rx, £4. *Radio Communication, SWM*, comp vols. G3JBU, QTHR, Tel 0604 43020.

R107 rx, £8. 625 line tv camera : can be modded for 405, internal syncs Cosmicar, f1·9–f22 lens, 240V ac mains, self contained, comp with vidicon, gd pictures, made in Japan, offers. G8DJM QTHR. Tel Lye 4388 (Worcs).

Canadian 52 rx, faulty on 160m, £4. Mnfctrs psu mns/dc, £2.50. DX40 tx, £16 ono. GM3YYY, 94 Larkfield Road, Lenzie, Glasgow. Tel 041-776 4833.

Morse courses 0 to 14 wpm on two C90 tape cassettes. Full instrctns, £2.75 ea. GW8PG, 37 Pickerill Road, Greasby, Upton, Wirral, Cheshire.

Collins TCS–10 tx, 160, 80, 40m, am/cw, with ac psu £15. G3ZYN, 9 Quendon Drive, Waltham Abbey, Essex. Tel 97 23820.

2m tx/rx, half comp "homebrew" in metal case 17in by 8in by 8in, £5. B44 tx/rx Mk 3, self contained psu, ideal as basis for 2m station, £4. Model boat, 36in by 8in by 9in, less radio control, £4. GW8CCA, 19 Pantycelyn Road, Llandough, Penarth, S. Wales.

Panda Cub fb all bands, £20 ono. G2FQD, QTHR. Tel 01-889 4022.

Murphy 806 /M 2m 15W tx/rx, 2 channel built-in psu, boot mounting, 30W public address facility comp in gd cond with manual, £30 ono. Buyer coll. Savory, 76 Mounts Road, Wednesbury, Staffs.

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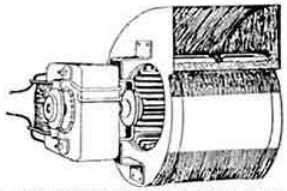

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