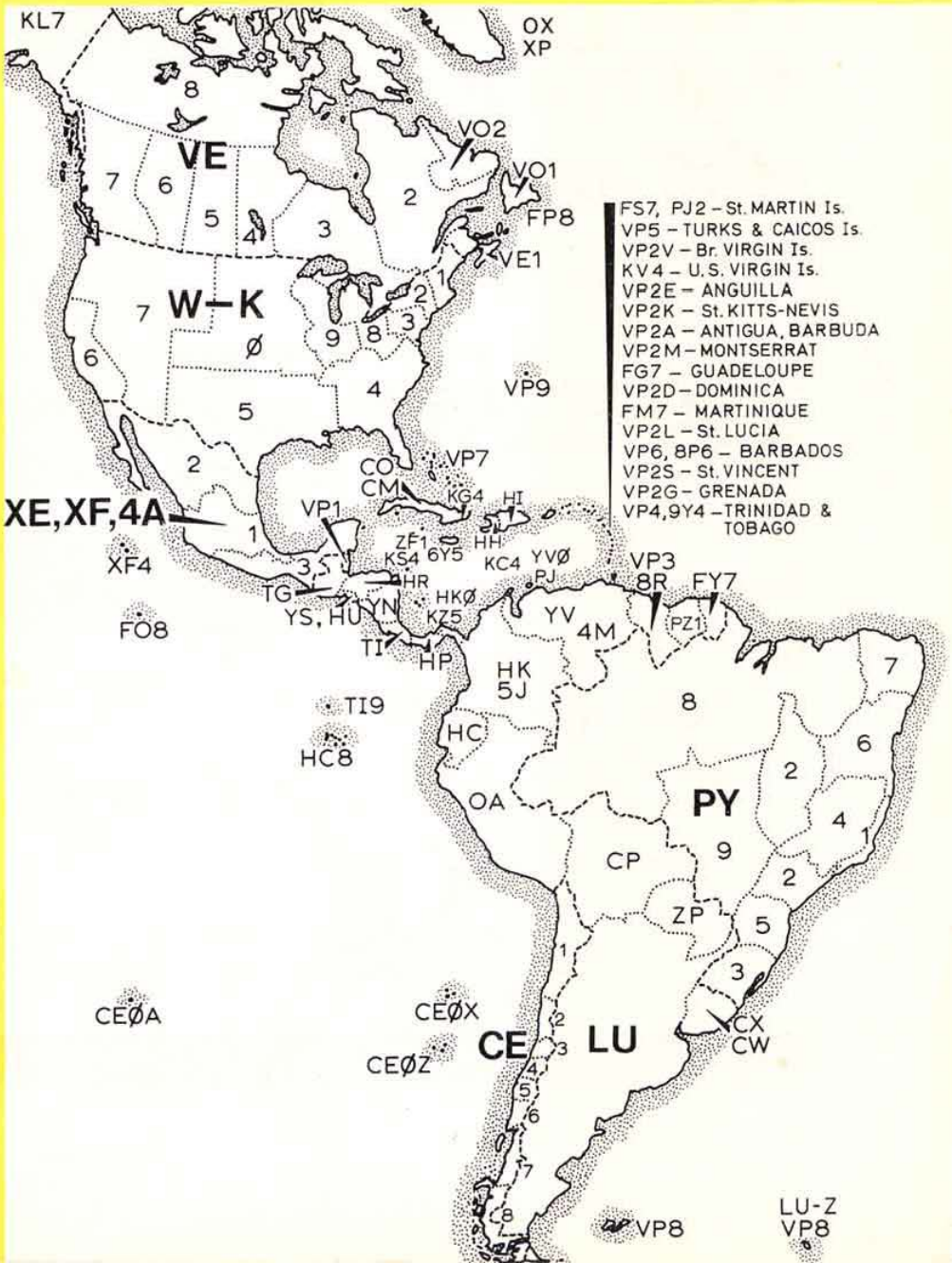
radio communication

March 1971

Journal of the Radio Society of Great Britain



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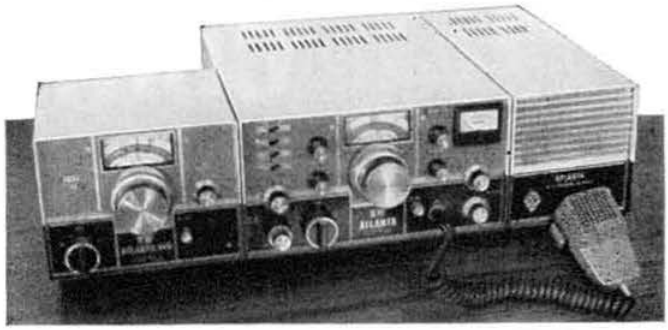

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radio communication

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CONTENTS

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

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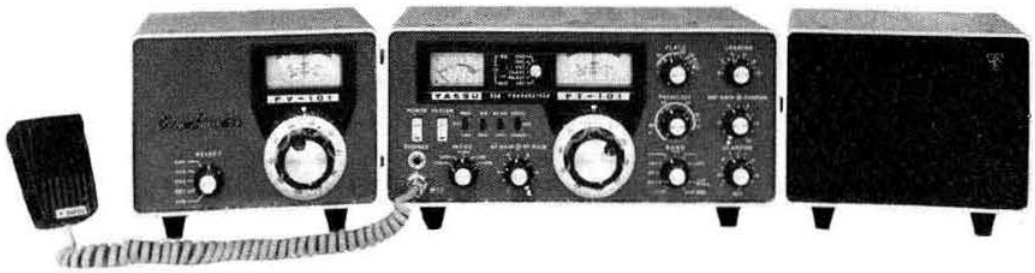

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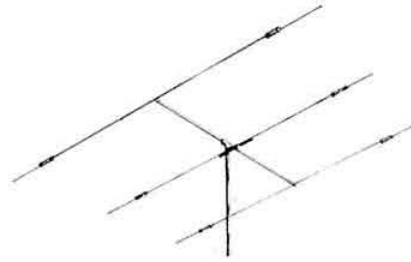

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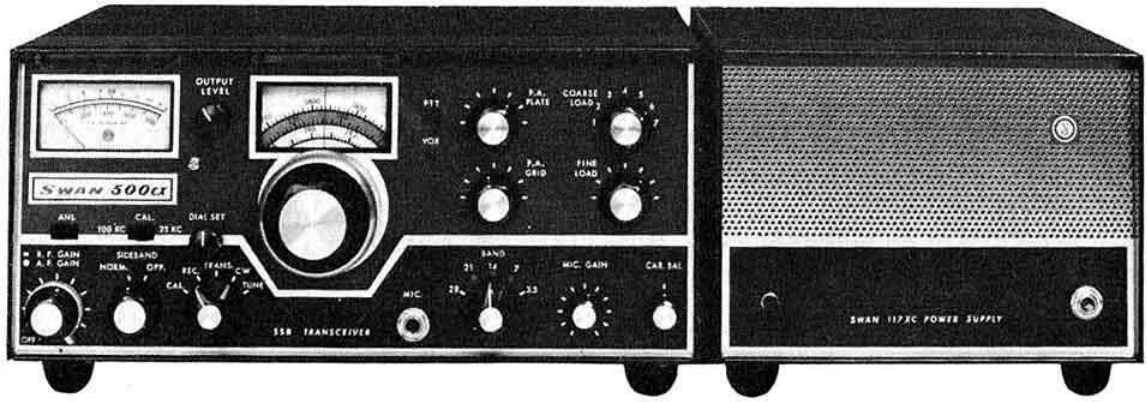

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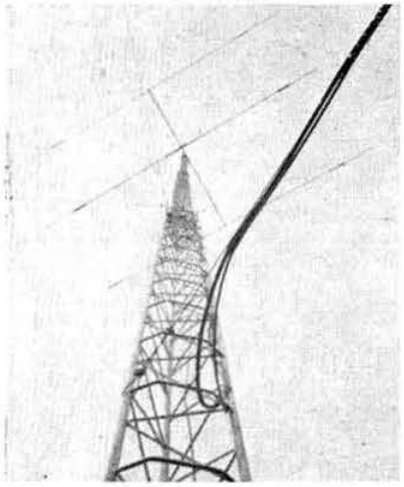

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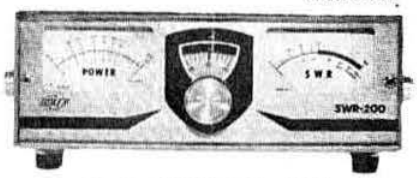

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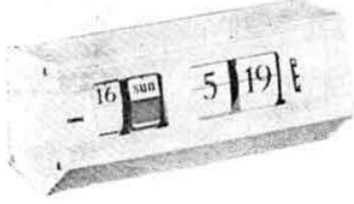
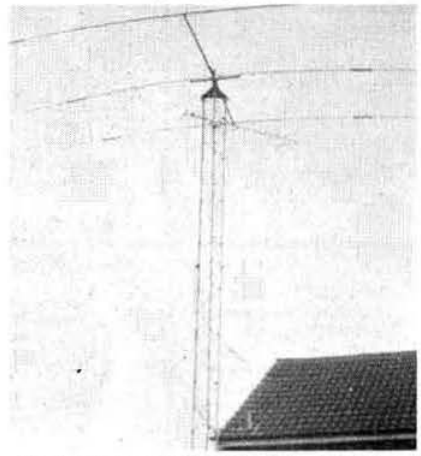


30' HAMTOWER



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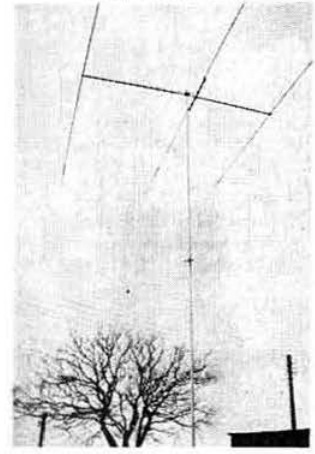

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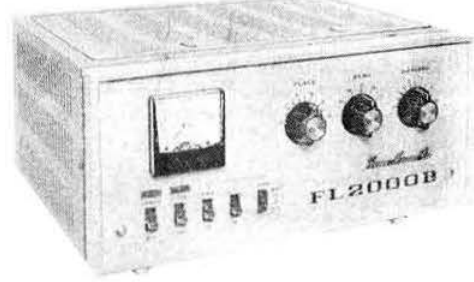

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FF500X	LP Filter	**£6·20**	**YD846**	Hand Microphone	**£5·00**

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QTC AMATEUR RADIO NEWS

RSGB Dinner Club

The next meeting of the RSGB Dinner Club will be at the Kingsley Hotel, Bloomsbury Way, London WC1, on Friday 26 March 1971 at 7.30 for 8pm. The Kingsley Hotel is a few minutes' walk from Holborn tube station and there is ample car parking space in the vicinity. The cost of the dinner is £1·30 (26s) and bookings accompanied by a remittance may be sent to Miss Shirley Eldon at RSGB headquarters. Please note that bookings must close 24 hours before the dinner.

All RSGB members are welcome to this informal occasion and a particular invitation is extended to overseas amateurs who may be visiting London.

RSGB lecture meeting

More than 100 members attended the lecture at the IEE on 21 January 1971 when John Pink, G3OQB, of Hewlett Packard Ltd gave a talk and demonstration on the subject of modern transmitter testing. After giving an introduction to the capabilities and uses of the modern spectrum analyser and associated equipment, Mr Pink showed the practical usage when measuring transmitter output frequencies and filter characteristics. A number of filters were brought by members for evaluation and most gave a less than satisfactory performance. Transmitting equipment for the occasion was loaned by Heath (Gloucester) Ltd under the supervision of Mr S. R. Boakes, G3HXN. At the close of a most interesting and informative lecture a vote of thanks to the speaker was proposed by Mr T. Lyell Herdman, G6HD.

World Telecommunication Day 1971

Last year the International Telecommunication Union named 17 May as the World Telecommunication Day. In 1971 this date falls on a Monday and the special activity radio stations established for the occasion will be active during the preceding weekend 15–16 May. The Society will be sponsoring two stations, GB2ITU and GB3ITU. The former will be under the supervision of G3GVV and operation will take place from Tonbridge School, Kent.

Amateur sound licence

RSGB HQ has recently received a number of queries concerning the amateur sound licence, and in particular whether a licensed amateur may send third-party messages.

Third-party messages, with one exception set out in Clause 1c of the licence, are not permitted and any licensed amateur who is in doubt on this point should read his licence carefully.

The exception mentioned above is when the station is used in connection with disaster relief operations or simulated exercises in conjunction with the British Red Cross Society, St John Ambulance Brigade or police force activity.

All licensed amateurs are therefore advised that should they receive a request to pass on a third-party message they should decline, pointing out that it is not within the terms for which the station is licensed.

VHF converter kits

Our attention has been drawn to the kits offered by the Projects Committee of the VK3 VHF Group. These comprise a 144MHz fet converter kit, a 144MHz preamplifier kit (using a TIS88) and a 432MHz converter kit. These kits contain all components (except for crystals in the case of the two converters) including transistors, board and sockets. Many of these kits are in use outside Australia and considerable trouble has been taken to ensure that they are suitable for multiple construction.

Prices of the kits are: 144MHz converter, $A13·50 (postage by air, $A1·10, surface 18c); 432MHz converter, £A22·00 (postage by air, $A1·55, surface 24c); 144MHz preamplifier, $A5·40. Orders and requests for further information can be sent to Jim Stewart, VK3AS, Victorian Division WIA, PO Box 65, Mt. Waverley, Victoria 3149, Australia. Please ensure that sufficient reply postage is sent; this is three IRCs per half ounce for an air mail letter reply.

Calling GD5APJ

Anyone knowing the whereabouts of Mr R. Delcourt, GD5APJ, formerly of Ramsey IOM, is asked to contact RSGB/HQ. Mr Delcourt was awarded the Arthur Milne Trophy last year but the certificate sent to his former address has been returned by the Post Office.

Morse test applications

Under an arrangement with the MPT the Post Office Corporation will continue to conduct morse tests for radio amateurs.

Applications to take these tests should be made to: GPO External Telecommunications Services, Wireless Telegraphy Section, Union House, St Martins le Grand, London EC2.

Special activity licences

With callsigns in the series G4AAA to be issued shortly the Ministry of Posts and Telecommunications has stated that no GB4 special activity licences will be issued. Issue of these licences will be confined to the GB2 and GB3 series.

Licence figures

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

Class A	13,701
Class B	2,551
Class A/M	2,588
Class B/M	361
Television	191
Model Control	19,242

Invitation to a sale

The Racal Radio Club, G3RAC, is fortunate in having access to equipment and components surplus from development and production. This is to be offered at nominal prices to members of local radio clubs at a sale to be held on 13 March. It will include oscilloscopes, 100kHz i.f. filter coils, tuning and other capacitors, resistors, relays, potentiometers, connectors, cables, cabinets and much other metalwork (much of it new and unused).

The sale will be held at the 4th Bracknell Scouts HQ, Meadoway, Bracknell, which is approached from Stoney

Road off the A329 opposite the Racal development building. It will commence at 0930 and will continue until 1700 or until sold out, whichever is earlier. An entrance fee of 5p towards Scouts' funds will be charged and a cafeteria will be available. G3RAC will be operating a hf station at the venue.

NRSA Convention

The Northern Radio Societies Association will hold its annual convention at Belle Vue Zoo Park, Manchester, on Sunday 9 May 1971 from 10am until 6pm.

Each member society will have a stand of its own on which it will depict some aspects of amateur radio to the general public, and they will also compete against one another for the G8AYD trophy. This trophy is awarded for the best presentation, and the stands are to be judged this year by the President of the RSGB.

Major manufacturers and distributors of amateur radio equipment will also be exhibiting their wares.

Talk-in stations will be operating on 2, 4 and 160m for the benefit of mobile operators and will be using the special callsign GB2BVC. The main station will operate on all hf bands from the exhibition hall and will QSL all contacts.

For the "gambling types", a raffle will be arranged. Tickets will be on sale during the day and the draw will take place during the late afternoon. All the "fun of the fair", the Zoo Park, restaurants and bars will be available to visitors.

Can you help?

The 1341 (Thundersley) Squadron of the Air Training Corps is endeavouring to build a radio room where cadets aged 13–18 can be taught basic radio, morse, principles of electricity etc. To this end it is appealing for any useful surplus radio equipment which radio amateurs may care to donate, or for assistance in any other form.

The adjutant, Pilot Officer C. Peachey, RAFVR(T), BRS15408, would be pleased to hear from or meet anyone who can help. The squadron's HQ is Waverley Road, Thundersley, Essex, and parades are held on Mondays and Fridays from 1930 to 2200.

Mr G. Lazzell, G3AMM, has been approached by F3HI, whom he has known for many years and has met personally, with a request from F6AUF of Tours who wishes to stay with an English family for the Easter holidays in order to improve his English. F6AUF may be reached via F3HI, R. Deremond, 6 Avenue Duquesne, 37 Tours 01.

Mr R. Pollock, G5KU, wishes to establish contact with other amateurs who served as VIs during the last war, and who corresponded with a Barnet, Herts address. Mr Pollock was involved with this activity, and any other VI may contact him at 108 The Fairway, North Wembley, Middlesex, telephone 01–904 2402.

Presidential Installation

Well over 100 members and guests attended the installation of Mr F. C. Ward, G2CVV, as President of the RSGB at the social evening held at the Bonnington Hotel, London, on 15 January.

The ceremony was performed by Dr J. A. Saxton, the retiring President, who spoke of his pleasure in doing so, and of his year of office which he had enjoyed tremendously.

In reply, Mr Ward expressed his appreciation of the honour conferred on him and his determination to maintain the high standard set last year by Dr Saxton.

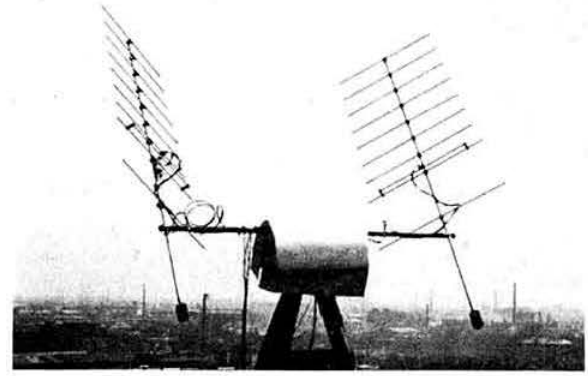
During the course of the evening a presentation was made to Dr M. Dransfield, 5N2AAF/G3JKO, on behalf of the Nigerian Amateur Radio Society as a token of its appreciation of the outstanding work he had done for that society. The presentation was made by Mr Eric Lomax, 5N2ABG, President of NARS.

Dr J. A. Saxton, Immediate Past-President, in conversation with Mr F. C. Ward (right) after installing him as President of RSGB for 1971

Dr. M. Dransfield, 5N2AAF/G3JKO, shows his mother the shield which was presented to him by Eric Lomax, 5N2ABG, President of the Nigerian Amateur Radio Society

Receiving Oscar-5

by Dr A. Gschwindt, HA8WH*



Receiving aerial

THIS article describes the receiving station which was in operation at Budapest Technical University during the lifetime of Oscar-5. The development and construction of the station was carried out by the members of the space research group of the university's microwave chair.

It is hoped that the ideas presented may encourage others to participate in the work connected with future satellites. Unfortunately the high electrical noise level in the heart of Budapest restricted reception to the 144MHz signals.

Basic considerations

Before describing in detail the equipment used, the factors which influenced its design will be considered.

First, consider the signal-to-noise ratio of signals coming from the satellite, assuming the following data:

(a) transmitted carrier power from the satellite $P_t = 50mW$; or in decibels relative to 1W: $P_t = -13dBW$.
(b) the distance between the satellite and the receiver aerial, with an assumed orbit height of 1,500km, when the satellite is near the horizon: $D_s = 4{,}500km$.
(c) the wavelength of reception: $\lambda = 2{\cdot}08m$.
(d) the gain of the cross-polarized receiver aerial: $G_r = 8dB$.
(e) free space loss between the satellite and receiver antenna:

$$a_f = \frac{20 \lg 4\pi D_s}{\lambda} = 20 \log \frac{4\pi 4{\cdot}5 \times 10^6}{\lambda} = 148dB.$$

From previous results the carrier power measured at the receiver aerial terminal can be determined:

$$P_c = P_t + G_r - a_f.$$

To obtain the signal-to-noise ratio of the received signals the noise power at the input of the receiver should be calculated using the following data:

Noise figure of receiver used for reception:

$$F = 4\ k\ T_o.$$

where k = Boltzmann constant

$T_o = 273°K$.

In the 2m band the average sky noise temperature (T_a) approximates to T_o, so the noise power measured in 1Hz bandwidth is:

$$P'_n = [(F - 1)\ T_o + T_a] \simeq F\ k\ T_o \quad WHz.$$

expressing the power of k T_o in decibels relative to 1W:

$$P'_n = F - 204 \quad dBW/Hz.$$

The i.f. bandwidth in the case of A3 mode transmission must be twice the maximum modulation frequency, which is 1,500Hz. So the minimum receiver i.f. bandwidth is 3,000Hz.

$$B = 3{,}000Hz.$$

Bandwidth in decibels above 1Hz:

$$10 \log B = 10 \log 3{,}000 = 35dB.$$

Received noise power in the whole band:

$$P_n = F - 204 + 10 \log B\ dBW.$$

From previous results the carrier signal-noise ratio is:

$$\frac{P_c}{P_n} = P_t + G_r - a_f - (F - 204 + 10 \log B) =$$
$$P_t + G_r - a_f - F + 204 - 10 \log B.$$

Substituting in the formula:

$$\frac{P_c}{P_n} = -13 + 8 - 148 - 6 + 204 - 35 = 10dB.$$

Thus the carrier signal-noise ratio measured before the demodulator will be about 10dB.

After demodulation the sidebands and not the carrier are used, so the result must be modified to obtain the true signal-to-noise ratio for sidebands measured at the af output of the receiver:

$$\frac{P_s}{P_n} = 2 \left(\frac{P_c}{P_n}\right) \left(\frac{m}{2}\right)^2$$

where m = modulation index

P_s = the power of demodulated signal.

Substituting m = 1 in the previous formula:

$$\frac{P_s}{P_n} = \frac{P_c}{P_n} 2 \frac{1}{4} = \frac{1}{2} \frac{P_c}{P_n}.$$

The signal-to-noise ratio for the modulated signal will be half of the carrier signal-to-noise ratio.

The result expressed in decibels is:

$$\frac{P_s}{P_n} = \frac{P_c}{P_n} - 3 = 10 - 3 = 7dB.$$

These results provide the best possible reception figures and the following considerations have been ignored:

(a) The supply voltage decreases during the lifetime of the

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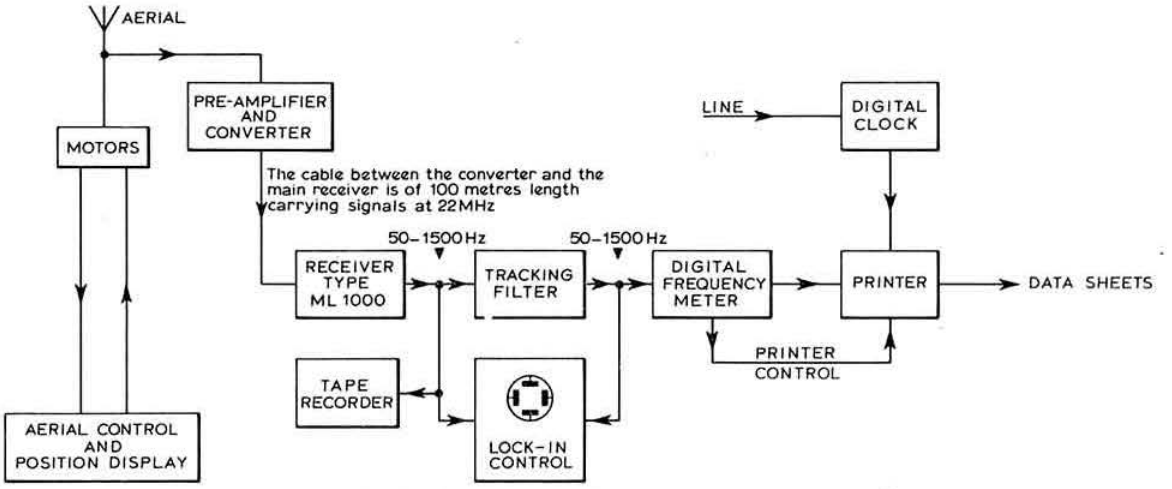


Fig 1. Block diagram of the receiving station

satellite, so the transmitter output power also decreases.

(b) For several days after the launch the satellite was tumbling, and fading was affecting the received signal.

Naturally, reception would be better when the satellite was above the receiving station. In this case the signal-to-noise improvement comes from a decrease in free-space loss. The improvement, which is proportional to the decrease in the satellite-receiver distance, can be calculated easily:

$$\frac{4{,}500}{1{,}500} = 3 \text{ times or } 5\text{dB}.$$

A signal-to-noise ratio of about 7dB is not sufficient for high accuracy frequency measuring when the digital frequency meter is connected directly to the output of the receiver. In Budapest Technical University's station the signal-to-noise ratio was improved with a reduction in bandwidth using a tracking filter.

Receiving station operation

The block diagram of the receiving station is shown in Fig. 1.

The signals transmitted from the satellite were received by a cross-polarized aerial system; the pre-amplifier together with the converter, which has an output at 22MHz, were located on the aerial mast.

The 22MHz signal was fed to a commercial hf receiver, at the output of which were the signals of the telemetry channels which lie within the 500–1,500Hz bandwidth. Improvement of the signal-to-noise ratio was carried out by the tracking filter; its correct operation being controlled by an oscilloscope.

During most of the receiving periods the output signal of the receiver was recorded on a commercial tape recorder to retain the telemetry signals in case of a fault in the counter chain.

The frequency of the telemetry signals was measured with a digital frequency meter and was shown on the display of the counter and at the output connection from the counter to the printer. The printer was controlled by the counter to print out the telemetry data every second. The time of the measurements was also printed; the time-signal being generated by a digital clock working with the mains as the time reference.

Aerial rotation was carried out with a hand-operated remote control. For the position display an analogue system was used.

Aerial

The aerial system was located on top of a seven-storey building; this location limiting its size, and because of the nature of the remote control it was decided to choose an aerial of simple mechanical construction.

A nine-element Yagi aerial was chosen, from two of which a cross-polarized aerial system could be produced. The cross-polarization reduced the fading originating from the tumbling of the satellite and the polarization-plane rotation of the ionosphere. The interconnection between the two aerials was designed to produce a 90° phase shift.

In some satellite passes only one half of the aerial was used, in which case the aerial was plane-polarized. This depended on the quality of the received signal which suffered from strong fading and from time to time disappeared in the noise. Although the gain of a single aerial was about 11dB, the two connected in parallel had about 8dB gain over the isotropic radiator. The relatively low gain is associated with a wide beamwidth which is advantageous during the tracking of a satellite.

Because of the simple aerial construction, the two perfectly balanced aerials were located at the ends of a horizontal aerial mast, as shown in the photograph. To reduce the effects of mast disturbances, the aerial plane was rotated relative to the horizon so that the two planes had a 90° angle between them. The rotation of the aerial in horizontal and vertical directions was carried out by two dc motors.

The position display was a simple analogue system. It consisted of two linear potentiometers rotated together with the aerial. The potentiometers, connected as a variable resistor, fed a constant-current dc generator, so the voltage measured on them was proportional to the aerial rotation. The accuracy of the position display was better than ±3 degrees.

Pre-amplifier and converter

The distance between the receiving room and the aerial was about 100m, and to eliminate the effect of large cable-loss a pre-amplifier was placed on the aerial mast, together with a converter and first-stage i.f. amplifier. The gain of the unit was about 40dB and the noise figure was $4kT_o$. All stages consisted of semiconductors; the supply voltage fed the converter via the inner conductor of a coaxial cable.

Receiver

This was a Hungarian hf communication receiver, type ML1000, which had a 3kHz i.f. bandwidth. No circuits for the correction of Doppler shift were incorporated and the tuning correction was performed manually.

During the reception of the satellite's signals, development of a product detector system with automatic Doppler correction was started, but unfortunately it was impossible to prove it during the lifetime of the satellite. This type of detector ensures the elimination of the knee effect in the reception of A3 signals. Where envelope detectors are used with a 3–5dB detector input signal-to-noise ratio, the detector output signal-to-noise ratio decreases very sharply.

Tracking filter

From the estimate of the expected signal-to-noise ratio it was seen that generally the signal-to-noise ratio measured at the output of the receiver would not be sufficient for high accuracy frequency measurement. The process used to improve the output signal-to-noise ratio was based on the following theory:

The frequency of a single signal being received continuously during the 6·5s period had to be measured, and using the receiver output signal a wide noise spectrum was connected to the input of the counter. In the 1,500Hz bandwidth the useful information was a single signal, and the variation of the modulation signal was very low during the 6·5s time interval.

A poor match exists between the receiver output and counter. If we take a bandpass filter and decrease the bandwidth near the desired frequency, for example one-tenth of the original bandwidth, we get a 10dB signal-to-noise improvement at the output of the filter.

However, it is not practical to tune the filter by hand every 6·5s from one frequency to the other; although the tracking filter used in this system operated in this way, the tuning was automatic. The block diagram of the tracking filter is shown in Fig 2; its operation being based on the phase-locked loop.

In the ssb generator the af signal is shifted up into the 450·5–451·5kHz band, a process found in all ssb transmitters. The signal located in the 450kHz band is amplified and then connected to the input of a limiter which removes the amplitude variation of the signal to ensure a constant amplitude signal for the phase detector.

The output of the limiter is filtered with a parallel tuned circuit, and the amplitude and band-limited signal is connected to the input of the phase detector unit through a buffer amplifier.

Phase-locked loops design points

Take one-tenth part of the incoming signal bandwidth, namely 150Hz, as the loop bandwidth. Theoretically it is possible to use a smaller value but this means the decrease of the lock-in band. To make an automatically following loop with, say, an oscillator frequency of 451kHz, the phase-locked oscillator will find the incoming signal in the 451 $\pm$0·5kHz range. Any further decrease in the loop bandwidth will result in the lock-in range being so small that the system will lose the incoming signal when the satellite switches the telemetry channel.

At the output of the phase-locked system the signal frequency is within the range of 451 $\pm$ 0·5kHz. This signal is mixed with that originating from the carrier oscillator of the ssb generator, 450kHz, and the difference of the two signals is the channel frequency measured at the output of the receiver.

There is no difference in the frequency of the two signals, but the output of the tracking filter has a 10dB signal-to-noise improvement over the signal at the receiver output.

Tracking filter circuit

The tracking filter consisted of two independent units; an ssb generator and a phase-locked loop.

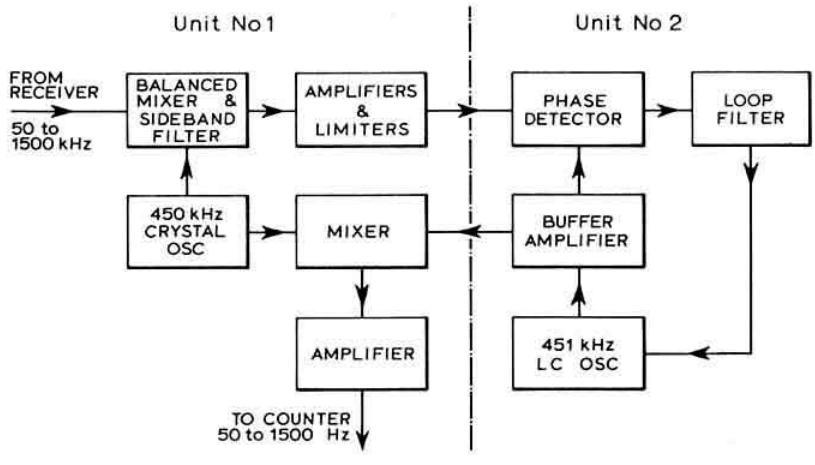


Fig 2. Block diagram of tracking filter

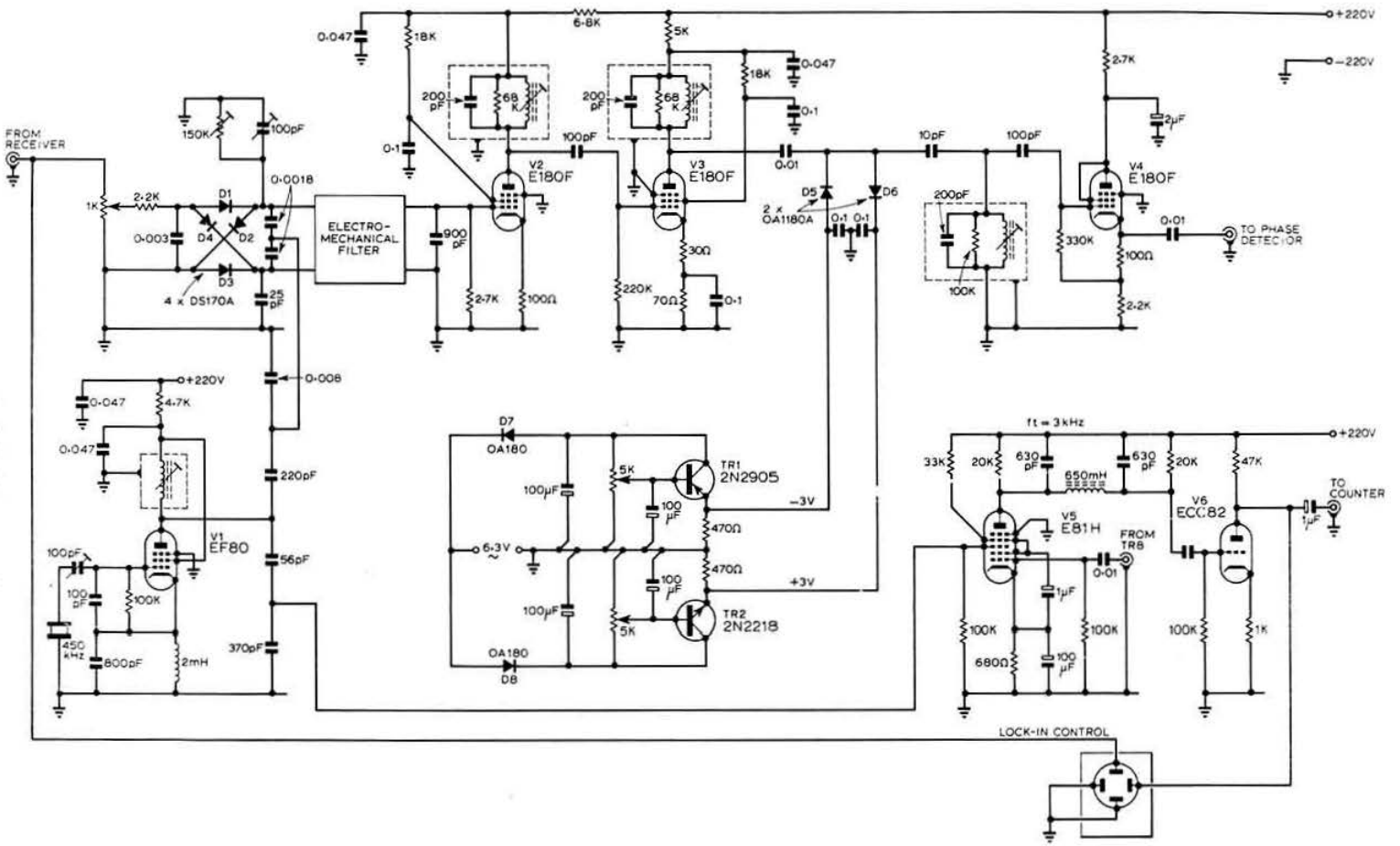


Fig 3. SSB generator and mixer circuit diagram

The circuit diagram of the first unit is shown in Fig 3. The signal from the receiver output is fed to the balanced modulator, the carrier generator having a 450kHz crystal to ensure the stability of the frequency source (V1). From the output of the balanced modulator, where the signal is a two-sided a.m. signal, the upper sideband is filtered out with an electromechanical filter.

The ssb signal, amplified by valves V2 and V3, is limited by a parallel diode limiter; the maximum value of the clipping is about 20dB. The bias voltage for the limiter diodes is produced from the ac heater voltage. TR1 and TR2 work in emitter follower configuration to give low internal resistor voltage source for the limiters. From the limiters the signal is fed to the output of the unit through a bandpass filter and a buffer amplifier.

The 450kHz signal produced by V1 is fed into the mixer (third grid of V5), and the first grid of the mixer is fed with the signal of the phase-locked LC oscillator from the second unit. The output of V5 through the low-pass filter is amplified and switched to the counter. The low-pass filter has a cut-off frequency of about 3kHz to remove the 450kHz components.

The circuit diagram of the phase-locked loop unit is shown in Fig 4. The limited signal located in the band 451 $\pm$0·5kHz feeds the input of the phase detector, TR3, TR4, TR5, D3, D4 and D5, which was constructed without a transformer—the asymmetrical inputs giving simple connection possibilities.

The signal at the output of the phase detector, which in the locked-loop condition varies proportionally with the phase and frequency of the incoming signal originating from the satellite, guides the phase and frequency of a Clapp oscillator through the loop filter.

The control devices are two Varicap BA124 diodes connected in parallel. With the help of the potentiometer it is a simple matter to tune the LC oscillator frequency to ensure the lock-in process at the start.

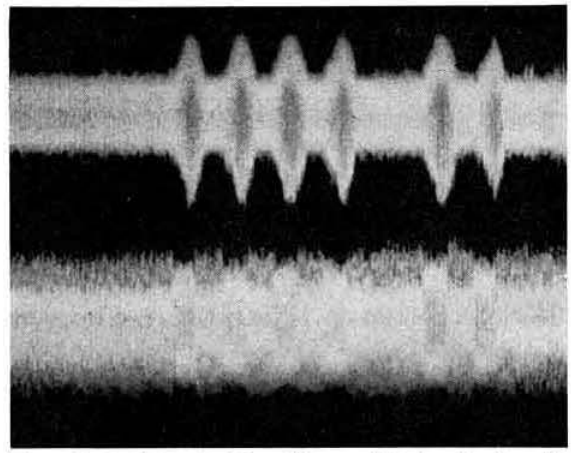
The buffer amplifier, TR7, is an emitter follower after the LC oscillator. The buffer output feeds the phase detector and the output of the unit, while the output signal of this unit feeds the first grid of V5 which is working as a mixer.

Control of the tracking filter

When the tracking filter is working correctly, the frequency is the same at the input as it is at the output of the filter. If the signals at the input and output of the tracking filter are switched into the horizontal and vertical input of an oscilloscope an elliptical (Lissajous) figure is shown when it is in locked condition. If it is a rolling figure, either the loop is not working correctly or the output frequency of the filter is not the same as the frequency transmitted by the satellite. In practice, this mode of loop control was a simple way of watching the tracking filter at work. Except during some extremely bad receiving conditions it was sufficient to control the loop lock-in process at the rising of the satellite, and all went perfectly during the pass.

Frequency measurement

The digital frequency meter used in the experiment was a Hungarian product, type TR5250, which has an upper count frequency of 10MHz. A measurement accuracy of 1Hz was



The effect of the tracking filter on HI signal when the reception was poor

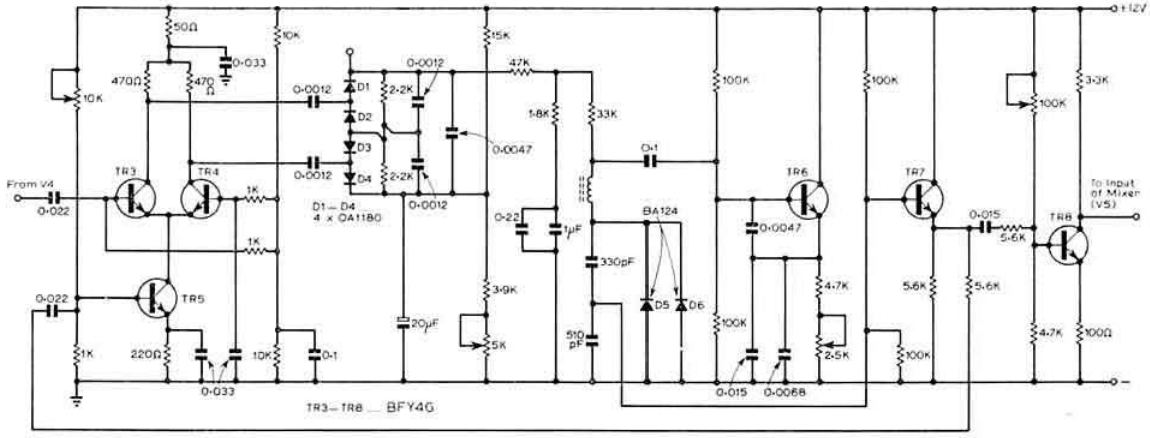


Fig 4. Phase-locked loop circuit diagram

Table 1. Data print-out with time display. Copy of original data sheet during orbit 177

Time (MEZ)	Channel frequency (kHz)	Channel number	Time (MEZ)	Channel frequency (kHz)	Channel number
15.30.06	1.245	1	15.30.29	0.698	4
15.30.07	1.247	1	15.30.30	0.853	–
15.30.08	1.245	1	15.30.31	1.260	5
15.30.09	1.245	1	15 30.32	1.260	5
15.30.10	1.246	1	15.30.33	1.261	5
15.30.11	1.125	–	15.30.34	1.262	5
15.30.12	0.701	2	15.30.35	1.254	5
15.30.13	0.710	2	15.30.36	1.261	5
15 30.14	0.705	2	15 30.37	1.439	6
15.30.15	0.785	2	15.30.38	1.442	6
15.30.16	1.037	–	15.30.39	1.440	6
15.30.17	0.773	3	15.30.40	1.444	6
15.30.18	0.783	3	15.30.41	1.446	6
15.30.19	0.788	3	15.30.42	1.447	6
15 30.20	0.787	3	15.30.43	1.336	–
15.30.21	0.787	3	15 30.44	1.287	7
15.30.22	0.788	3	15.30.45	1.290	7
15 30.23	0.786	3	15.30.46	1.289	7
15.30.24	0.749	4	15.30.47	1.290	7
15.30.25	0.722	4	15.30.48	1.291	7
15.30.26	0.715	4	15.30.49	1.141	–
15.30.27	0.709	4	15.30.50	0.623	start
15.30.28	0.706	4	15.30.51	1.214	of HIs

Table 2. The effect of the tracking filter on the accuracy of the data

Channel frequency (kHz) Without tracking filter	With tracking filter	Channel number	Channel frequency (kHz) Without tracking filter	With tracking filter	Channel number
1.279	1.254	1	0.945	0.600	4
1.284	1.256	1	1.295	0.979	–
1.269	1.250	1	1.345	1.245	5
1.281	1.252	1	1.324	1.234	5
1.306	1.236	–	1.336	1.251	5
0.960	0.074	–	1.366	1.244	5
0.782	0.642	2	1.349	1.210	–
0.810	0.642	2	1.122	0.949	–
0.838	0.642	2	1.073	0.836	6
0.840	0.642	2	1.061	0.812	6
0.806	0.641	2	1.061	0.800	6
0.860	0.691	3	1.036	0.797	6
0.861	0.731	3	1.020	0.777	6
0.871	0.729	3	1.378	1.196	–
0.875	0.731	3	1.367	1.290	7
0.888	0.731	3	1.371	1.273	7
0.911	0.729	3	1.354	1.254	7
0.869	0.649	4	1.377	1.263	7
0.842	0.602	4	1.365	1.250	7
0.853	0.605	4	0.980	0.701	–
0.822	0.602	4	1.102	0.658	–
0.908	0.608	4			

sufficient and the 1Hz resolution required 1s of gate time. In the 6·5s channel time four to five useful items of data were obtained because the counter was not synchronized with the channel time.

The measured frequency was readable in the display part of the counter and in parallel code at the output of the counter. The output of the counter fed the printer for automatic measurement and the gate signal controlled the printer start.

Digital clock and printer

In addition to the channel frequency, the time of reception was also printed out. The time signals came from a digital clock made at the university, and as there was no need for high accuracy, the clock was regulated by the mains supply.

A Hungarian fast printer, type PRE-10-P/161, was used. The control signal from the digital frequency meter commanded the printer every second to print the channel frequency and the time of reception on one line.

Results

An example from the output of the printer is shown in Table 1. Between channel numbers 1 and 2 the data is not correct because of the asynchronism between the channel switching and measurement points. The signal-to-noise improvement caused by the tracking filter is shown in two examples, Table 2 and the photograph; in the table the error is greater without the filter, and in the photograph the HI signals are clearer following the introduction of the filter and are lost in the noise without it.

BOOK REVIEWS

Through to 1970. 122 pages. Published by the Royal Signals Institution, Cheltenham Terrace, London, SW3. Price (by post) 62½p.

This attractively produced book containing many colour illustrations has been published to commemorate the Golden Jubilee of the Royal Corps of Signals. It deals with the history of the Corps, commencing in 1870 with the formation of the first Telegraph Unit and proceeding to modern satellite communication provided by the 14th Regiment. Many radio amateurs have served with the Royal Signals and have continued their association by membership of the Royal Signals Amateur Radio Society. This book will be of particular interest to them, while recording for the general public the unique history of the Corps.

Guide to Broadcasting Stations, 16th edition. 160 pages. Published for Iliffe Books by the Butterworth Group. Price 50p (by post 60p). Obtainable from RSGB Publications, 35 Doughty Street, London WC1N 2AE.

The information that appears in this popular book has been prepared by the Tatsfield receiving station of the BBC. The first portion of the volume is devoted to a short guide to listening and this is followed by lists of long- and medium-wave European stations, short-wave stations of the world and European vhf sound broadcasting stations. Published in December 1970, the information in this book is as up-to-date as possible and forms an invaluable guide to the broadcasting stations of the world.

Plagiarize and hybridize

An approach to receiver design

by PETER G. MARTIN, G3PDM/W1*

Part 1: Design considerations

Introduction

Receiver design practice has changed radically in the past decade, partly through the availability of advanced semiconductor devices, but primarily through the awareness that high gain and good i.f. selectivity are not alone sufficient to guarantee high performance under normal operating conditions.

The hard facts about cross-modulation and other large-signal effects have been laid down succinctly by several authors [2, 3, 6], but many current receivers only tackle the problem half-heartedly by at best adopting mos transistors in conventional rf amplifier/mixer front-ends. At the same time, many new circuit techniques applicable to amateur communications receivers have been described in the journals, but not applied to practical designs. These cover such topics as the treatment of noise, the use of frequency synthesis to improve stability, and the use of modern filter design techniques to increase front-end, i.f. and audio selectivity.

In 1968 [1], the author described an amateur band receiver which adopted some new techniques, while retaining valve circuits in some parts of the design. The receiver discussed here represents a considerable improvement over the first version, at the expense of higher complexity. Although a wide variety of silicon devices is used, some stages are again based on valve circuits. The reasoning behind this is sound, and will be explained where appropriate.

Although complete circuit diagrams are given, it is unlikely that many readers would wish to duplicate the design, and full constructional details are not given. The emphasis is on appraisal of the latest techniques, details of the receiver design, and an assessment of the prototype after laboratory tests. As the receiver was built over a three-year period, it was inevitable that further improvements would suggest themselves in the latest technical journals. Some of these have been described.

Large signal performance

As the behaviour of a receiver under large-signal conditions is affected by many aspects of design, it is appropriate to consider these first. The main distinguishing feature of a communications receiver should be its ability to resolve extremely small signals in the presence of very much larger ones on nearby frequencies. This is *not* a question of i.f. selectivity alone: front-end design is equally important.

The most serious problem is that of cross-modulation, where the modulation of a nearby signal appears as modulation of the desired signal, although the two may be separated in frequency by several hundred kilohertz, and the interfering signal will normally be outside the i.f. passband. Cross-modulation is difficult to assess outside the laboratory, and many amateurs are reluctant to admit that their station receivers might be inadequate in this respect. There is also a feeling that signal voltages from aerials are not sufficient to cause large-signal effects, regardless of aerial gain. The following argument might convert some of the bigots.

The main cause of cross-modulation is third harmonic distortion in a receiver mixer. The third harmonic distortion in a good hi-fi amplifier is rarely below 0·1 per cent, yet 0·08 per cent is sufficient to cause one per cent cross-modulation in a receiver. Under these conditions, the *maximum* signal-to-noise ratio possible with equal desired and interfering signals is only 40dB! It can be shown that cross-modulation effects increase as the square of the interfering signal voltage, so a 0dB signal-to-noise ratio results if the interfering signal is only 20dB stronger than the desired signal. This situation is extremely common, and it is not unknown for signals to differ in amplitude by more than 120dB.

The ability of a mixer to handle large signals is therefore related to the signal level where third harmonic distortion rises much above 0·01 per cent. Most Class A amplifiers will give distortion figures lower than this for signal levels below 100μV, but achieving such performance with signals of several volts driving a mixer circuit is considerably more difficult.

Once cross-modulation has taken place, it cannot be removed by i.f. selectivity. The use of rf attenuators is helpful, as a 6dB attenuator reduces cross-modulation by 12dB.

Rheinfelder [2] distinguishes between static selectivity, normally the i.f. filter response measured with a signal generator, and the effective selectivity defined by large-signal effects. He quotes a communications receiver with an i.f. bandwidth of 100Hz, but a cross-modulation bandwidth of 50kHz. He concludes that the crystal filter was an unnecessary expenditure, and more effort should have been expended in front-end design.

Another large-signal effect is intermodulation, where two interfering signals and their harmonics beat together to generate a spurious signal at the desired frequency. For example, with frequencies $f_1 = 14{\cdot}130$MHz and $f_2 = 14{\cdot}140$MHz, the intermodulation product $2f_1 - f_2$ will give a spurious signal on 14·120MHz. In severe cases the fifth-order product $3f_1 - 2f_2$ on 14·110MHz may be audible. Intermodulation is reduced by the use of balanced mixer circuits, and by optimizing the quiescent conditions of front-end valves or transistors (see Fig 1).

Strong interfering signals outside the i.f. passband can also cause receiver overload or desensitization, by driving

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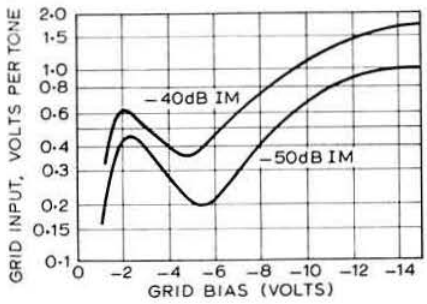

Fig 1. Two-tone input signal level needed for −40dB and −50dB third-order intermodulation distortion in a 6BA6 amplifier, as a function of grid bias. (After Pappenfus *et al* [29])

early stages into Class C and biasing them into a region of low gain. Desensitization can be particularly severe if bias developed at the rf amplifier input circuit reaches the i.f. amplifiers through the age line. Squires [3] mentions a high-priced receiver which "collapsed in silence" at signal levels of 35mV.

The three effects mentioned above occur primarily in mixers, because of their inherent nonlinearity. The problem is treated by:

(*a*) using no rf stage before the mixer(s), to keep signal levels low;
(*b*) providing as much rf selectivity as possible, consistent with having a tunable network;
(*c*) using as few mixers as possible, preferably one balanced circuit;
(*d*) providing i.f. selectivity immediately after the mixer, to prevent large-signal effects in subsequent stages.

Current device technology and circuit techniques ensure that these goals are realizable. Several types of low-noise mixer devices are available which make rf amplifiers redundant, steep-sided i.f. filters abound, and modern filter synthesis techniques can yield excellent rf selectivity.

Noise and small signals

The limiting factor in the resolution of small signals on a clear frequency below 30MHz is the aerial noise figure. This figure depends on the type of receiving aerial and the levels of atmospheric noise and solar activity, but it is rarely below 18dB. Receiver noise figure adds to this, so a receiver with a 4dB noise figure can resolve signals down to about 0·6μV from a 50Ω aerial (with matched input circuits and a 6dB signal-to-noise ratio in a 3kHz bandwidth). Laboratory measurements on the same receiver would show a 0·1μV sensitivity, because of the absence of aerial noise. Receiver noise is relatively unimportant below 30MHz.

A good mixer will have a noise figure as low as 5dB, without any rf amplifier. This gives an aerial sensitivity of about 0·67μV under matched conditions. With no rf stage, and a crystal filter preceding the first i.f. amplifier, the noise figure of the first i.f. stage must be low enough for aerial noise to dominate at the receiver output.

Reception of weak signals is also impaired by man-made impulse noise. Some interesting recent papers have been concerned with the treatment of noise pulses in receivers, and it has become possible to copy weak signals through the din caused by the machines of modern living. Several circuits have been described which outperform the familiar noise limiter in two most important respects:

(*a*) A limiter can only reduce the noise to the same level as the received signal, so that although the abuse to one's ears may be alleviated, the noise is still present at an intolerable level. On the other hand, an effective noise *silencer* will break the main receiver signal path during each impulse, so that a few microseconds of silence replace each deafening crack.
(*b*) A noise silencer operates before the main receiver selectivity, whereas a noise limiter acts after it. This is important because a short noise pulse is "stretched" greatly by the high-Q elements of a mechanical or crystal filter. A 1μs pulse may be over 5ms long after passing through a filter with good skirt selectivity.

Some noise silencers pick up noise pulses in the vhf spectrum, but as W2PUL [4] points out, many types of impulse noise do not manifest themselves evenly over large parts of the spectrum. It is better to obtain pulses by monitoring the band in use. The use of vhf circuits does have the advantage that one can choose a band with no strong carriers: noise silencers using hf circuits can be affected by really strong signals.

One of the first noise silencers was described by Lamb [5], but his system was designed to be used "as far along from the antenna stage as possible, but ahead of the high selectivity section of the receiver". This hardly suits the receiver described so far! In Lamb's circuit, amplified noise pulses are used to turn off a 6BE6 "controlled i.f. amplifier", but the 6BE6 can no longer be regarded as a good switch.

W2PUL's system (see Fig 2) is most interesting. Wideband i.f. signals are taken from the first mixer anode and amplified in two high-gain stages with a 500kHz bandwidth. As the noise pulses generally have a greater amplitude than the instantaneous background signal level, the entire amplifier output is envelope detected. The noise pulses are subsequently squared and applied to a noise gate which breaks the receiver signal path for the duration of the incoming noise pulse.

The gate introduces severe design problems. It must have an insertion loss less than about 3dB when ON, but as much as 80dB when pulsed OFF. In addition to this, blanking pulses must not induce switching transients in the signal path, or the whole object of the silencer is defeated. As signals may be at the microvolt level, this is quite difficult to achieve. Furthermore, the gate acts before the main receiver selective filters, and must therefore handle large signals without introducing cross-modulation.

The gate used by W2PUL in 1963 consisted of an RCA-2N1169* bi-directional transistor in a rather unusual circuit. He claims that by isolating the collector circuit by means of C1 (Fig 2), silencing pulses do not appear at the gate output. This argument ignores the base-collector capacitance of the transistor, which causes transients of about 1V to appear at the output. The component of these transients at the i.f. frequency is of the order of tens of microvolts, which is unsatisfactory under weak signal conditions. W2PUL further claims that the gate will handle signals of "1 or 2V"

* No longer available.

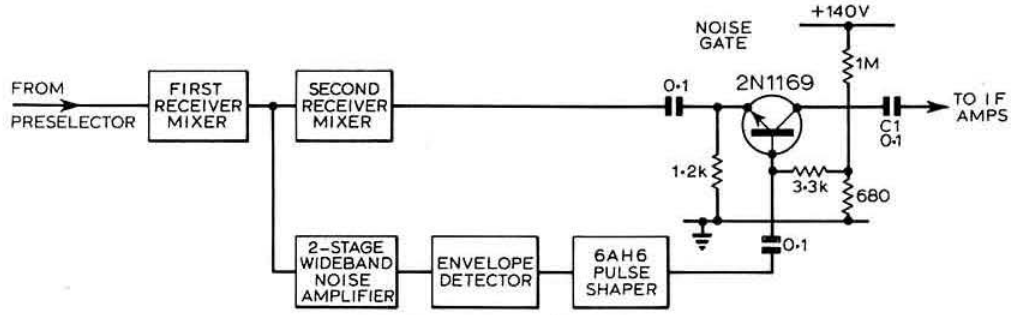

Fig 2. The W2PUL noise silencer

without producing cross-modulation, but the author has found that severe distortion occurs on signals greater than 200mV.

A device which is linear and resistive over a wide operating range is the field-effect transistor. The fet has a resistive path between drain and source whose impedance can be varied from about 100Ω to several megohms by means of the gate electrode voltage. In the case of junction FETs, the gate-source isolation is better than 1,000MΩ. There remains the problem of the gate-source capacitance, which is about 5pF in good n-channel JFETs, or 30pF in p-channel types. The noise gate developed for the G3PDM receiver uses a 2N3823 or 2N3819 fet, and spurious switching transients are *cancelled* by loosely coupling inverted blanking pulses to the output terminal, through the 5pF trimmer C1 (Fig 3). The gate was tested by connecting it between a signal generator and the aerial terminal of a receiver with 0·5μV sensitivity. Blanking pulses can be made totally inaudible by adjusting C1.

For the treatment of noise, Gorbachev described a new concept in *Radioteknika* [7] which relies on the fact that adjacent rf cycles of a received signal (even if it is amplitude modulated) are almost identical. Two i.f. signals, e_1 and e_2 in Fig 4, are applied to a wideband differential amplifier. If the signal is unmodulated, the amplifier output will be zero:

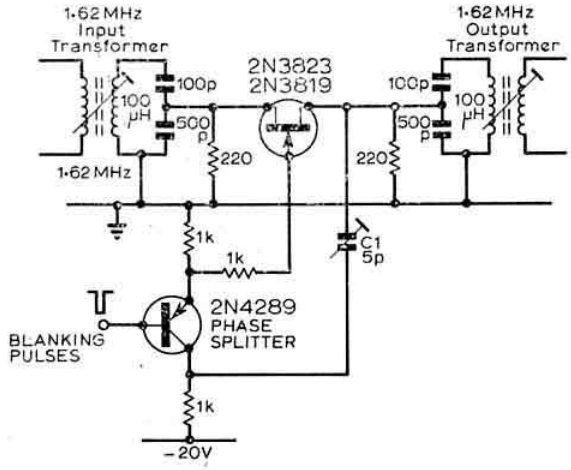

Fig 3. The fet noise gate developed for the G3PDM receiver

if it is amplitude modulated its output will still approach zero. However, if a noise impulse passes through the system, e_1 varies rapidly, whereas e_2 cannot, because of the transient response time of the selective amplifier. A pulse therefore passes through the limiter and arrives at the first i.f. amplifier input out of phase with the incoming noise pulse. This reduces the noise pulse amplitude by a factor approximately equal to the gain of the differential amplifier.

Noise and large signals

Oscillator noise and its effect on receiver performance have received attention in several articles [8, 9, 10]. A local oscillator will produce a noise output in addition to the regular sine-wave carrier, and this adversely affects the large-signal performance of mixers. A really strong incoming signal can behave as the local oscillator drive to a mixer, and beat with the noise components of the true oscillator output to produce a noise signal at the i.f. With sound design, oscillator noise can be maintained 140 to 160dB below the carrier level. In general, valves are better than transistors, because of their higher dynamic range and lower susceptibility to noise modulation. The effect of oscillator noise is to reduce the dynamic range of a receiver in much the same way as cross-modulation.

Noise-modulation effects arise when a signal and noise are applied simultaneously to a mixer or non-linear amplifier. Three noise components appear at the output, due to modulation of the noise voltages upon each other (E_{nn}), modulation of the signal carrier by noise (E_{cn}), and modulation of the sidebands by noise (E_{mn}). With no input signal, only E_{nn} is generated, and this can normally be made small.

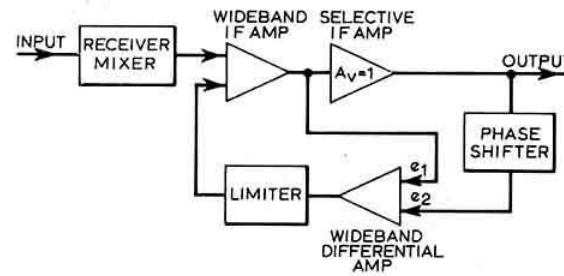

Fig 4. The noise silencer described by Gorbachev, which relies on the time delays associated with selective amplifiers

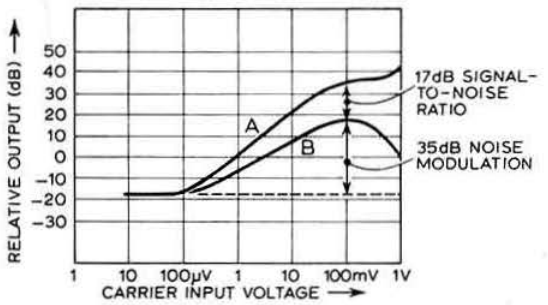

Fig 5. Graph showing noise modulation and other effects in a poorly-designed a.m. receiver (after Rheinfelder)

Rheinfelder [2] emphasizes the importance of the other components, as they cause a degradation of the effective receiver noise figure. Fig 5 shows input/output curves for a poorly designed transistorized a.m. receiver, with modulated (A) and unmodulated (B) input signals. Curve A shows the agc threshold, agc range and the onset of overloading. Curve B shows noise output versus input carrier level, and the difference between the two curves represents the signal-to-noise ratio. Note that at a carrier level of 100mV, noise modulation effects have increased the receiver noise figure by 35dB! These graphs are not often published by receiver manufacturers, but it would be enlightening if such results were available for some of the "2dB noise figure" vhf converters on the market.

Noise modulation effects are typically 10dB lower in valve circuits than in transistor circuits. Noise modulation also explains a familiar effect: if an unmodulated carrier is tuned in on an a.m. receiver, the noise output increases because of the generation of the component E_{cn}. Without the carrier, only E_{nn} can be heard.

Receiver selectivity

The main i.f. filter in current receivers normally has a bandwidth of 2·0–2·5kHz. This is ideal for ssb reception, but for modes such as rtty and cw narrower subsidiary filters can be used to improve signal-to-noise ratios. For rtty using frequency-shift keying, the optimum bandwidth varies from 1,200Hz for a 850Hz shift to 500Hz for a 170Hz shift. For cw reception, the optimum bandwidth depends on transmission speed, and varies from 500Hz to below 100Hz. Variable bandwidth crystal filters can be made to cover this range at i.f. frequencies below about 2MHz. Audio filters are also useful, although bandwidth is not normally variable.

If a receiver has no rf amplifier and a single mixer, up to 100dB of i.f. gain is required to bring the weakest signals to a level suitable for product detection. Sabin [11] points out that if a high-gain i.f. strip has its selectivity concentrated in a single input filter, the wideband noise generated in the first i.f. amplifier will normally be audible as a high-pitched hiss at the receiver output. He treats the problem with a second selective filter rather than an audio filter to obtain a 3dB advantage in signal-to-noise ratio. The author has found it more economical to use several half-lattice crystal filters, distributed along the i.f. chain in such a way that i.f. amplifier noise is inaudible, yet large-signal effects do not occur in the early i.f. stages. This has the further advantage of great flexibility in i.f. filter design.

The local oscillator

The advantages of double-conversion receivers were two-fold. A high first i.f. is used for good image rejection, and a low second i.f. for inexpensive selectivity. These considerations are no longer significant, as good high-frequency crystal filters are readily available. Secondly, good frequency stability is achieved by the use of a crystal-controlled first conversion oscillator, and a low-frequency tunable second oscillator operating over a fixed range.

In a single-conversion amateur band receiver, one local oscillator source is required to tune parts of the frequency spectrum between about 3MHz and 35MHz. There are four approaches to the problem, with varying degrees of stability, complexity and cost. These are:

(*a*) A band-switched tunable LC oscillator. This technique is used in most low-cost single-conversion receivers, and lacks frequency stability, especially on the hf bands;

(*b*) A "crystal-mixer" vfo. This has the potential stability of a double-conversion design, but is liable to generate spurious responses;

(*c*) A phase-locked frequency synthesizer. A relatively unstable band-switched LC oscillator is phase-locked to a stable low-frequency vfo, using a crystal oscillator to translate one frequency to the other for comparison. This has the stability of method (*b*) and the advantage of method (*a*) that only one oscillator is connected directly to the receiver mixer. Spurious responses are therefore minimal and under control;

(*d*) A digital frequency synthesizer. The cost of full frequency synthesis is falling with the price of integrated circuits, but is still higher than method (*c*). Digital frequency synthesizers have crystal oscillator stability and compatibility with simple Nixie tube displays, but amateurs have not yet come to terms with tuning receivers in discrete steps.

References

[1] *Radio Communication Handbook*, RSGB (1968), p. 10.104.

[2] *Design of low-noise transistor input circuits*, W. A. Rheinfelder, Iliffe (1964).

[3] "A new approach to receiver front-end design", W. K. Squires (W2PUL), *QST*, September 1963.

[4] "A pre-i.f. noise silencer", W. K. Squires (W2PUL), *QST*, October 1963.

[5] See *The Radio Amateurs Handbook*, 47th Edition, ARRL, 1970, p. 115.

[6] "What's wrong with our present receivers?", Byron Goodman (W1DX), *QST*, January 1957.

[7] English translation in *Radio Engineering*, Vol. 18, No. 2, 1963.

[8] "Phase-stable oscillators for space communications, including the relationship between the phase noise, the spectrum, the short-term stability, and the Q of the oscillator", L. R. Malling, *Proc IRE*, July 1962.

[9] "Noise in oscillators", W. A. Edson, *Proc IRE*, August 1960.

[10] "Oscillator noise and its effect on receiver performance", B. Priestley (G3JGO), *Radio Communication*, July 1970.

[11] "The solid state receiver", W. Sabin (W0IYH), *QST*, July 1970.

To be continued

A higher-power tripler-amplifier for 70cm

by L. L. Williams, G8AVX*

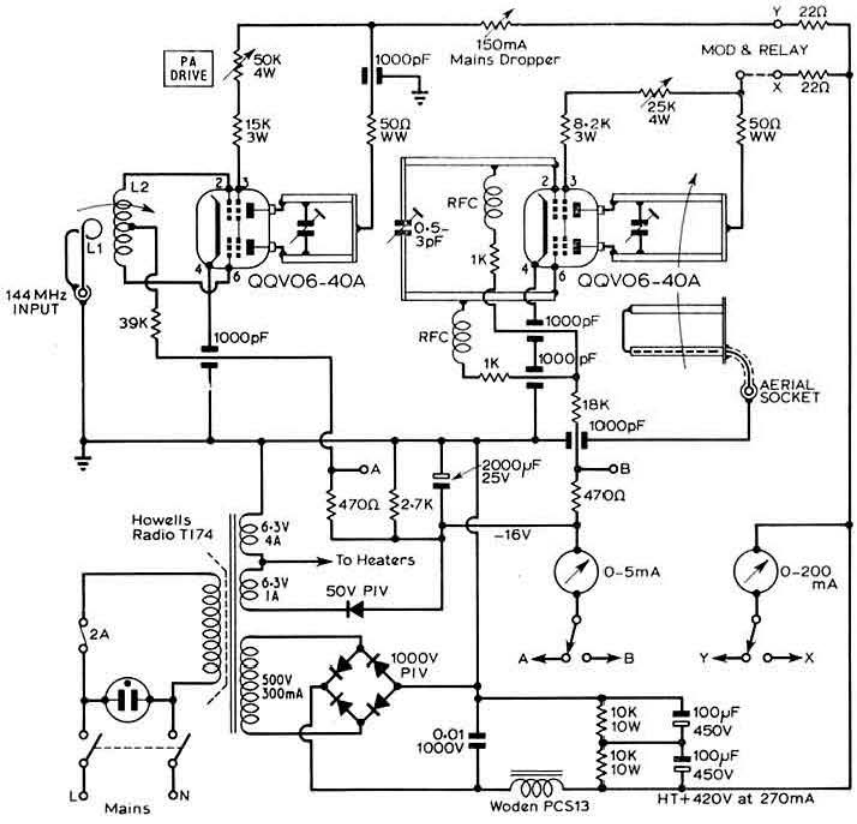

Fig 1. Circuit of complete unit

In this tripler-amplifier, QQV06-40A valves are used both as tripler and amplifier in place of the lower power QQV03-20A, thus enabling a significant increase of power output to be achieved.

The design is basically the same as that illustrated in the *Radio Communication Handbook*, but with the larger valves the power amplifier operates at an input of about 60W. It includes different methods of tuning the anode circuits of both stages, together with an improved and adjustable output coupling.

The circuit of the complete unit is shown in Fig 1, from which it will be seen that the amplifier anode circuit has been changed from a half-wave to a quarter-wave tuned circuit. The tuning of this circuit, as can be seen from the rear view illustration, is by dielectric.

The amplifier grid circuit is tuned by a 0·5—3pF capacitor in place of the 2—8pF originally used and which is too large for the increased input capacitance of the QQV06-40A.

The anode circuit of the tripler is tuned by a "U-shaped paddle" around the valve envelope, increasing the anode to anode capacitance.

The rf chokes for feeding both anode circuits have been replaced by 50Ω wire-wound resistors which are more effective.

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The screens of both stages are each fed through variable resistors, to set the input power; the resistor feeding the tripler effectively operates as a drive control to the amplifier. The amplifier grid current should be set to 3mA with the bias provided in the circuit.

It will be found that the anode current to the tripler to give this input to the amplifier will be between 85 and 130mA dependent on the performance of the valve used.

The input to the amplifier at 400V is adjusted to 150mA at resonance by means of the variable screen resistor and loading.

Construction

As is shown in the illustrations, the tripler-amplifier circuit is completely screened and the power supply components are fitted between the front panel and the tripler-amplifier compartment.

The tuning control shafts for the tripler and amplifier are brought out to the front panel and the output coupling control is accessible from the back.

The "U-shaped paddle" used for tuning the tripler anode circuit consists of a piece of copper or brass §in wide bent to form a U-shape slightly larger than the valve bulb diameter. This is fixed at its centre to an insulator block,

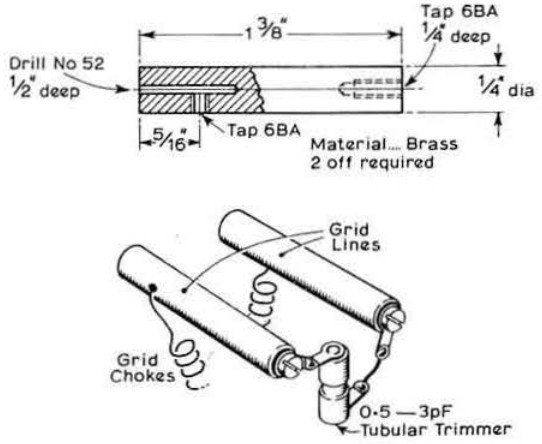
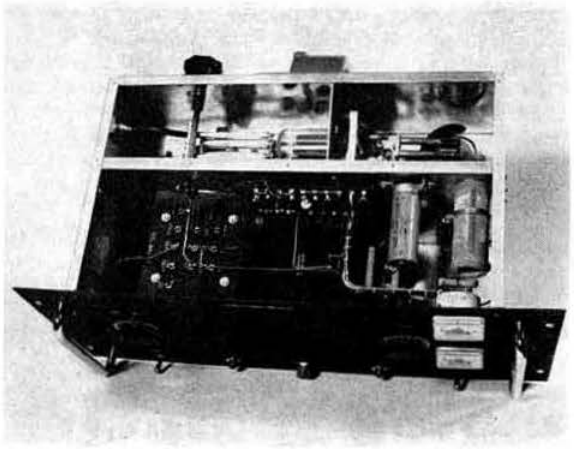
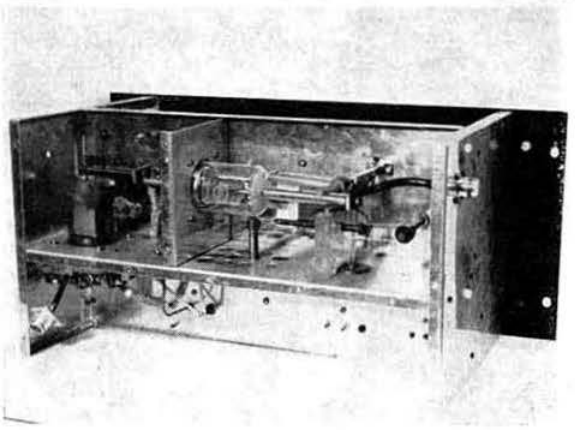


Fig 1. (a) PA grid line detail. Due to the much higher input capacitance of the QQV06-40A compared to a QQV03-20A the 2-8pF trimmer specified in the *Handbook* is not suitable and a 0·5-3pF trimmer must be substituted



Top view



Rear panel removed to show detail of lines

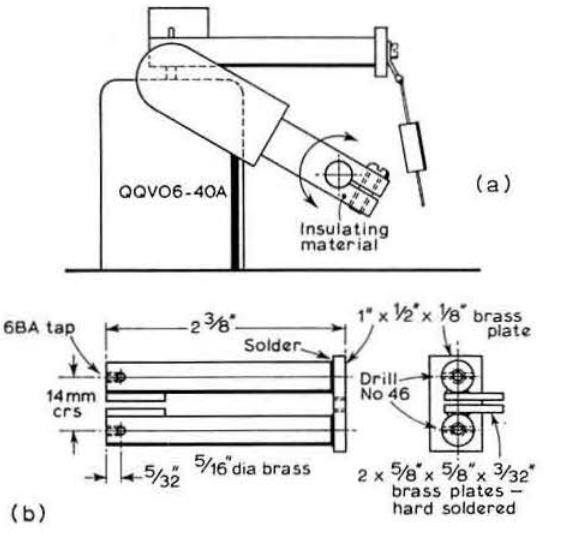


Fig 2. (a) Arrangement of QQV06-40A tripler anode lines and tuner. (b) Tuner construction

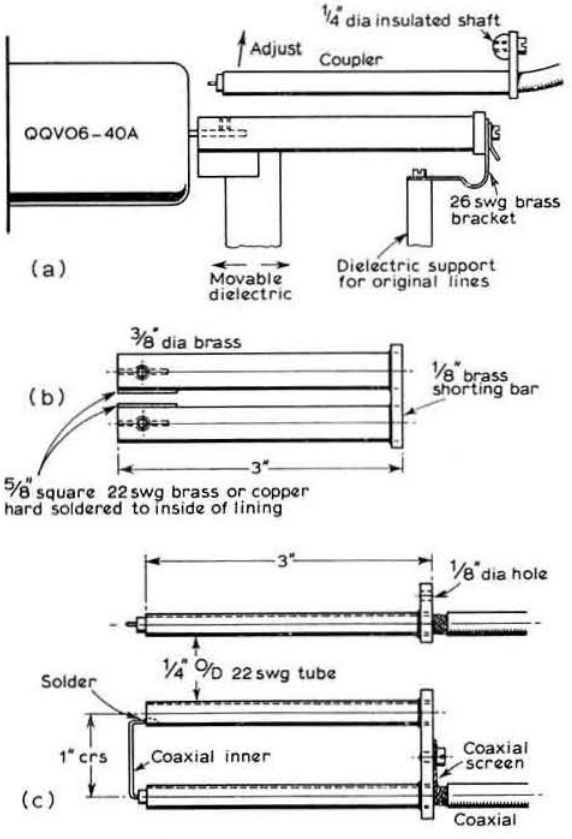


Fig 3. (a) Arrangement of amplifier anode lines and coupler. (b) Shortened anode lines for QQV06-40A. (c) Balanced coupler detail

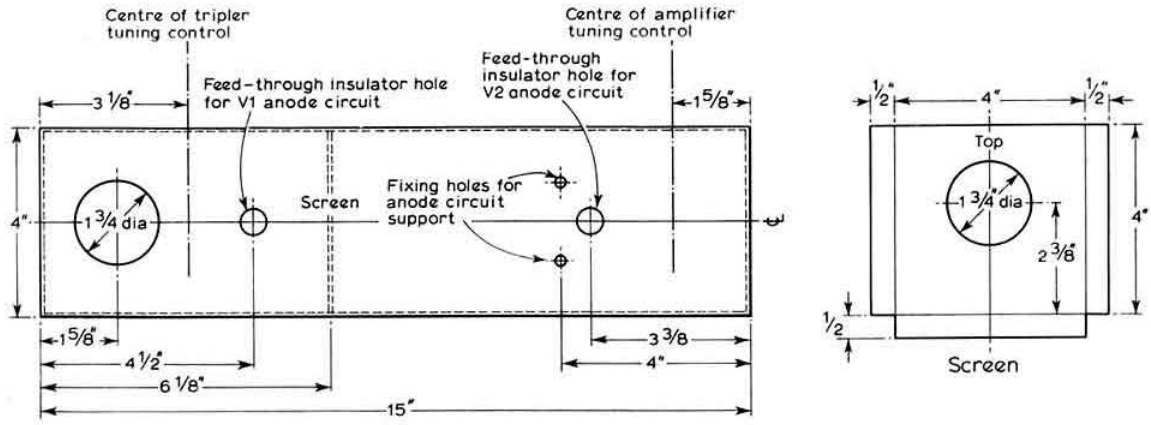


Fig 4. Chassis layout

suitably drilled for attaching to the tuning control (see Fig 2). It should be noted that this control has a limited range and the actual position of the anode lines on the valve anode pins is used to set the centre of the range required.

Fig 2 gives details of the tripler anode lines and tuner.

The amplifier tuning as mentioned earlier is by dielectric, a plate of $\frac{1}{8}$in PTFE is fixed to a rod which is positioned by a hole in the mounting block supporting the anode lines. This PTFE plate is arranged to pass between the flags soldered to the anode lines; its actual position is determined by the frequency required.

Control of the position of the PTFE plate is by use of standard dial cord and spring and suitable pulleys. (see rear view illustration).

Details of the anode lines and output coupling are given in Fig 3.

The fixing bracket of the anode line should be bent to allow for expansion, the corner should be well rounded or preferably a small double bend, as indicated in Fig 3.

When running the amplifier at 60W input in an enclosed screen it is desirable to provide some cooling, and a small blower is attached to the rear panel of the enclosure. A number of ventilating holes are made in the base plate of the amplifier screen and these are located directly under the valve, with the air flow from below.

Chassis details are shown in Fig 4. Note, only the major items are given, such detail as fixing holes for the screen or valve sockets are left to the constructor.

A switched noise source and noise factor comparator

by H. L. GIBSON, MIEE, G8CGA*

THE diode noise source using a saturated thermionic diode is well known for the measurement of noise factor. It suffers from the disadvantage that the measurement is rather tedious to make and has to be repeated many times as a converter is brought to optimum noise performance. The instrument to be described uses a noise diode in a standard arrangement and can be used to measure accurate values of noise factor. In addition, the diode may be supplied from an ac ht source so that pulses of noise are produced on alternate half cycles of mains frequency. An indicator unit takes the audio output from the receiver, rectifies it to produce positive-going pulses which are supplied to a diode switching arrangement operating at mains frequency which in turn supplies two voltmeters. One voltmeter indicates the noise output of the receiver when the mains supply is positive and hence the noise diode is passing current and producing noise, while the other voltmeter shows the receiver output on the negative mains half cycle when the noise diode, having negative anode voltage, is cut off. With the noise diode filament temperature set to an arbitrary value, it is then only necessary to adjust the converter for the maximum difference between the two meter readings to reach a condition of optimum noise performance. As the gain of the converter will vary during the adjustment, it is convenient to adjust the receiver gain control to keep the "receiver noise only" meter at a constant reading, so that the "receiver noise plus

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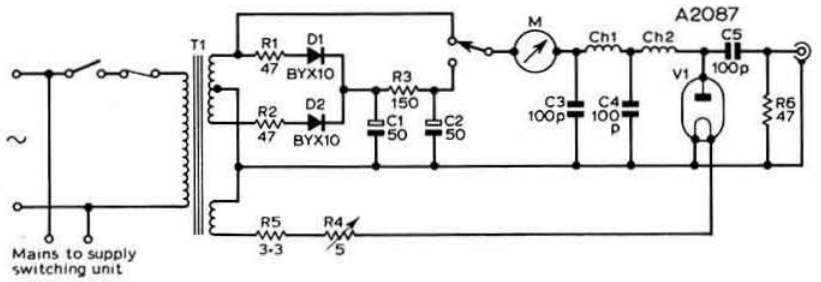

Fig 1. T1: Radiospares midget mains, secondaries 125-0-125V 50mA 6·3V 1·2A. D1, D2: BYX10. R1, R2: 47Ω ½W. R3: 150Ω ½W. R4: 5Ω. R5: 3·3Ω. R6: 47Ω HS (75Ω if required). C1, C2: 50μF. C3, C4, C5: 100pF Erie type A. Ch1, Ch2: Painton 2·2μH (resonant frequency 164MHz) (PartNo 58/10/0007/10). M: 25mA FSD. (a second range of, say, 5mA would be useful). V1: A2087.

noise generator" meter merely has to reach a maximum deflection to indicate optimum noise factor. It may be necessary to reduce the diode filament temperature if the difference between the two meter readings becomes too great.

Having reached optimum, the noise factor can be measured by switching the noise diode to the dc anode supply and turning off the switching when both meters will read substantially the same and may be used as output indicators. As neither the receiver nor the indicators are likely to be linear, the three-reading method should be adopted in which the receiver gain is set to give a reference noise output; the noise diode turned on to substantially increase this level (diode current I_1); the receiver gain reduced to give the original output, and the diode current increased (I_2) to restore the higher level of output.

$$\text{Then NF(dB)} = 10 \log_{10} \frac{20\ I_1^2\ R}{I_2 - 2I_1}$$

where R is the noise generator load impedance.

Construction

The noise generator is built into a deep cast box 7½in by 4½in by 3in and the circuit is shown in Fig 1. The layout of the mains components is quite unimportant but the noise diode itself should be located so that all leads can be kept very short. The prototype was intended for use in the 2m band and the chokes supplying ht to the anode were chosen to be resonant above that frequency. If the noise source is intended to cover a number of frequencies the anode filter chokes should be carefully considered as they and the diode capacitance appear in shunt with the load resistor. The dc ht voltage to the diode is not critical but a value of 190V is used. The switch S1 transfers the diode anode to an ac voltage derived from one half of the ht transformer (140Vrms).

The switching unit is housed in a box of similar area but only 2in deep and is mounted on the lid. The circuit is shown in Fig 2 and all the components except the meter and transformer are mounted on a piece of 0·15in metric Veroboard 2½in by 1½in. If it were considered extravagant to tie up two fairly sensitive meters, jack sockets could be provided for external meters in which case the unit could probably be mounted in a smaller sized box. An alternative would be to mount the diode supply components and the switching unit in one box with the noise generator as a separate "head".

Operation of the switching unit

The audio output from the receiver taken from the headphone jack is rectified by D1 and the positive-going pulses passed through the blocking capacitors C1 and C2 to the diodes D3 and D4. In the absence of a mains input to the transformer, these pulses are passed on to the two high resistance voltmeters formed by M1 and M2 with their series resistors R1 and R2. If, however, ac mains are applied to the transformer, when end X of the secondary is positive D5 conducts and only the small offset voltage of about 0·5V appears between point X and earth. This voltage is used to forward bias D3. The full rectified output from the secondary is developed across R3 thus reverse biasing D4 and cutting it off. Thus only M1 reads during this half cycle. On the alternative half cycle the opposite conditions apply and D3 is cut off while D4 is forward biased. Since the noise diode only draws anode current during one half cycle, the meter which operates during that half cycle will show the increased output due to the noise source.

When the switching ac voltage is applied, both meters will show a small deflection typically of 1/10 of fsd. This is no disadvantage provided that the receiver output is sufficient to raise the reading significantly above the standing value.

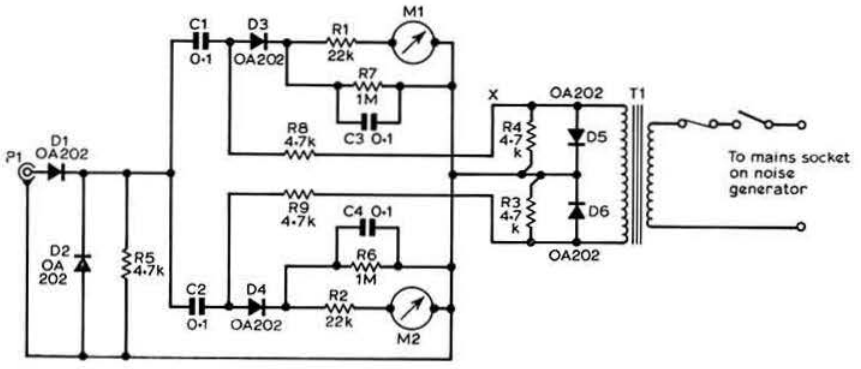

Fig 2. P1: Belling Lee socket. D1-6: OA202. R1, R2: 22kΩ. R3, R4, R5, R8, R9: 4·7kΩ. R6, R7: 1MΩ. C1-4: 0·1μF. T1: Radiospares miniature mains 12V (only one secondary used) 12V 3VA. M1, M2: 50μA FSD.

TECHNICAL TOPICS

A monthly feature by PAT HAWKER, G3VA

IT IS sometimes said that amateur radio has become almost entirely subdivided, with each of the main interest groups concerned only with its own sector of communication. The ssb man scoffs at "ancient modulation"; the vhf man at those who enjoy working on the "dc bands"; the cw operator has no time for the "donald ducks" and "taxi-cab natterers"; or the "homebrewers" for the "appliance" users. This rivalry has its good as well as its bad points, but there is a real danger of playing, in this way, into the hands of those who for various reasons are not friends of amateur radio—"divide and conquer" and all that. So, whatever our own particular operating interests may be at a given time, it is surely up to all of us to try and keep reasonably well in touch with the ideas and aspirations of the broad sweep of amateur activities.

This month we feel that we have unearthed a reasonably interesting mixture of the theoretical and strictly practical, including circuits and ideas which could be useful to the hf and the vhf man, the phone man and the dyed-in-the-wool cw addict. One aims at this, of course, every month, but sometimes the cards seem stacked one way or another, and it is difficult to keep one's own interests and prejudices from colouring the selection of material. Anyway, here goes!

Dual-gate mosfet harmonic oscillator

One of the traditional crystal oscillators which have remained popular over many decades has been the twin-triode oscillator/doubler arrangement, often known as the Jones oscillator. A novel and up-to-date adaptation of this circuit has been described by Ch. Baud, F8CV in "Oscillateur Jones a transistor" (*Radio-REF* December 1970). This is based on the use of any of the usual dual-gate mosfet devices such as the 3N140, 3N141, 40602, 40604 etc: see Fig 1. In effect one section of the device is working as the crystal oscillator, the other as a harmonic multiplier. One of the many possible uses of this arrangement would be to obtain 24MHz output, for vhf applications, from an 8 or 6MHz crystal.

Compensated gdo

In *Break-In* (September 1970), Bert Shuttleworth, ZL4IO, suggests that a few small additions to a simple 3–150MHz transistorized grid-dip oscillator can result in worthwhile improvements, reducing any tendency for a simple unit to show reluctance to dip at some points in the range or to show wide differences in meter scale indications. This is achieved by operating the oscillator in a compensated or stabilized condition: Fig 2. The oscillator output is rectified across the base-emitter circuit of the meter amplifier, with the resultant dc connected through a compensating diode back to the oscillator stage in the form of bias. At frequencies at which the oscillator may tend to produce greater output, an effective reduction in forward bias occurs, so that the output is roughly stabilized.

ZL4IO suggests that the only critical component in the circuit is the 15pF capacitor between oscillator base and collector; this value has to be adequate to provide sufficient feedback at the lowest frequency which the meter is to cover, consistent with reliable operation at the highest frequency. This means that different transistors may need a different value, depending on hf current gain, internal feedback capacitance, admittance phase angles and the like. He also points out that the unit can be fed from any supply voltage from 9 to 18, but that if a change is made from the suggested 12V the 10kΩ resistor in series with the 1mA meter may need to be reduced to 8·2kΩ or increased to 15kΩ for lower and higher supply voltages respectively.

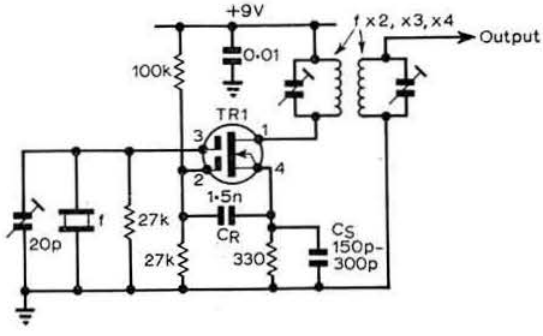

Fig 1. Mosfet harmonic oscillator suitable for use with FT243 crystals etc

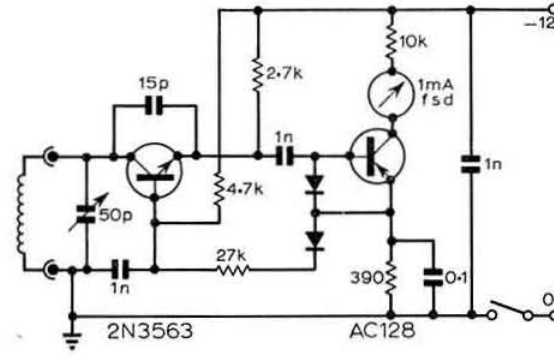

Fig 2. Dip oscillator with compensated scale. The diodes are germanium types

HF polarization gains and losses

On vhf it has long been recognized that significant coupling losses occur in communications systems when attempts are made to receive vertically-polarized signals with horizontally-polarized aerials, or vice versa. Indeed this problem has led recently to the use, for some BBC local radio stations, of slant polarization, and in the USA of circular polarization; it has been found that such techniques improve pick-up on portable receivers using small telescopic aerials and also by car radio aerials.

Yet a very different situation is commonly considered to apply to hf ionospheric operation. We confidently use receiving aerials of either polarization to receive signals transmitted with either polarization. In doing so we rely on the firmly rooted belief that during the sojourn of the signals in the ionosphere they get so mixed up that they can be safely regarded as randomly or circularly polarized when they emerge.

A few years ago a rather different concept took root, once again helped along by the work of a number of amateurs. This was the principle of polarization diversity, based on the discovery that fading seldom coincided in time if signals were received with two aerials of different polarization without the requirement of physical separation. For example, George Messenger, K6CT, did a lot of work on a simple form of polarization diversity using crossed-dipole Yagi beams (which were later marketed by the Space Raider Antenna Company) for 28MHz. He reported his work in a number of journals, including the *RSGB Bulletin* (December 1962). Possibly because this was a time when sunspot numbers were declining, so that 28MHz was at a low ebb, and because such crossed-dipole arrays would be difficult to make on the lower frequency bands, the technique did not immediately attract much attention among amateurs (though a re-read of the article shows how impressive were his results).

However, the idea of polarization diversity was taken up by commercial companies, and certainly Granger Associates (large log-periodic arrays) and Rohde & Schwarz (simpler ground-plane-type monopoles) promoted this technique, and I do not think anyone today would seriously question the basic principles. A detailed explanation of these was published, for example, in Granger Associates' *Technical Bulletin No. 4* "Polarization diversity reception of high frequency signals" issued about 1965.

True diversity reception (involving two receivers and some form of switched combining) must always be very much of a luxury in the amateur field, and most proposals have involved the rather less elegant system of combining signals before they reach the input of a single receiver; one exception was a simplified diversity combiner described by P. Lee, W3JM, "Diversity reception made easy" *CQ* (May 1964) involving two receivers, one connected to a vertical dipole and the other to a horizontal dipole.

But certainly all the work of amateurs and professionals indicated that fading could be significantly reduced in this way; the K6CT work also indicated that his crossed-dipole beams extended the time when 28MHz was effectively open, presumably the result of the low angle of radiation of the vertically-polarized Yagi.

A recent paper in *Proc IEE* (January 1971) by P. A. Bradley of RSRS includes many measurements made at Slough of hf signals from transmitters in the Shetlands (operated by, among others, R. Flavell, G3LTP) and some interesting comments about polarization of signals, though this was not the primary purpose of the experiments which were to investigate the accuracy of two commonly-used techniques for calculating path-loss of hf signals. The work involved simultaneous measurements on different frequencies (3·2, 5·9, 7·9 and 11·2MHz) over this 960km path of signals radiated from horizontal half-wave dipoles. The receiving aerials were a horizontal dipole broadside-on to the incoming signals, a second end-on to the signals, and the third a vertical monopole with a vertical response nearly constant for signals at angles from 5° to 50° to the horizon.

For our purposes, one of the interesting conclusions reached is that the results suggest that the downcoming waves were of *markedly elliptical polarization*, whereas the path-loss calculations assume that such signals are normally circularly polarized. It seems to me that this can be interpreted as confirming the value of being able to use both vertical and horizontal elements in any hf receiving (or transmitting) system even if one is not planning to attempt full polarization diversity. One notes, for example, the popularity of inverted-V dipoles (even though *QST* recently suggested that these have low-angle radiation only in a direction along the sloping ends), or the inverted-L as suggested in the February *TT* by G3VYF and G3CDR. The proportions of the G3CDR 3·5MHz aerial are such (25ft vertical, 42ft 8in horizontal) that very roughly half the radiation occurs in each section. By coincidence, just as the February issue was going through the press, I came across an article in *CQ* (December 1970) by the well-known *Radio Handbook* editor, William Orr, W6SAI, describing "an inexpensive utility antenna for 80 metres" with a configuration closely resembling that of G3CDR's quasi-vertical. While he commented that "old timers will scoff that this antenna is little more than a jazzed up version of the old Marconi", it seems well worth including his arrangement (Fig 3) which has no ferrite matching transformer but simply a series capacitor ("a bit of juggling with this value can move the resonant frequency several hundred kilohertz across the American 3·5MHz band"). And instead of the multiple earth spikes he runs out three 66ft insulated radials above ground. He does not propose this as a dx aerial but rather as giving good utility service out to a thousand miles or so. By disconnecting the series capacitor from the coaxial cable and inserting a two-turn coil from the capacitor down to the radials, the aerial can be adjusted to resonance by means of a dip oscillator.

But it does seem part of these general ideas that perhaps we should stop thinking that cross-polarization does not matter on hf and instead should start thinking more on how to take advantage of elliptical polarization and polarization diversity to avoid polarization coupling losses.

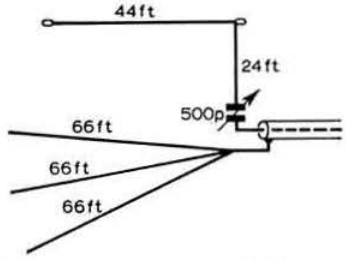

Fig 3. W6SAI's utility aerial for 3·5MHz

LA1EI three-band vertical

I make no pretence of understanding the Norwegian text of an article by Petter Braekken, LA1EI, in the NRRL journal *Amator Radio* (Nr 9 1970) but his final diagram is reproduced here as Fig 4. This represents what appears to be a useful $\frac{5}{8}\lambda$ vertical monopole for 14MHz with ingenious use of RG8U coaxial matching sections to allow the same vertical to be used on 3·5 and 7MHz, and with a gamma-matching feed on 3·5MHz. It would seem that excellent matching can be achieved on 14 and 3·5MHz, with very usable results also on 7MHz.

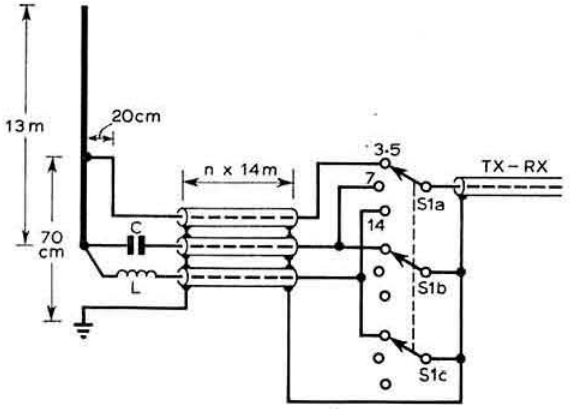

Fig 4. LA1EI's three-band vertical. C about 88pF. L about 2·8μH. If n is an odd number, then impedances are 3·5MHz 75Ω, 7MHz 140Ω, 14MHz 75Ω. If n is an even number, then impedance is 3·5MHz 75Ω, 7MHz is 34Ω, 14MHz is 75Ω

FET attenuator

In the past we have referred to several types of diode attenuators (and will be getting round to them again in the next section) and have shown a number of arrangements suitable for use ahead of a receiver to reduce cross-modulation effects or overloading. A simple alternative technique for this (and other) application is outlined in *CQ* (December 1970) by J. J. Schultz, W2EEY.

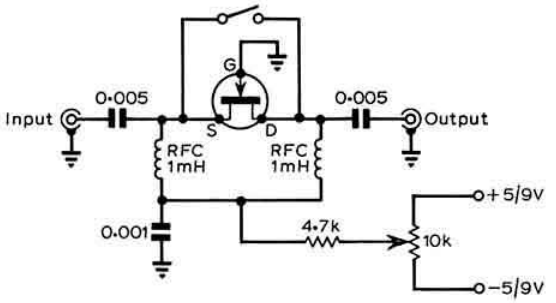

Fig 5. FET rf attenuator

This attenuator (Fig 5) is based on a single fet and is claimed to have a range of from several decibels to about 50dB controlled by a potentiometer. Because of the minimum loss of this system a switch is included to put the signal straight through; this can conveniently be a switch on the control potentiometer. Apart from the arrangement of Fig 5, W2EEY also provides a modified circuit intended to allow the potentiometer/switch to be located remotely from the input circuit. This same form of fet attenuator can be used for many other applications, including remote control of audio gain.

Diode gain control

The use of a diode attenuator for remote gain control of an audio amplifier has been described recently in *Techlink* No 739 apparently based on work at the Royal Armament Research and Development Establishment. The basic circuit is shown in Fig 6(a), the attenuator consisting of the resistor R in series with the diode. The value of the ac resistance of the diode is varied by changing the dc current flowing through the diode, so that in effect one has variable volume control. The ac resistance of the diode can thus be changed from a remote dc potentiometer. The capacitor C, near the attenuator, eliminates noise picked up on the control cable. Because of the non-linearity of the diode, a degree of signal distortion may be involved but this can be kept to low limits if the attenuator is situated towards the front of a high gain amplifier. A practical circuit given in the *Techlink* uses a transistor rather than a diode as the control element, with the collector held at 0·7V by means of a silicon diode. This is claimed to allow the gain of the four-transistor amplifier to be varied between 60 and 1,600: the vital part of this circuit is shown in Fig 6(b).

Integrated-circuit audio filters

In *TT* (May 1970) some ideas were given on using integrated circuits to make audio filters, including an arrangement from *Handbook on RC Active Networks*, drawn to our attention by

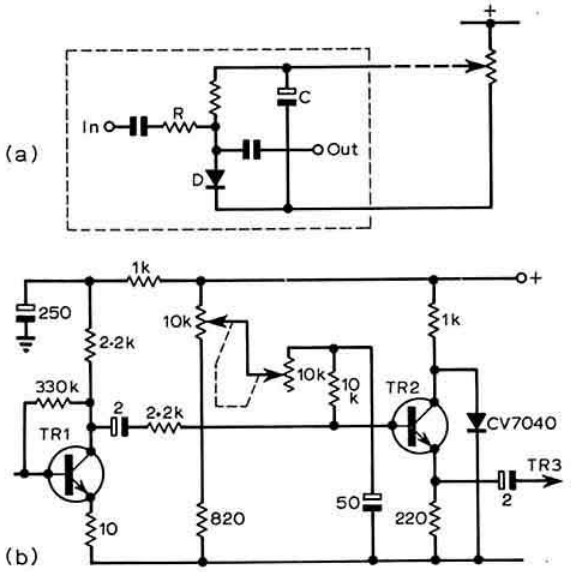

Fig 6. (a) Basic arrangement for using diode as voltage variable resistor. (b) Part of an amplifier in which TR2 is used as voltage variable resistor (all transistors type 2N3933)

Bob Whelan, GW3PJT. It was then noted that the possibility existed of varying the centre frequency of the filter by means of a two-gang potentiometer. One of those who took up the challenge offered by this circuit was John Rabson, G3PAI. As a result he has recently published a detailed analysis of the basic circuit and various modifications in *Drain and Source* (December 1970), the newsletter of the University of Essex Radio Society, edited by R. A. Gape, G8DQX. It is not intended here to reprint this analysis but merely to reproduce the circuit as he finally developed it: see Fig 7. This represents a practical variable bandwidth, variable centre frequency active filter, each control being in the form of a dual-gang potentiometer. This filter looks very promising for cw operation and possibly of use also in the lower-Q settings for ssb reception. It is all based on the popular 709 operational amplifier ic, widely available at low cost. G3PAI suggests that the circuit as shown is suitable for centre frequencies from about 300 to 3,000Hz. If for any reason you want to extend this up to about 10kHz, the type 741 operational amplifier would be more suitable (depending on the maximum value of Q required) and this device is even less likely to be unstable than the 709.

G3PAI also notes that "if you can tame it, there is no reason why in principle the circuit should not be used at frequencies up to 2MHz with the type 702 device, assuming that internal phase-shift effects are allowed for". This presumably would offer possibilities for providing a variable i.f. amplifier. For the circuit shown, Rc should be adjusted experimentally to compensate for the finite output impedance of the 709 and tracking errors in the 5kΩ dual-pot. G3PAI indicates that a value of 27Ω can provide a useful starting point.

An alternative audio filter, also based on an ic operational amplifier, has been developed by Sim Weir, GM3SAN: Fig 8. This has proved its value even on an FT DX500 fitted with a good 400Hz filter and also, of course, on transceivers fitted only with a 2·4kHz ssb filter. GM3SAN writes:

With S1 opened the μA702A operational amplifier functions as a normal pre-amplifier between the headphone jack and a pair of low-impedance headphones. To develop a specific frequency response characteristic, the feedback path

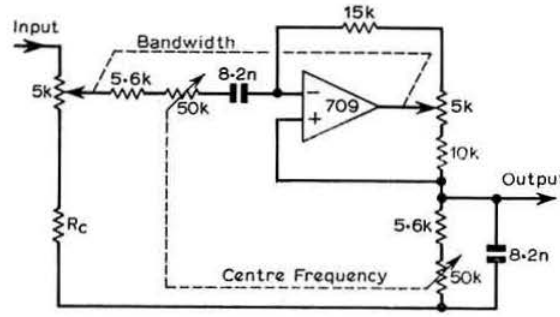

Fig 7. G3PAI's bandpass active filter using single integrated circuit. For additional connections to the operational amplifier see *TT* May 1970

includes a twin-T frequency selective network. This is a rejection filter with a high impedance at its characteristic frequency; this means that the feedback is minimum at this frequency, with gain of the amplifier maximum. RV1 functions as a bandwidth control, and with a 50K pot the bandwidth can be varied from about 15Hz to 200Hz as measured on a home-built digital frequency meter. A greater range of control could be achieved by increasing the value of RV1 without affecting the minimum bandwidth which will depend on the degree of component matching in the twin-T network.

The series RC network on pin 6 of the ic should not be omitted as this is required for frequency compensation. Equally important, says GM3SAN, is power supply by-passing, as positive feedback through excessive impedance in the supply can cause oscillation at very high frequencies; by-passing the power supplies immediately adjacent to the lead-out wires on the ic with 0·01μF low-inductance capacitors should eliminate any tendency to this type of instability. He mentions that although he has not tried using a type 709 device there is no reason why this should not work equally well though it has different connections and requires different frequency compensation components. A type 702A is not capable of supplying the current required to operate 8Ω headphones so a 2N708 transistor amplifier is added, and the arrangement shown proved the best compromise between simplicity, power output and battery consumption; it can provide more than adequate audio for modern 8Ω headphones. Total consumption is under 20mA from two PP9 batteries or a small ac supply using the bridge rectifier, zener splitting technique shown in *TT* (April 1970). In either case the total voltage between pins 4 and 8 of the ic should not exceed 21V. The T/T4 transformer is made by Radiospares (available from Henry's).

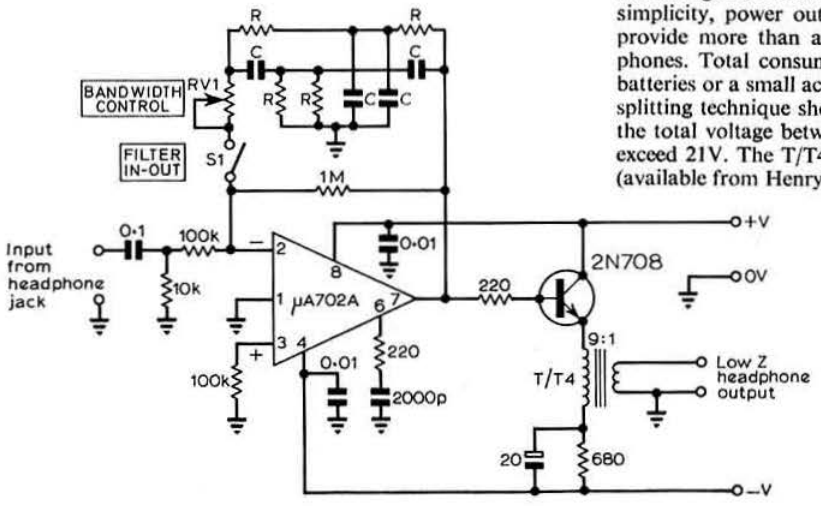

Fig 8. GM3SAN's bandpass cw filter. For a centre frequency of 740Hz, R is 4·7kΩ and C is 0·047μF. For any other frequency, f is 1/(2π RC). When RV1 is 50kΩ bandwidth variable from about 15 to 200Hz

IC Wien bridge oscillator

As indicated in the preceding paragraphs, the uses for integrated-circuit operational amplifiers are becoming more and more evident. In case readers are still puzzled as to exactly what the term "operational amplifier" means, the following notes may help strip some of the mystery away from this vogue term.

The term originally came into general use to define the types of amplifier used to perform mathematical operations in analogue computers—summation, integration, differentiation, etc—all of which were achieved with a basic building-block amplifier by varying the feedback networks. The main requirements for such amplifiers were high voltage gain, high input impedance, low drift, and good stability under various feedback conditions. Since it may be required to use substantial feedback, the output impedance is normally low; another requirement is low noise factor.

Not surprisingly, as such "operational amplifiers" were developed as compact modules, and later in the form of integrated circuits, it was soon found that amplifiers with all these in-built characteristics could be pressed into service for many different purposes. The amateur can thus think of the "operational amplifier" as just a convenient packaged amplifier with a gain which can be varied by adjusting the degree of feedback.

One further example of the way they can be used is the low-cost Wien bridge audio oscillator suggested recently by P. C. Lipoma in *Electronics* (18 January 1971): Fig 9. It is claimed that this unit, providing stable, low-distortion audio tone at frequencies between 1Hz and 100kHz, can be built for a total cost under $5. The frequency is determined by the value of the two fixed capacitors, C1, C2 (typically 0·033μF for 1kHz), and a complete generator could be built simply by incorporating a series of switched pairs of capacitors. The unit can drive 8 or 10Ω loads, providing an output of from about 2 to 8V peak-to-peak across a 10Ω load; harmonic distortion is given as less than 0·5 per cent over the range. The small lamp provides automatic gain control and it will be necessary to determine a suitable British bulb. Unfortunately we have not found the characteristics of an American No 80 bulb listed in the usual references. The output can be varied over a certain range by changing the value of R3.

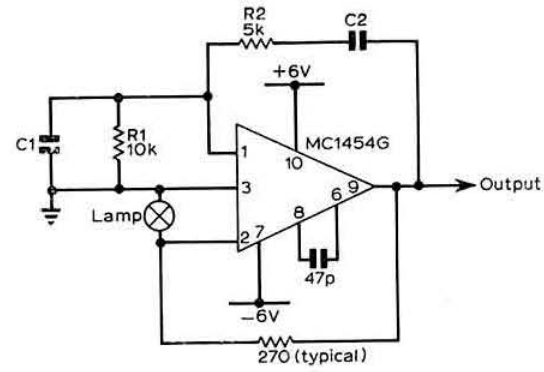

Fig 9. Single-stage Wien bridge oscillator provides stable frequencies from 1Hz to 100kHz across loads as small as 8Ω. Frequency depends on C1, C2 non-polarized capacitors: 1Hz 33μF; 100Hz 0·33μF; 500Hz 0·065μF; 1kHz 0·033μF; 10kHz 3,300 pF; 50kHz 650pF; 100kHz 330pF. Lamp is listed as type 80 (Lamps Inc of Gardena, California)

Diode-switching supply protection

The problem of power supplies that can easily be damaged by a short circuit or heavy overload is well known. Another of the ZL4IO series of circuits using diodes (*Break-In*, September 1970) is shown in Fig 10. This not only overcomes the problems set out above but also protects the circuit being powered from the effects of a sudden runaway of current. No indication is given by ZL4IO of the supply voltage up to which this circuit can be used (dependent upon the voltage rating of the transistor) but it would presumably be suitable for most supplies intended for use with transistors and integrated circuits.

So long as the current flowing through R is such that the transistor emitter voltage is less than 0·5V lower than the voltage on the base, the transistor is in a saturated condition and offers low resistance to the supply. But as current flow increases, the diode begins to lose its forward bias, thus restricting base current and raising the internal resistance of the transistor. ZL4IO indicates that if R is 100Ω then 5mA of load current represents a drop of 0·5V and hence the threshold of current limiting; should a short-circuit or low resistance appear across the output of the supply then the maximum current will be limited to the balancing effect of the emitter-base voltage across the now high internal resistance between emitter and collector. As a result the current flattens out at about 6·5 or 7mA. Similarly, if R is 10Ω, the threshold current would be 50mA, and with 1Ω about 500mA. If R is a wirewound variable resistor it can be calibrated for setting to the required current limiting threshold.

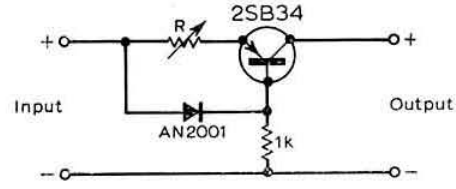

Fig 10. Short-circuit and overload protector

Sensitive meter protection

It is well known that placing a diode across a milliammeter can form useful overload protection for the meter movement. Unfortunately, this simple technique is useless for the protection of microammeters since the safe voltage drop across the meter is often below that required for diode conduction. The arrangement shown in Fig 11 has been suggested by Paul Krueger in *Electronic Design* (22 November 1970) to limit the current through any meter to a safe, predetermined value.

A transistor is connected so that meter current flows through the collector circuit. Maximum base current is established by the 1·5V battery and the resistor R. This resistor is chosen so that the maximum collector current is about 1·5 to 2 times the full-scale meter current, a value almost any meter will stand. The resistor value shown

(1·2MΩ) is a nominal value for a 20μA meter and should be changed for other movements. Also, since there may be wide variation in beta for low-cost transistors, the system should be checked by finding the maximum current which can flow. But a little trouble should make the user much more confident in the safety of an expensive meter.

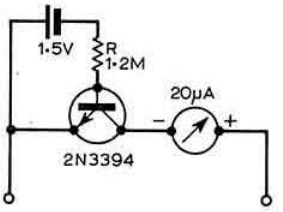

Fig 11. Current limiting protection for sensitive meter protection. Circuit can be made suitable for any meter by changing the value of R

Class D ssb transmitters?

In the past (see *ART2* and *3*) we have drawn attention to the use of Class D (switched mode) amplifiers not only for audio amplifiers based on pulse-width modulation techniques but also for rf power amplifiers. It was noted that for linear rf amplifiers the high switching speeds would impose severe frequency limitations, and that most of the work on rf power amplifiers used the much simpler systems involving only a change in the biasing arrangements of push-pull amplifiers. A transmitter based on these principles was later described in the *Bull*, but this type of amplifier is unsuitable for ssb.

Recently a Mullard press announcement indicated that Brian Attwood of the Mullard Central Application Laboratory at Mitcham has been developing linear Class-D amplifiers using similar pulse-width-modulation in connection with high-speed switching stages basically similar to that used for the high-quality audio amplifiers which he has also been working on (and capable of distortion as low as 0·03 per cent).

He has already developed experimental linear amplifiers suitable for frequencies up to 2MHz with efficiencies up to 90 per cent instead of the 50 per cent or so of conventional ssb amplifiers, and patents have been granted on this work.

This looks like quite an exciting development, clearly aimed at military ssb packsets and the like where the extra power efficiency would be very useful. I spoke to Brian Attwood to see whether he felt that this technique could readily be applied in the near future to amateur equipment, for instance for Top Band. He was anxious not to hold out false hopes, as he clearly felt that initial implementation is almost certain to be in the professional field. This is primarily because of the very high switching speeds needed, calling for the development of specialized transistors if the frequency limitations are to be overcome, though he mentions that some power devices with F_T up to 1,300MHz have appeared. The switching speed needs to be at least twice, and preferably five times, the carrier frequency to ensure that the carrier can be adequately reconstructed and radiated; on the other hand he already foresees integrated-circuit analogue/digital converters for audio applications. His experimental circuits have handled frequencies up to 2MHz and standard two-tone tests showed them to have intermodulation product levels of —36dB.

In general, Class D continues to offer scope for experimental work; a recent development has been the appearance of yet a further related class of amplifier: Class BD (see *Electronics Letters*, 31 December 1970).

Pulsed uhf generators

In September 1970 we drew attention to the "poor man's Trapatt oscillator" making use of the unexpected property of low cost Fairchild FD300 power rectifier diodes to oscillate in pulse modes at uhf. In doing so we managed to scoop by several months *Electronics* which, in its 21 December 1970 issue, made a major news story from the fact thaf 40-cent devices could show outputs of hundreds of watts ot uhf power. To be fair, *Electronics* carried the story beyond the stage revealed in *Proc IEEE* (January 1970) which was our source. Workers at the Lincoln Laboratory have been able to make groups of three paralleled FD300 diodes in coaxial mounts achieve repeatable 395W, 0·2μs pulses at 570MHz with the efficiency "a surprising 75 per cent". The diodes have to be operated in a short-pulsed mode to avoid overheating. But the story notes that "the simple rectifier diodes in your hifi set could be uhf Trapatt oscillators in disguise—or perhaps something even better".

Here and there

Barry Priestley, G3JGO, points out that there are some problems as well as some advantages in the cross-coupled mixer configuration (*TT* January). The arrangement has a tendency to instability; more serious is that although the circuit is, as stated, balanced in respect of both signal and oscillator frequencies, it tends to act as a good doubler, so that harmonics of both these frequencies tend to be present in some strength in the output. Despite these misgivings he agrees it is a useful circuit to get to know.

He also notes that, far from tvi now being solved, recent polls conducted at Maidenhead and St Albans show that the majority of active amateurs in fringe areas still suffer from tvi on many bands. The Maidenhead amateurs reported most trouble on 14 and 21MHz (four out of six users still having trouble on these bands); rather surprisingly, less trouble was reported from 7MHz operation than from 1·8 or 3·5MHz.

Nostalgia corner 2

Someone else with a long memory is Jim MacIntosh, of GM3IAA and the aerial-enshrined VS1AA, who, prompted by the October item on Beverage aerials, recalls using a very, very long aerial near Ismailia in 1917 and then called a "Beveridge" (almost certainly a corruption of Beverage since, although not described until 1923, his aerial had been developed some years before). He also recalls a massive aerial which used as its support the top of the Pyramid of Cheops, near Mena, Egypt. This was a *four-wire* aerial with spacers, the wires being a few inches apart in the form of a square. The pyramid is 451ft high and the aerial terminated in a tent well away from its base, and must have been well over 1,000ft long. It was the brain-child of the famous (then Lieutenant) T. L. Eckersley as part of an experiment intended to "balance-out" atmospherics or "Xs" . . . it failed completely in that respect but produced some fine signals, GM3IAA recalls, even on the crystal set, along with a fantastic amount of QRN.

Four and six metres—The Gibraltar story

by JOHN PATRICK, G3TWG/ZB2BO*

IN Gibraltar both the four and six metre bands are available for amateur use, and during the last four years both have been used extensively. This story began on four metres.

In 1966 vhf enthusiasts in Hampshire and Sussex began looking for somebody to set up a 70MHz beacon in Gibraltar. Alan Osborne, G3SLI/ZB2AP, volunteered, and in November of that year ZB2VHF, comprising a keyer, a 25W transmitter from the UK, a four-element J-Beam and receiving facilities, commenced transmitting on 70·26MHz. Its signals were received in the UK several times in the following months, but it was not until 2 June 1967 that the first two-way contact was achieved. Then came a bonanza—37 contacts that day and 34 the following, mostly on a.m. voice and many peaking over S9. "Ossie" went on to make 129 contacts that year with stations in England, Wales, Ireland and southern Scotland. By September 1970 the total has risen to over 800 contacts by four stations in Gibraltar.

Sporadic E

Almost all the 70MHz contacts between Gibraltar and the British Isles have been made by Sporadic E, which is the same mode of propagation as that which gives the "short skip" on the hf bands in summer. There are a number of varieties of Sporadic E, some found only near the equator, some in temperate latitudes, and Auroral E_s which only occurs near the magnetic poles. It consists of patches of intense ionization in the E layer of the ionosphere, 70 to 80 miles above the earth's surface, which may be only a few miles across and can move rapidly, generally from east to west. As with the hf bands, all frequencies below the maximum usable frequency are reflected and this enables some warning to be obtained by listening for broadcast stations or tv signals on frequencies lower than 70MHz, since these must open first. 70MHz may then follow quickly or there may be strong signals on 50MHz with nothing on 70MHz.

The muf for Es reaches 70MHz fairly often in summer while very occasional openings occur on 144MHz. The best time of year is from mid-May to early August. A second smaller peak occurs in mid-winter, but openings rarely extend above 50MHz. Isolated openings have been recorded outside these seasons.

Sporadic E can occur at any time of the day or night. In temperate latitudes the two most common times are from 0900 to 1400 and from 1600 to 2000 local time, but Auroral E_s is most common during the early part of the night. Openings may last only a few minutes or continue for several hours, but many of these long openings actually consist of a series of smaller openings. The maximum distance for a single hop is about 1,400 miles while the minimum at 70MHz is about 350 miles, but back-scatter has been noticed once or twice. Double-hop Sporadic E is quite often found on 50MHz but only very rarely on 70MHz.

For best results beacon stations are essential at one end of the path. In 1967 and 1968 the only beacon was ZB2VHF at Gibraltar, but in 1969 EI4RF and GB3SU came on the air from the northern end of the path, followed by GB3SX in 1970. In the latter year there was no continuous beacon at Gibraltar but ZB2BO used the keyer when openings seemed likely.

The BBC Channel 2 tv sound signals on 48·25MHz were monitored in 1969 and 1970 for warning of openings, and Channel 3 on 53·25MHz would also have been suitable. Too low a frequency gives too many false alarms while too high a frequency reduces warning time.

Equipment for Sporadic E reception

Complicated or expensive equipment is not needed to make use of Sporadic E. The high-power station obviously stands the best chance under marginal conditions, but there have been hundreds of contacts with low-power stations using a.m. The writer obtained 275 contacts with 10 to 20W of cw or a.m., an E88CC or fet converter and a four-element Yagi. CW can make all the difference under marginal conditions—there have been many low-power stations heard with

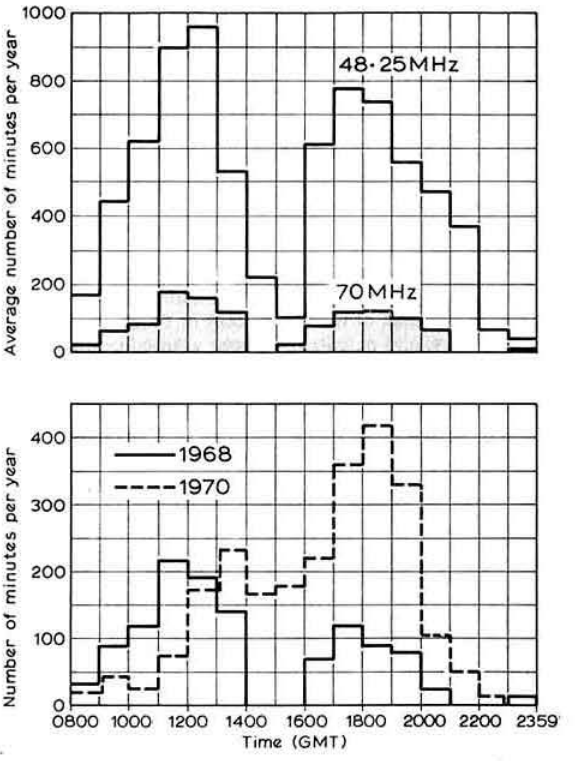

Fig 1. Hourly histograms of Sporadic E Gibraltar-UK. Upper graph : 48MHz and 70MHz, average 1969 plus 1970. Lower graph : Comparison between 1968 and 1970

* 5 Carpenter Road, Plymstock, Plymouth PL9 8UA.

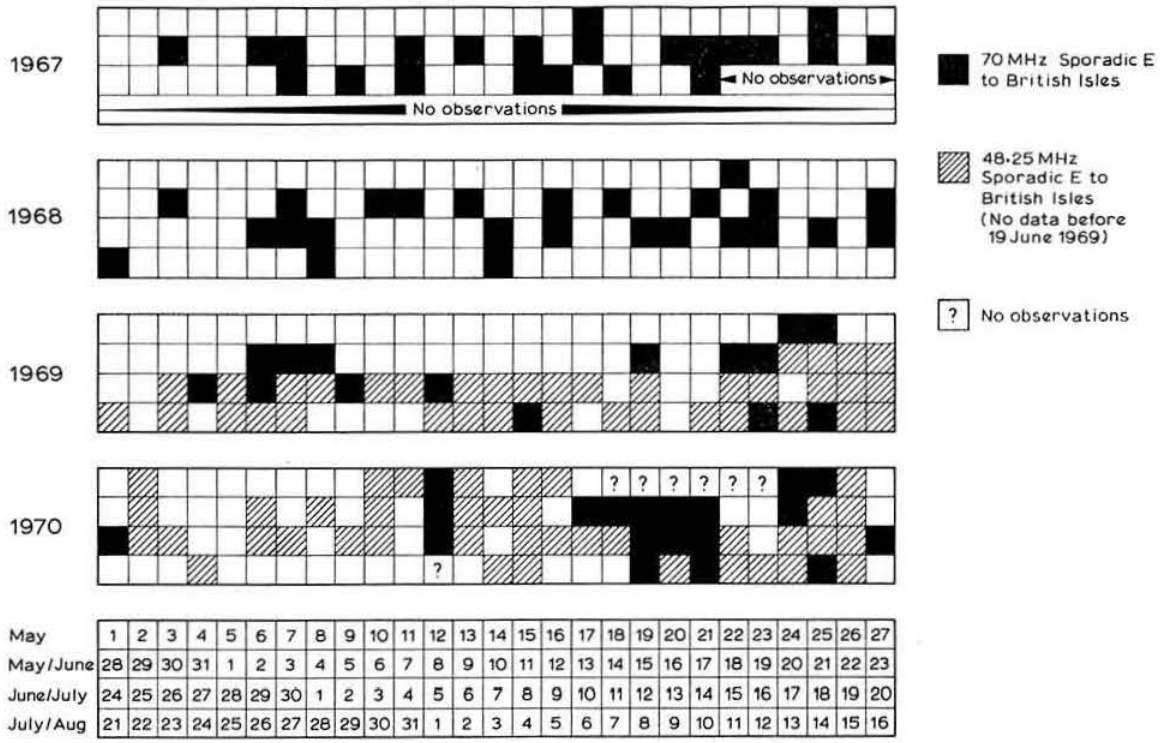

Fig 2. Seasonal pattern of Sporadic E from Gibraltar plotted on a 27-day base-line

clearly audible carriers but unintelligible modulation, which could easily have been worked on the key. PA cathode keying works well on 70MHz, both with twin tetrodes and single-ended pa stages, and space can be found for a bfo in most small rigs.

An old valve converter now lying idle can easily be adapted to monitor frequencies around 50MHz, while a beacon keyer can save much manual work in calling but is not essential.

A good vhf site such as is required for tropospheric work is not needed for Sporadic E. A reasonable hf site is desirable, but ZB2BC made 60 contacts with the UK from a site very badly screened to the north.

Sporadic E results obtained

There are now records for four years on 70MHz and one and a half years on 48·25MHz. Operators and equipment varied, but beacons were used in all years from one or other end of the path. All years were close to the sunspot maximum.

Table 1 gives an idea of the wide variations in duration and intensity of Sporadic E in the four years. Intensity is not easy to gauge, but a good indication can be obtained from the percentage of contacts made on two-way voice. A.m. voice was used whenever possible, but all the ZB2s used cw under marginal conditions.

Comparing 48MHz with 70MHz in 1969 and 1970 showed much more Sporadic E on 48MHz. After allowing for the greater power of the BBC sound transmitters it still appeared that 48MHz enjoyed between four and five times as many hours of Sporadic E as 70MHz. The daily pattern for 70MHz looks like a scaled-down version of that for 48MHz.

The hourly histograms for 70MHz varied widely from year to year, but all years had a mid-day peak, a dip about 1500gmt and a second peak about 1800gmt. In 1967 and 1968 long openings in the afternoon and evening gave only a small dip and a very pronounced evening peak. In 1970 the mid-day peak was greater, and both this year and 1969 show very little Sporadic E around 1500gmt.

Table 1. Sporadic E between Gibraltar and the British Isles. Comparison between the years 1967-70

	1967	1968	1969	1970
Duration of Sporadic E				
Total hours—48MHz	—	—	69h 35m*	125h 15m
70MHz	29h 50m	39h 45m	13h 50m	18h 55m
Longest opening—48MHz	—	—	5 30m	6h 5m
70MHz	6h 5m	6h 15m	2h 6m	2h 15m
Number of openings				
Total number	27	26	17	18
Openings with two-way contact	11	22	12	12
Number of two-way contacts				
Number of stations in Gibraltar	1	3	2	1
Number of contacts	129	535	79	72
Percentage on two-way voice	75	82	30	65

* From 19 June till end of season. 70MHz hours for same period 8h 45m.

Fig 2 shows Sporadic E plotted against the sun's rotational period of 27 days. In 1970 the openings showed a 27-day cycle and generally followed solar flares. The tendency is much less apparent in other years, where repetitions at or near 27-day intervals are only slightly greater than would be obtained with random numbers. Auroral E_s shows a much closer connection with solar activity.

The variations in the hourly and seasonal patterns suggest the presence of at least two varieties of Sporadic E, with one originating in solar flares. This latter variety may be the one found occasionally outside the normal season. A year or two's results from Gibraltar at the next sunspot minimum could shed further light on these points.

Although both ZB2VHF and ZB2BO possessed equipment for 144MHz neither station caught any Sporadic E with it. This was disappointing but does emphasize the rarity of Sporadic E on this band.

Two instances of double-hop Sporadic E on 70MHz were noted on 23 June 1968. ZB2BO heard GB3GM at Thurso, RST569 at 1849gmt for eight minutes, and UV3-AAM heard ZB2VHF at 1920gmt, RST339 in Moscow.

There have been a few chance meteor-scatter contacts between ZB2VHF and G3JVL using the break-in facility that the beacon possessed in 1967 and 1968. This enabled a quick exchange of reports during a big ping.

A study of the logs shows that 70MHz activity in the British Isles has developed in pockets with empty areas in between. Not all the empty areas are around Channel 5 tv transmitters, and it is to be hoped that this article will encourage more of the "silent majority" to come on to 70MHz.

Six metres

Unlike the situation on 70MHz, there have been ionospheric contacts on 50MHz between various parts of the world for many years. Transequatorial propagation was discovered by amateurs during the 1950s, and in the years 1957 to 1962 ZC4IP and ZC4WR carried out systematic monitoring of transmissions from ZE2JV in Rhodesia. Transequatorial propagation is also found between North and South America and over the Pacific Ocean. However, 1968 was the first year in which the band had been activated from Gibraltar. ZB2BO and ZB2BC came on the band in September 1968 and were quickly rewarded by reception of the Rhodesian beacon ZE1AZC on 50·046MHz. On 5 October both stations worked ZS3E in South-West Africa. In the next 15 months there were numerous contacts with ZS3E, ZS3B and three Rhodesian stations before Rhodesia re-allocated the band for tv. ZB2BO worked KV4FU for a transatlantic contact, and the path to the USA was carefully watched during the winter of 1968–69, but nothing was heard. A beacon in Johannesburg, ZS6VHF on 50·100MHz, was heard occasionally in the spring of 1969, and ZB2BC was heard in ZS6 but no two-way contact resulted. The most useful result achieved was the systematic recording of the ZE1AZC beacon by ZB2BC.

The F_2 layer muf can reach as high as 50MHz during sunspot maxima. This occurs most often about 15 degrees north and south of the magnetic equator. Two-hop F_2 layer contacts are possible between Europe and southern Africa and between North and South America during daylight hours at good signal strengths. However, the story does not end at sunset. There now commences a mode of propagation between these same areas, rather weaker and with a

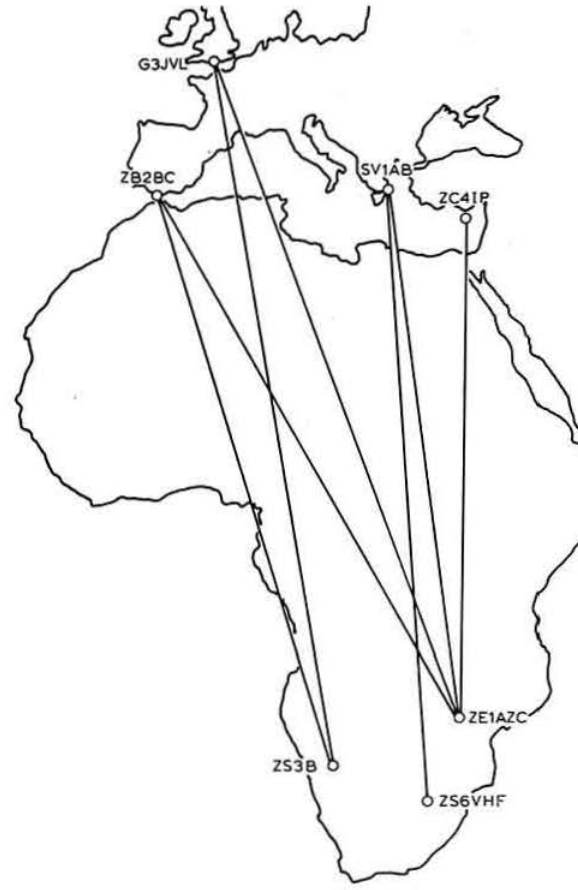

Fig 3. Transequatorial paths

characteristic flutter, which takes place without the signal returning to earth at the mid-point. At sunset the F_2 layer over the equator splits up into small clouds. The areas of more intense ionization north and south of the equator become weaker without breaking up. A signal from the earth hits one of these areas, is reflected into and scattered by the small clouds and then reflected back to earth from the other more intensely ionized area. This is called trans-equatorial propagation (TE for short) and usually occurs between 1800 and 2300 local time. Generally, but not always, there is a gap between the end of F_2 propagation and the onset of TE, but sometimes there may be a gradual change from one to the other, shown by the onset of flutter.

TE is fairly critical as regards the points between which it can occur. These must be on opposite sides of the magnetic equator and between 1,500 and 2,500 miles from it. The path should cross the magnetic equator at right angles for best results. In Gibraltar signals from South-West Africa were stronger than those from Rhodesia which gave a more oblique path. ZE1AZC was received far more often in Gibraltar than was ZS6VHF about 500 miles further south. On rare occasions ZE1AZC and ZS3B were received in

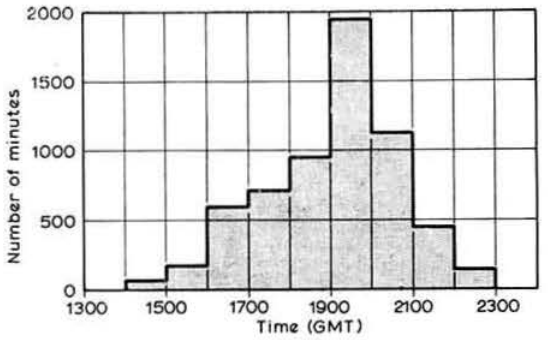

Fig 4. Hourly histograms of ZE1AZC-ZB2BC propagation February-May 1969. Frequency 50·046MHz

England, but not ZS6VHF. No South American signals were heard in Gibraltar, although at the last sunspot maximum contacts between Madeira and South America were common. The magnetic equator runs from north-east to south-west where it crosses the Atlantic, and the path from Gibraltar was probably just too long or too oblique to permit contacts at 50MHz.

The seasons for TE run from mid-February to May and from mid-September to late November, namely at or slightly following the equinoxes. The muf for TE propagation is about 1½ times that for F_2 but signals gradually become weaker as the muf is approached, and high power is needed to work the highest frequencies. ZB2BC listened during the spring of 1969 for the Rhodesian beacon ZE2AZE on 69·998 MHz but without success. The transmitter was running 50W to a quarter-wave vertical, which probably gave insufficient power. Since then it has been fitted with a beam aerial.

Two instances were noticed of side- or back-scatter. When ZB2BO worked KV4FU in November 1968 the latter reported that the signal peaked on a beam heading of east rather than the true great circle heading of north-east. In the spring of 1969 ZB2BC was heard in Athens by SV1AB who was listening for a Rhodesian station and beaming south.

Fig 4 shows the daily pattern observed by ZB2BC monitoring ZE1AZC on 50·046MHz during the spring of 1969. At mid-season the path was open at some time most days. Over the whole season the path achieved a reliability of nearly 50 per cent between 1900 and 2000gmt by TE propagation with signal strengths averaging four to five. F_2 openings were less frequent, occurring mostly around 1630 gmt and giving signal strengths of seven to eight.

Equipment for six metres

Both ZB2BC and ZB2BO used converted four-metre gear which was changed from band to band to suit the season. Both ran 10 to 20W and used crystal-controlled converters with E88CC rf stages. ZB2BC used a two-element quad or four-element Yagi, while ZB2BO used a three-element Yagi. The power could have been increased with advantage to the legal maximum of 50W, but even with the available power contacts were not difficult, and a.m. contacts were made on several occasions.

Conclusions

Two and a half years in Gibraltar gave the writer a splendid opportunity to study propagation at 50 and 70MHz. There is still a lot to be learnt about these frequencies, which exhibit types of propagation not found on other vhf bands.

If the amateur movement can show that it can make good use of 70MHz for the study of propagation it is possible that other countries may allow amateurs to use it. If we use it solely as a "local natter band" we weaken our case for having it. In other words, "Reap and keep".

Like most vhf dx, the opportunities come rarely, and success requires patience. However, it is worth having equipment good enough to seize a fleeting chance, and in particular a cw capability pays dividends. Beacons help greatly in making two-way contacts possible, in building up a full picture of propagation and in showing up the unexpected. Recent reports of reception of TF3VHF by VE2AIO and of ZE2AZE in England show what may yet be found on 70MHz.

Acknowledgements

The writer would like to thank Alan Osborne, ZB2AP, and Jack Braithwaite, ZB2BC, for the use of their results; also Mike Walters, G3JVL, and Don Hayter, G3JHM, for their help and advice while the writer was operating from Gibraltar and during the preparation of this article.

The RSGB News Bulletin Service

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

SCHEDULE

Time (bst)	Frequency (MHz)	Location of station
0930	3·6	SE England
1000	3·6	Severn area
	145·1	SE England (Farnham, Surrey, beaming NE)
	145·8	Aberdeen (beaming W)
1015	3·6	Belfast
	145·8	Belfast
	145·8	Belfast (beaming S)
1030	3·6	N Midlands
	145·1	SE England (Farnham, Surrey, beaming SW)
	145·89	NE England (Bishop Auckland, beaming N)
	145·8	Aberdeen (beaming SW)
	145·3	Birmingham area (beaming NW)
	145·5	Bradford (beaming NE)
1045	145·89	NE England (Bishop Auckland, beaming E)
1100	3·6	NW England
	145·3	Birmingham area (beaming SW)
	145·5	Bradford (beaming SE)
1130	3·6	SW Scotland
	145·5	Leeds (beaming N)
1200	3·6	NE Scotland
	145·5	Leeds (beaming E)

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

High-attenuation low-pass filter for hf band use in transmitter aerial feeders

by J. W. SHELLEY, G3YFZ*

THE filter described in this article has more attenuation than most commercially available filters. The circuit is a "T" section filter with "M" derived end sections; no formulae are given as it was considered to be unnecessary and no difficulty should be experienced with the construction. For details of the circuit see Fig 1.

The specifications shown in Table 1 demonstrate the qualities of the filter of high attenuation and low insertion loss. The graph shows the response of the author's filter.

Table 1

Input impedance	50Ω
Output impedance	50Ω
Insertion loss (a) 3·5MHz	Negligible
(b) 30MHz	1dB
Cut-off frequency	31MHz
Maximum attenuation frequency	42MHz
Maximum attenuation	120dB
Dimensions	10¾in by 1½in by 1½in

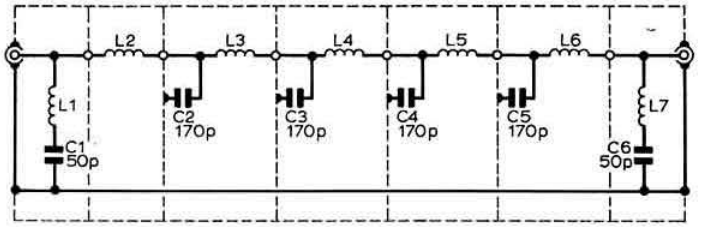

Fig 1. Circuit diagram of filter

Construction

The filter body is made entirely of double-sided copper-laminate board for ease of mechanical construction. It consists of a number of equal compartments, made up as shown in Fig 2, with a section of the filter in each one. Each compartment is fully screened by the copper-laminate boards which are soldered on both sides so as to form a double screen.

A 10¾in by 1½in strip of copper-laminate is used as a base plate for the filter and the eight screens are soldered on to it (after drilling) so as to form equal compartments. The end plates are drilled to take sockets of a type to suit particular requirements. The other six plates are drilled at the centres to accept PTFE feedthrough insulators.

The coils are wound as described in Table 2. The ends of the coils are terminated with just enough wire to bridge the two respective insulators, as shown in Fig 3.

The end section coils are wound and mounted in a different manner as shown in Fig 4. The junctions of the coils (L1 and L7) and the end section capacitors (C1 and C6) are mounted

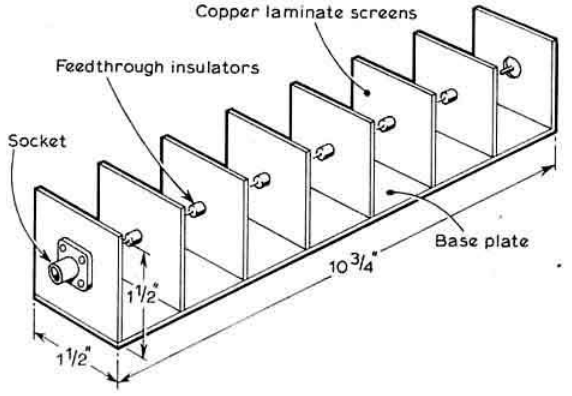

Fig 2. Layout of filter body

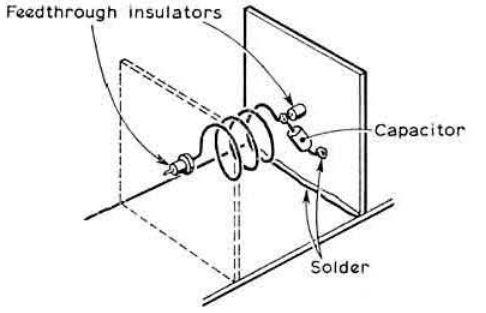

Fig 3. Coil terminations

* 7 Chewells Close, Haddenham, Ely, Cambridge.

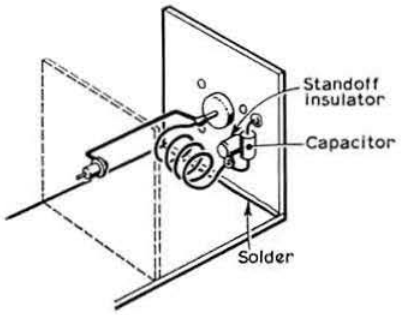

Fig 4. End coil mounting

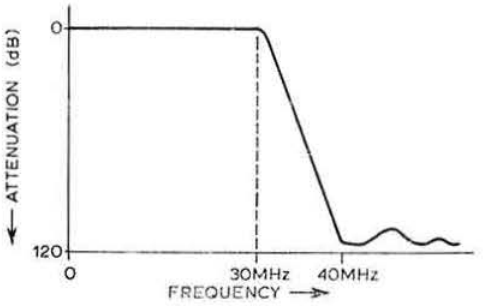

Fig 5. Filter response

on small stand-off insulators bolted to the input and output socket mounting bolts. The earth connections of all the capacitors are soldered directly to the copper with the shortest possible leads close to the sockets for C1 and C6 and as close as possible to the feedthrough insulators for C2 to C5. The connection from the live terminal of the socket to the junctions of L1, L2 and L6, L7 is routed in as direct a line as possible without touching the coils. The capacitors C2 to C5 are mounted directly on the feedthrough insulators and soldered to the screens with short leads close to the insulators.

After soldering the coils and capacitors in place, thoroughly check for any short circuits as it is difficult to take the filter apart to rectify any mistakes when construction is finished. The coils must be made to the exact specifications laid out in Table 2 as no adjustments are possible after the tops to the compartments are in place.

Table 2

C1, C6 50pF
C2, C3, C4, C5 170pF } Close tolerance silver mica. 500v dc wkg.

The capacitors specified will handle the legal power limit assuming the filter is correctly terminated.

L1, L7 0·3μH 5½ turns of 18swg with 8 tpi, 0·7in long, ¼in diameter.
L2, L6 0·45μH 8 turns of 18swg with 8 tpi, 1in long, ¼in diameter.
L3, L4, L5 0·5μH 9 turns of 18swg with 8 tpi, 1·2in long, ¼in diameter.

The sides of the filter are soldered on to the base plate all the way along the bottom edges and on the vertical sides of the screens on both sides. The tops to the compartments are soldered in place so as to completely seal each compartment.

The author's filter achieved 120dB attenuation when measured on a spectrum analyser, without adjustment to the coils or capacitors.

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MICROWAVES–1,000MHz and up

by Dr D. S. EVANS, G3RPE*

Polarization and the polaplexer

Continuing with the topic of polarization, special mention must be made of the polaplexer technique described recently by G3EEZ (*Radio Communication* November 1970). In each polaplexer unit the transmitted and received signals are polarized at 90° to one another. In order to communicate, one set of equipment has to be oriented at 90° with respect to the second, and in a series of contacts it may be necessary to alter the orientation repeatedly to match each transceiver to the other.

Both G3HWR (Swiss Cottage) and G3MTI (Malvern) have since pointed out that this adjustment becomes unnecessary if signals are polarized at 45° *in the same sense*; if this is done then each set of equipment becomes similar in geometry and fixed in polarization.

If this system is adopted, then the polaplexer type of equipment becomes more compatible with other equipment which uses either horizontal or vertical polarization, although there will be a small extra loss (3dB) involved in such contacts due to the 45° cross-polarization present.

Microwave equipment at the VHF/UHF Convention

People are interested in other people's equipment—especially the home-built type. (As a microwave man, I reserve the term "home-brew" specially for magic Ts). That this is so, if not obvious, is apparent from recent letters to the editor of *Radio Communication*, and the many forceful comments made at the last RSGB AGM. This is especially true for microwaves where relatively little practical information has yet got into print.

It is suggested, therefore, that we should make a special effort to exhibit as much microwave equipment as possible at the VHF/UHF Convention in April, not necessarily as part of the Constructors Competition. So bring it along, whatever it is, together with as much information as you can manage; but particularly try to make yourself available to chat to interested parties. I am certain that everyone will appreciate it.

The VHF Committee, which is responsible for organizing the convention, fully supports this idea and will make plenty of space available for all your exhibits.

IFs and common i.f. working

Several readers have enquired whether there is a preferred intermediate frequency for the microwave bands. The short answer is, yes: 30MHz and a bandwidth of ± 500kHz.

The longer answer involves the question of the common i.f. working technique which is in current use on microwaves. Consider a simple transceiver in which part of the rf generated by the transmitter is used as the receiver local oscillator. The receiver will then detect signals which are higher or lower in frequency than the transmitter by an amount equal to the intermediate frequency employed in the receiver. If a second transceiver is operated on either of these frequencies, then it will be received, and it will also receive the first transmitter at the same time. Such a system effectively gives full duplex communication.

As an example, suppose a transceiver fitted with a 30MHz i.f. transmits on 10,035MHz. This will receive signals on 10,005MHz and on 10,065MHz equally well if, as is usual, there is no pre-mixer filtering. A second similar transceiver sending on either 10,005MHz *or* 10,065MHz would be heard, and would also hear the first, in the first case on the upper frequency channel (10,005 + 30MHz), or in the second case the lower frequency channel (10,065 − 30MHz). If *one* transceiver is fitted with automatic frequency control, then it will follow the second as it drifts in frequency and contact will be maintained.

Within wide limits, any i.f. may be used. One choice could be 70MHz: this is the international standard for commercial point-to-point links, and surplus equipment may be available. Alternatively, 45MHz i.f. strips used in British radar systems are available, but these may be difficult to use in Channel 1 tv areas. What appears to be a strong case can be made for the frequency used in the example above—30MHz:

(*a*) If the i.f. strip is to be usable on all the microwave bands, then it must be lower in frequency than the width of the narrowest amateur band while leaving room at the edges for modulation and drift. As this minimum width is 75MHz (on 9cm), the i.f. has a maximum value of about 65MHz. There is a real advantage in making the i.f. less than half this value, in that a transmitter accidentally tuned to the wrong image could still be operating within the allocated band.

(*b*) The lower level is set by the need to discriminate between the two image channels on a receiver. Thus, suppose a transmitter is tuned to a receiver on 21,000 MHz fitted with a 10MHz i.f., then quite a good wavemeter would be required to detect that the transmitter was on 21,010MHz rather than 20,090MHz: using a 30MHz i.f., a resolution of about 1 part in 300 is all that is required, a much more practical proposition.

For these reasons alone, 30MHz would be a good choice. However, there are other advantages: firstly, this i.f. is already known to be in use in this country, in the USA and on the Continent. Secondly, the design of a broadband amplifier at this frequency is relatively easy, and test equipment (including your hf receiver) is more readily available. Thirdly, when crystal-controlled equipment comes into use, hf receivers can be used as the i.f. amplifier directly, without modification of the rf head.

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

As regards bandwidth, the value ± 500kHz appears to be about right. This is ideal for receiving both broadband fm and conventional pulse transmissions having a pulse length of 1 μsec, and is manageable in terms of likely rates of drift in the frequency of self-excited oscillators. A possible source of i.f. amplifiers is tv i.f. strips which frequently are designed for higher frequencies. Extra tuning capacity across each of the i.f. transformer windings to make them tune to 30MHz could well reduce their excessive bandwidth.

The reception of broadband F2 modulated signals produced by tone modulation is a special case. G3HWR (Swiss Cottage) has demonstrated that in the case of the 723 A/B klystron tone modulated on the reflector, the sidebands produced are of uniform amplitude up to the frequencies corresponding to peak deviation. Because of this, the signal/noise ratio in the receiver is independent of its bandwidth providing this is less than the peak deviation. This means that a narrow-band receiver can be used to receive tone modulated transmissions without loss of sensitivity. Broadband speech-modulated signals, F3, would not of course be properly detected.

As a final point on standards, another reader whose call-sign I have regrettably mislaid, has suggested 1kHz as the preferred tone modulating frequency, since a standard is necessary if post-detector filtering is to be employed. This frequency fits in well with pulse modulation.

Do's and don'ts for variable capacitors

Communicated by R. KAY, BSc,
G3OQF/HB9ANW*

THE variable capacitor is a component which, because of its robust construction, is probably misused and ill-treated more than any other electronic component.

These words introduce a concise Code of Practice which appears in a new publication of the International Electrotechnical Commission dealing with air dielectric rotary variable capacitors.

Although the Code of Practice is intended for the professional field, nevertheless the amateur can see from the following extract what 18 countries (including the UK) have agreed to accept as good engineering practice.

1. During packing and unpacking, care must be taken to ensure that:
   (a) the rotor vanes of capacitors are at the maximum capacitance position or completely enmeshed with the stator vanes. In this way, the danger of fingers or other extraneous objects touching and damaging the vanes is minimized;
   (b) trays of capacitors are not stacked on top of each other by being supported on other capacitors;
   (c) capacitors are stored in such a way that they are separated from each other and protected from dust and dirt;
   (d) in the event of capacitors being returned to the suppliers, they should be properly packed to prevent damage.
2. Care must be taken to ensure that the capacitor is not mounted on an uneven surface, for this may cause distortion of the frame assembly and a subsequent capacitance change due to variation in the air gaps between rotor and stator vanes. It has been known, for example, that the mounting surface is sometimes made uneven by the insertion of connecting wire or perhaps washers under one of the mounting feet. This practice should be avoided.
3. Equipment designers are inclined to use the variable capacitor as an anchoring point for other items in the apparatus, a procedure which often entails drilling and tapping holes in the frame of the capacitor. This practice cannot be too strongly deprecated, for apart from the strains which are inevitably set up by drilling and tapping holes, there is a possibility that the frame will be weakened causing mechanical instability. When holes are provided in the frame of the capacitor, which are intended to be used for anchoring brackets etc, it is important that the brackets or other items are made from a thin material which will not introduce strains in the capacitor frame.
4. It is bad engineering practice to use any part of the rotor or stator vane systems as an end stop. If necessary, equipment designers should incorporate properly designed end stops in the drive mechanism.
5. The practice of bending the adjustor vanes to change the capacitance value when the capacitor is assembled in the equipment should be forbidden.
6. Subsequent machining operations on the rotor spindle such as the drilling of cross holes, re-shaping, sawing etc, will inevitably cause damage to the rotor bearings and should not be permitted under any circumstances.
7. When connections are made to variable capacitors it is important that the solder tag or any other part of the capacitor is not overheated, and that the physical strain imposed on the capacitor by the connecting leads or by injudicious use of pliers etc is minimized.
8. Unless instructions are given to the contrary, it is inadvisable to provide any additional lubrication for the rotor bearings or for any other moving parts. Capacitors are lubricated during manufacture and the lubricants used are carefully chosen to satisfy certain conditions of humidity, temperature and conductivity throughout the life of the capacitor. Cleaning by the use of solvents should not be permitted.
9. Damage to rotor and stator vanes is often caused by fixing screws which protrude too far into the capacitor. It is essential for this to be borne in mind when the length of capacitor fixing screws is being specified.
10. Rotor contacts are carefully adjusted to the correct pressure by the manufacturer and subsequent adjustment should not be allowed, for it may introduce other complications, eg crackle, noise etc.

* c/o International Electrotechnical Commission, 1 rue de Varembé, CH 1211 Geneva 20, Switzerland.

FOUR METRES AND DOWN

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

RSGB 17th ANNUAL VHF/UHF CONVENTION

The Winning Post Hotel, Whitton, Twickenham, Middlesex

SATURDAY 17 APRIL 1971

THE PROGRAMME

1. "Amateur Microwaves Today"—a session to be conducted by Dr Dain Evans, G3RPE, contributor of the *Radio Communication* feature "Microwaves—1,000MHz and up". He will be assisted by Don Hayter, G3JHM. This will offer invaluable "how to get started" advice, and will include equipment to use and actual demonstrations.
2. Stream A: G2HIF will talk on matching networks. G3NNG will talk on vhf receiver design.
   Stream B: More about amateur television.
3. Dinner at 7.30. Guest of honour: Mr Harold Stanesby of the Ministry of Posts & Telecommunications.
4. All the usual attractions: Big raffle; trade stands; RSGB bookstall; bring and buy sale—and the usual opportunity to meet your metre-wave friends in person.

TICKETS

Please apply for tickets on the application form which will reach you at any moment now.

Convention and Dinner—£1.75.

Convention only: 35p. Dinner only: £1.40.

Tickets will be despatched to applicants from 27 March.

Convention secretary: Frank Green, G3GMY, 48 Borough Way, Potters Bar, Herts.

The Winning Post Hotel is on the northern side of A326, the Chertsey Road, at Whitton, Twickenham, Middlesex, AA Members' Handbook 1968/69 maps page 12, square TQ1473. A more precise reference is Ordnance Survey Map No 170, GR 140½ 703½.

As the A316 is a dual carriageway with few turning points you are advised to approach the main entrance of the hotel from the west end of A316—it terminates at the junction of A316 and A305—or into the back entrance via a minor road which passes Whitton station.

The hotel can also be reached from Waterloo, Southern Region, to Whitton station (approx 20 minutes) which is about five minutes' walk from the hotel.

And then, after the contest . . .

It seemed during January's 144MHz CW Contest that high walls of QRM had been erected around the country's main centres of vhf activity, for it was difficult indeed for stations further away to force their signals through it. Many of the London operators were gotaways to contestants farther up country. This was indicative of the very high level of activity during the event. Many callsigns new to "Two" (refugees from 80?) made welcome appearances.

Few contests go by without throwing up lessons on how the next one may be conducted (the VHF Contests Committee considers all suggestions received) and in particular how one's equipment and operating skills may be improved. What the January 2m telegraphy event showed was an enormous increase in members' ability to co-channel by vfo with a wanted station, and by raising him with a quick "three times three" to complete a QSO with him while others were still laboriously pounding out his callsign further up the band.

A tendency for bunching towards the low end of the cw segment of "Two" was self-defeating: the QRM level enforced repeats of serial numbers and QRA/QTH details that were time wasting. Operators who settled in the 144·10 to 144·15MHz area found themselves in the clear for most of the time but short of contacts when others tuned from 144 up.

* * *

After the clamour and clatter of the cw contest came the deathly silence. Hardly a signal was to be heard on 144·0 to 144·15 for many nights to follow. The same was true of 145·41 after the January 2m ssb contest. In fact it is true after almost every vhf contest, and always has been. Why? Satiety? Placating the family with your company after it is all over, or what?

On this point G8BCG of Manchester, a recent recruit to the sideband scene, says: "I have listened regularly on 145·41 for many months and heard few signals. Then suddenly along comes a contest and the band is full of ssb stations all fighting for air. What happens afterwards? A dead channel again! Can sideband men only say '59 QRA QTH 73'?"

Which brings us back to the hardy annual . . .

Where and when

The *where* of single sideband on "Two" is 145·41MHz. The *when* is any Monday at 8pm. But as G8BCG implies, this is to render the frequency dumb for the rest of the time unless sidebanders use it more often than this. And as *Four Metres and Down* and several of its readers have said before, why

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

stick to 145·41 *except for calling purposes?* With the elasticity of vfo co-channel facilities at their finger tips the A3J men could more often zero on the A3 men's frequencies than they do at the present time. Intermode contacts are so infrequent as to provide a pleasurable shock of surprise when they happen. There should be more of them.

Of course there are A3 operators around who have no bfo facilities with which to resolve A3J. But it takes no time at all for a single sideband to identify who among the double sidebanders offers best promise of a satisfactory intermode exchange.

* * *

Most of the above discussion applies also to telegraphy on "Two". The *where* is 144·0 to 144·15MHz. No formalized *when* like Mondays for sidebanders has been established for brasspounders, but it was suggested a year or two back that "at the hour on the hour" should be the set time for rapping out a CQ on the key.

To promote further telegraphy activity on the band we offer the suggestion afresh to morse-men.

Another mini opening

The unseasonable weather of early February brought cheer to metre-wave men as a huge "high" developed over the west of the British Isles. "Two metres has gone mad" people were saying as they took refuge in the relative quietude of 70cm. This was a pardonable exaggeration, but certainly "Two" was alive with signals and slick operating, and unexpectedly long paths covered. As for "Seventy", long paths too—and from a high spot—for GW8AWS/P on his Flintshire mountain sounded like a local in the south of England.

The high millibar situation obligingly persisted for the 70MHz Contest on 7 February. Here the big prize for many was GD2HDZ, well in the clear at the top end of "Four" to give the Isle of Man to many who had not even heard it before on this band. Members in tvi-prone areas who prudently held off after lunch and lost points will have their chance in the April event: it is an all-nighter, presenting the opportunity to pile up the scores while video is off.

200 for "Two"

The 200 mark in applications for the Four Metres and Down 144MHz Transmitting Award has been reached and passed. To G8DJM, David Seaward of Brierley Hill, goes Certificate No. 200 for "Two", one of a batch of 10 which were dealt with by the Society's VHF Committee at its February meeting.

Nine of the 10 were Class B applicants: the one Class A member applying was G3YED of Leeds. A fellow Yorkshireman, Bob Cliffe of Sheffield, put in *two* lots of cards with his application—one set of five plus 30 for the home station, G8BRT; the other for portable operation—this having been mightily assisted by Ivy, Mrs G8BRT, who attends to logs and logistics during the G8BRT/P expeditions.

Among the 432MHz applications, too, a well-known portable operator's name appeared. Phil Dutfield, G3OBD/P (his activities on "Seventy" date almost from the day he received the ticket) by activating many counties from which 432MHz signals do not often emerge has earned the thanks and good wishes of operators in search of them for their own 70cm applications: it is nice to note that 'OBD/P gets Certificate No. 73 for this good work.

The other two applications dealt with by the VHF Committee in February were the 432MHz Seniors discussed here last month which go to East Anglians G8ATS and G8BBB, bringing the total in this tough category to no more than nine.

Here is the complete list of FMD Certificate Awards cleared at the February meeting:

144MHz Transmitting: No 198 to G8BKQ; No 199, G8DMY; No 200, G8DJM; No 201, G8BCL; No 202, G8CXV; No 203, G3YED; No 204, G8DJK; No 205, G8CRN; No 206, G8BRT; No 207, G8BRT/P.

432MHz Transmitting: No 73, G3OBD/P.

432MHz Senior Transmitting: No 8, G8ATS; No 9, G8BBB.

Certificates for the above should be on their way by the time this is read, provided postal troubles have become untangled.

M-S and Ar

No meteor shower of any significance from the radio communication point of view is due until April, although G3MNQ and BRS15744 will tell you that their automatic tape monitoring of "Four" produces M-S bursts from East European broadcast stations for many days in any month.

From 19–23 April the Lyrids will be around, but offering a radio rate of only 12 per hour, in marked contrast to the 45 per hour which is the customary yield from the Quadrantids of early January. These were encouragingly productive to EI6AS near Dublin: Albert Latham during his M-S schedule with HG5AIR and UR2BU on "Two" heard pings from the latter, and reports that GI5AJ had similar success. And from TF3EA during the schedule with G3CCH long bursts were copied.

EI6AS seeks M-S schedules on 2m with stations nearer in than HG and UR. On the auroral front he reports a sizeable opening on 28 January, when Tone A contacts were made on "Two" with a trio of GMs, 'EOJ, 'UAG and '2DRD.

Personalia

Well, G8AUE and G8AUF of Derbyshire, now G3ZYC and G3ZYD respectively, did receive conjunct callsigns with effect from morse-test day, 15 January. Seventy centimentalists who had a go in the Cumulatives needed no telling that one of the best known voices on the band came from the same larynx (Ian Sneap's) but wearing a different necktie. And on 31 January when 'ZYC made his first Sunday morning sally forth on 4m he was much in demand. "Who said 'Four' was dead?" he remarked as he closed for lunch after six contacts on the band.

* * *

A welcome back to "Two" for G5DF after a couple of years in Sweden. He radiates from Reading, just above and just below 144·15, phone and cw respectively.

* * *

From the very new to the venerable: the callsign G6PG is one of the few to have been held by its present owner from the day it was issued. Now operating on 2m from his place of retirement in Norfolk, "Pip George" was one of the very earliest comers to "Two" when the band was released in

1948, and he operated from north Kent. Then he was immediately recognizable for his copper-plate Morse sending and still is, down at the lf end of "Two". A handful of other "original owners" were there too, during the January cw contest.

* * *

A second callsign for Laurie O'Loughlin of Scarborough, widely known on 70cm as G8AXC. He now has G6AGC/T. ". . . we hope to be outputting video before too long," he reports. A 40ft lattice topped by a J-Multibeam now at the planning stage will help the video getaway.

* * *

The callsign G8EAE disguises the identity of someone well known for years as an advertiser in this journal: "King the Patent Agent". When the former G5TA left amateur radio he passed on the callsign to his son. Then, as they say, the bug bit again, and last September the old G5TA became the new G8EAE, regularly on "Two" from New Malden in Surrey.

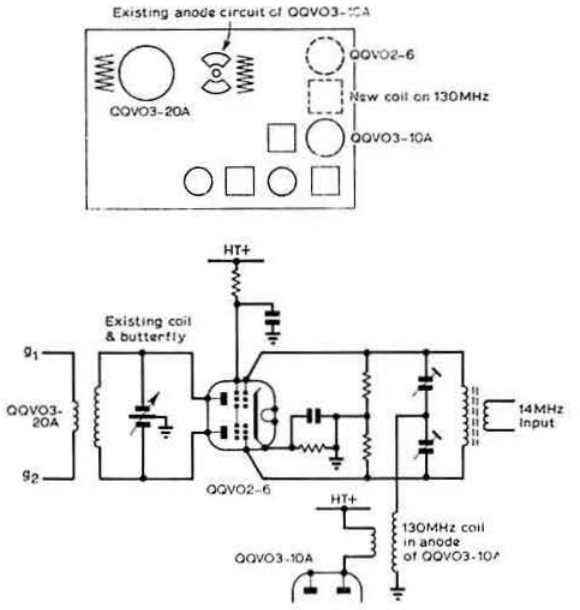
* * *

The latest alighting place for G3PLL (he is with the RAF) is Cottesmore. He surprised and pleased many contestants in the 7 February 4m event by giving them Rutland. But his colleague G3MKG, another 4m and 2m "activist", has just been posted away.

Tech Corner

From G8BCG (Peter Taylor of Manchester)

The Pye "Vanguard" transmitter chassis lends itself to adaptation as an ssb transverter. Using a suitable crystal to multiply up to 130MHz the "Vanguard" crystal chain is retuned to give output at this frequency. Crystals at or around 21·7MHz or 7·23MHz may be pressed into service for this purpose: there is enough selectivity in the crystal chain to ensure that only the wanted 130MHz output will appear at the end of it.



The crystal chain terminates in half of a QQVO3-10. The anode coil and butterfly capacitor are disconnected from this anode and a new anode coil, tuned to 130MHz, inserted in its place. This 130MHz output is fed into the grid circuit of an added QQVO2-6, for which there is plenty of room on the chassis. The discarded anode coil and butterfly are now used as the push-pull output circuit of this valve, tuned to 145MHz.

In addition to the 130MHz input there will be 14MHz input to the 2-6 from a single sideband source, the two frequencies additive-mixing to provide output in the 144–146MHz band and to drive the existing 3-20A pa on the "Vanguard" chassis.

Here and there

Intelsat 1 ("Early Bird") in 1965 was an 85lb 28in diameter drum providing 240 two-way phone (or one tv) channels. Intelsat 4 launched at the end of January 1971 is 17½ft tall, over 6ft in diameter, weighs 1,560lbs in orbit, handles 9,000 two-way telephone calls or 12 colour tv channels or any similar combination. Two of its microwave dishes giving 4-degree beams may be focused from the ground on to any desired spot on earth.

* * *

A reminder from EI6AS: the 4m band in the Republic of Ireland is 70·2 to 70·4. British stations beaming that way should specially search this segment for phone and telegraphy signals. Put another way, do not search the UK telegraphy zone of 70·025 to 70·1MHz if you want a cw contact with EI: it is not included in the Irish licence.

* * *

Clem Cole, GW3GEN, tells us that apropos the G3FZL tech-note about nbfm detector modules, he has acquired a supply of tv detector modules using the TAA570 which he says are almost identical with the circuit in Fig 3 in *FMD* January. Price is 75p including postage. Enquiries direct to him at 18 Parklands View, Sketty, Swansea.

* * *

The last RAE pass-list, announced at the end of January, included many members destined to have a G8F— callsign. Already a QSL sub-manager has been appointed for the imminent G8FAA series. He is G3REP, Bob Parkes, 94 Canterbury Walk, Warden Hill, Cheltenham, Glos, himself an active vhf man, regularly on 4m telegraphy.

* * *

There is good reason for the huge signal now coming out of Stoke on Trent from G3EHM on 432MHz. It is spelt 100W to a 4CX250 and two 46-element beams at 40ft. It paid off during January's mini-opening by giving QSOs from GD2HDZ (off the back of the aerial) down to F2YT in Caen. Yes, we are talking about seventy cems!

* * *

"Re the quote from G8BQX (*FMD* December) that all vhf modes disappear at much the same range, if this is true why is cw so good compared with a.m.?"—G3GVL, Hunstanton.

* * *

"I regularly beam to G-land. On Wednesday nights I have been using an automatic CQ caller on 70·198 . . . so far without result."—GI3TLT of Bangor, County Down. Members in NW England may care to shine beams westwards—and use cw—on Wednesday 4m Activity Nights.

Sorry, members, that this is just about the thinnest *FMD* ever. Reason: a failure of communication (postal) over the period when the copy had to be prepared.

Due to a typographical error, the date of the VHF/UHF Convention was given as 17 *March* on page 118 of the February issue. This should, of course, have been **17 April.**

VHF Personalities—No 19

GI3TLT (Hugh Irvine of Bangor, Co Down)

GI3TLT is among the active operators on "Four" in Northern Ireland and he describes its attractions in the following terms: "Four metres is my favourite band. I cannot give you any particular reason for this except that if you want to work a vhf band properly you must give it your full attention. There is something that attracts me to 'Four', I just cannot say what. Although I have 2m gear I would never think of using it except on a Sunday morning to read the news."

He goes on to say: "I do not favour any particular mode of operation, although for a vhf man cw is a must. Sideband for 'Four' is OK but in my view there is not a big enough percentage of stations capable of receiving it to make it worthwhile at the moment.'

On telegraphy and a.m. telephony the GI3TLT "four-score" is up to seven countries (the latest is Iceland). Soon radio-teleprinter will be added.

Hugh Irvine is a farmer, with dairying and barley-growing as his main interests. Before he obtained his licence in August of 1964 Hugh Irvine's only knowledge of amateur radio was hearing a lot of talk that meant nothing to him coming from the domestic radio receiver at points on the scale marked "Amateur". A subsequent incident developed this interest from the passive to the active. When collecting a television set from the local repair man one day, he was mystified by a piece of equipment he saw in the shop. Out of curiosity he asked what it was and the man behind the counter, who happened to be GI2AFW, told him it was an amateur transmitter. An invitation quickly followed to see GI2AFW in action at home. Before long, Hugh Irvine was sitting in at cw sessions there, an experience which filled him with the resolve to do likewise. He lost no time in learning the morse code, less than four months in fact, with the help of a newly-acquired secondhand communications receiver.

Urged on by local radio amateurs he studied for the RAE, and so GI3TLT was born. Within the year the "surplus" B44 sets came on to the market. "As everyone else was getting one I bought one also, and this started me on 'Four', "he says.

The limitations of commercial gear pressed into amateur service soon became obvious to GI3TLT. Improvements made to the 4m installation included the acquisition of a TW converter and a 10-element Yagi. Building himself a three-section self-supporting crank-up tower, Hugh Irvine loaded it with the 10-element for "Four" another 10-element for "Two", a 4m dipole and a TH2 for hf. "I can crank this lot up to about 70ft," he says. Other GI-men, impressed with the solidity of this piece of outdoor home construction, asked 'TLT if he could build them something like it. Now several monuments to his expertise grace other members' sites.

The enhancement of the 4m set-up has continued with the installation of an EMSAT converter. The 25W transmitter has a 3/20A modulated by two 807s at present but with ssb to come: a transverter for "Four" is at the commissioning stage.

Outside of operating hours Hugh Irvine enjoys the social contacts which membership of the Bangor and District ARC provides. He and Wes Campbell, GI3PQW, were among those who helped initiate three years ago what is now a flourishing society with over 50 members, some fine new premises and the club callsign GI3XRG. He is, in addition, a member of the local RAEN group. And, always ready to lend a hand when it comes to fostering collective activities, GI3TLT has accepted an offer to join a committee which has been formed to organize an exhibition station at the Ulster '71 Expo, May to September this year.

Harrow Radio Society's most distinguished member

The Harrow Radio Society was honoured in January when King Hussein of Jordan accepted its invitation to become an honorary member of that society. The invitation to the royal ex-Harrow Schoolboy was made by Mr N. Joly, who contacted the King during one of his fairly frequent appearances on the amateur bands.

King Hussein granted Mr Joly and three other members of the Harrow RS a 30-minute interview at the Dorchester Hotel during his stay in London in January and accepted from them a hand-drawn certificate of membership.

The photograph shows King Hussein, left, receiving the certificate from Mr Chris Rees, chairman of Harrow RS, with Mr Joly and Mr Russell Medcraft, secretary, right, looking on.

The King has been a member of RSGB since last year and has become well known to amateurs all over the world as a result of his dx activities.

Harrow Observer photograph

THE MONTH ON THE AIR

A monthly feature by John Allaway, G3FKM*

THIS month's column is being prepared during the suspension of some postal activities and is therefore somewhat bereft of news of forthcoming events. That there is any article at all is largely due to the vast amount of help received from Geoff Watts (of *DX News Sheet*) and those members who kindly contacted your scribe by telephone. It is to be hoped that conditions will have returned to normal before the April issue goes to press.

Readers will be sorry to hear of the death of OK1CX on 16 November last. He had acted as awards manager of the Czechoslovak Central Radio Club since 1955.

Top Band news

The first-ever contact between Europe and Japan on 160m is reported by W1BB in a special "flash" bulletin. This took place between JA3AA and DL9KRA at 2157 on 3 January and signals were RST559/579. JA3AA and JA2CLI have met with considerable success on the transpacific path in the form of contacts with up to 20 stations in the W6/W7 area, and KL7CL has been heard in Japan. Readers who are wondering why Stew is not being heard on the band as much as usual will be sorry to learn that his "tower" station is out of action as the result of the coaxial feedline becoming twisted around a warning light on the tower—this means that it is not possible to raise or lower the aerial, which is on a rope and pulley. Release of the cable depends on a rigger being lowered on a boatswain's chair and will have to wait for better weather.

VK6KK and several others have been calling "CQ G" on 1,804kHz at 2000 most days, and '6KK himself worked G3RPB and has heard EI9J, DL9KRA, G3IGW and G3MYI.

News from overseas

Jussi Hartikainen, OH7OQ, is the youngest licence holder in Scandinavia, and possibly in Europe. He received his full licence in late 1970 when he was twelve-and-a-half years old and took part in the CQ WW DX Contest two days later! There is no lower age limit for amateur licences in Finland and passing the examination and morse test is all that is required. Jussi, who speaks English, is also a keen stamp collector.

Bill Metcalfe, formerly G3TIF, is now VE6APN and has become president of the new Canadian CHC Chapter 100. He wishes to draw readers' attention to the first ever VE CHC QSO party which takes place soon—see *Contests*.

G3DYY will be in Sierra Leone during mid-March and at the end of June, for a period of about two weeks in each instance. He is licensed as 9L1GC for all bands 1·8 to 28MHz, and also 144MHz (same allocations as UK). Ross will have no difficulty with aerials, except for 1·8MHz, but will try to get on the band. He expects to return in October for four months, but QSLs should be sent to his home address—IRCs will not be required as all cards will be sent out via the bureaux.

G3VAO will be going to the Maldive Is in April and asks that QSLs should be sent to M. J. Farmer, G3VAO, c/o 75 Beechwood Road, Fishponds, Bristol, BS16 3TW.

DX News

DXpress lists the new prefix allocations presently being used in Surinam. These are as follows: PZ1—Paramaribo and Suriname; PZ2—Nickerie; PZ3—Coronie; PZ4—Saramacca; PZ5—Foreign visitors; PZ6—Para; PZ7—Brokopondo; PZ8—Commewijne; PZ9—Marowijne; and PZ0—special stations.

AC3PT, Namu, has been heard and worked recently on 14MHz ssb; his aerial is a dipole. He is not a quick operator and long calls seem to be needed to attract his attention. According to the *DXers Magazine*, VR6TC puts his signal on the air from Pitcairn Is on Mondays between 0600 and 0700 on 14,185kHz, and on Thursdays at 0500 on 14,230kHz ssb.

Both ON5DO and HB9CM have been on the air from E. Pakistan recently. They were with the Red Cross organization and it is not known whether they were officially licensed to work on the amateur bands. The station which recently appeared on 14MHz with the callsign XV5HH seems to be a pirate as W9JT (whom he gives as his QSL manager) has no knowledge of him.

VK4UC reports that Heard Island, VK0HM, will be active until 6 April. The French operator's name is Gerard and his QSL manager is F2MO. Operating frequencies and times are 14,200kHz ssb 1300-1500gmt and 14,120kHz, 1600-1900gmt. During both periods he will also occasionally be on 14,040kHz CW.

Rumour has it that on the departure of the British presence from the Trucial States each will become a separate entity for the purposes of DXCC. This may result in the addition of up to seven new countries to the countries list. *West Coast DX Bulletin* says that Tom, MP4BHH, is interested in operating from them if the opportunity arises. He is also considering a visit to the Kamaran Is (VS9K) but is leaving the area in August for the USA.

5Z4FB has been in Uganda since early January and is now 5X5FB. He seems to have a preference for 21MHz ssb operation but has been heard on 14MHz as well. Also in Uganda is 5X5SS, who was previously 5Z4SS and who hopes to be on the air on several bands cw in the near future. He has no ssb equipment as he left it in the UK after a spell of G3SS activity last year.

FR7ZU/Glorieuse Is QSL cards have been received via F8LX. Those who have had no success with the direct

10 Knightlow Road, Birmingham B17 8QB.

This very neat receiving set-up belongs to BRS2098, Bob Scase of Leatherhead. Received signals can be examined on the oscilloscope on top of the left HRO. The QSLs are over 30 years old but Bob is still as active as ever

approach might well direct an enquiry to Yves Naintre, 20 Rue C Alby, 92 Chaville, France.

LU2DLE/MM is said to be the callsign of the research vessel *Robert Concad* belonging to the Lamont Geological Observatory. According to VE1AST the ship will be working in the vicinity of Bouvet Is for about one month.

F0YO, Bob, is now in Dahomey and has the callsign TY1ABE. There are three new operators at FB8XX—Georges, Roger and Pierre, and the station now has a Trio 510. The three operators being relieved will be there until March. QSLs should continue to be sent via F2MO. FH8CG has been reported active again on 28MHz, and FH8CY (formerly FP8CY) has been logged on 14MHz ssb.

JD1ABH on Ogasawara Is is looking for European contacts between 0800 and 0830 in the area between 21,040 and 21,060kHz. He has a two-element quad for this band and a ground-plane for 7MHz, and activity should continue until he leaves the island in April. JD1ADO now has a three-element tri-band beam 30ft high and frequents 14MHz between 0300 and 0400 and also between 0700 and 0900. He goes on 7MHz between 1000 and 1500, and 28MHz from 2100 to 2300.

Those still awaiting QSLs for contacts with the stations which used special callsigns from Surinam during the 1970 World Telecommunication Day celebrations may like to know the normal calls of the stations which used the ITU suffixes. They are as follows: PZ1ITU = PZ1AC; PZ2ITU = PZ1AK; PZ3ITU = PZ1AP; PZ4ITU = PZ1AV; PZ5ITU = PZ1BH; PZ6ITU = PZ1BK; PZ7ITU = PZ1CM; PZ8ITU = PZ1CK; PZ9ITU = PZ1CU, and PZ0ITU = PZ1DF.

Belgian operators with the Red Cross organization in E. Pakistan will use the special callsign OR4CR/AP after 11 February. Activity is expected to continue for about two months and QSLs should be sent via ON5KL.

Bob, VE3EWY, has completed trips to Antigua. Montserrat, Dominica and St Vincent, and now has the callsign VP2LY from St Lucia. He expects to be there for one year.

The Arabian Net (mentioned in last month's *MOTA*) is reported to have been in operation at 0830 on 21,300kHz as well as at the times given on 14MHz. BV2A may soon be on ssb thanks to the arrival of suitable equipment from Hong Kong. It is thought that INDXA may have been involved in this effort to bring Taiwan on the air again on ssb.

ZK2AG is said to sked his QSL manager, ZL4NH, at 0600 on 14,300kHz. Likewise ZL4OL/A keeps in touch with ZL2GX at 0630 on Mondays at 14,120kHz. Tactful calls *after* the completion of these business sessions may pay off! Another QSL manager sked is that between ZP9AC and DJ4NI on 21,250kHz at 1700 on Thursdays.

The recent Laccadive Is expedition, VU5KV, is said to have made over 13,000 contacts on all bands 3·5 to 28MHz.

WA1ARF/KS4 is active again and will be on Swan Is for several months. CR8AG and CR8AI are also being heard once more, the former on 28MHz and the latter on 21MHz. 9C9DX, who used the special Iranian prefix last year, will do so again in the WPX contest in April.

Eighty-metre dx

Exceptional openings into the Far East and western USA (via the long path) have been recorded during January. A group of European dxers, including GW3AX, G6LX, LA5KG,S M5BLA,S M5SB and SM3BIU, have managed to work or hear the following stations between 1400 and 1600: K6AHV, W6CN, W6CXF, W6EJJ, WB6KGG, W6KGK, K6NH, K6SEN, W6TSQ, W6VSS, W7PHO, W7RM, W7YTN, VE7ZU, DU1FH, KH6GS, ST2SA, VS6DO, VU2REG, VK6XX, MP4TAA, UW9AF, YB0AAO, 3B8CR, 9K2AL and 9M6BB. It has been established that the Scandinavian stations hear the dx signals about one hour before G6LX, who in turn hears them approximately half an hour before GW3AX. Propagation also seems to be better on the hf end of the band. A most unusual opening was recorded one day when VE1IE was worked at 1240! Many New Zealand stations have been in evidence around 1800, and other choice items reported on ssb include KW6AAS (2030), KL7DTH/KG6 and ZS1MH (2115). VU5KV was worked on cw at 2130, and a number of Japanese stations (including JH1JPS and JA2CQO) appeared at various times between 1900 and 2300. At least one exceptional morning opening into the western USA took place on 12 January when W7RM, K6AHV and WA6ZZK were peaking at S9. Other early morning loggings include HI8SAV, HK6BOK, LU7AAC, WA5KPL/HR1, VP2AA, VP7NS, XEs and YVs.

It might be pointed out perhaps that international frequency allocations on 3·5MHz result in some countries being restricted to quite small segments—eg Indian amateurs may only use 3,890 to 3,800kHz and Australians 3,500 to 3,700kHz. The Region III allocation is from 3,500 to 3,900 kHz and Region I 3,500 to 3,800kHz, although there would seem to be some individual national variations within these bands. Phone stations in the USSR seem to favour that part of the band between 3,600 and 3,650kHz. Italians are believed to have 3,613 to 3,627kHz for cw, 3,618—3,623kHz for rtty, and 3,467—3,667kHz for telephony (although they have recently been heard at the top end of the band). G3HVA reports that a dx net is run on 3,665kHz by I1RC at 2100 every Friday.

"Wanted" countries

In a poll conducted by Geoff Watts in *DX News Sheet* last summer the most wanted DXCC country proved to be Clipperton Is (FO8). Research shows that there has been no

Tor Lover, JX8IL, operated from Jan Mayen Is last winter but is now located on Bear Is. He uses a Sommerkamp line and linear

activity from there since the FO8AT expedition by the San Diego DX Club in 1958. Second and third places were occupied by Laccadive Is and Albania—two areas which have been activated recently and will have lost their scarcity. Fourth on the list was Bouvet Is which has only once been the site of an amateur station when W4BPD operated from there as LH4C in 1963. Other countries (in order of demand) included Maria Theresa (only activity recorded being by W9WNV/FO8M in 1966), Cambodia (W9WNV/XU in 1964), South Sandwich Is (VP8HF/VP8 in 1964), China (BY4SK worked western stations in 1965), Spratly Is (1S9WNV in 1965), Iraq (YI2WS in 1963), Tibet (AC4H by W4BPD in 1965), Kuwait/Saudi Arabia Neutral Zone (HZ3TYQ/8Z5 in 1965), San Felix (CE0XA in 1965), Tokelau Is (W9WNV/ZM7 in 1965), Minerva Reef (IM4A in 1966), and the Iraq/Saudi Arabia Neutral Zone (HZ3TYQ/8Z4 in 1965). There seems to have been no station on from Bhutan since 1965, from Bajo Neuvo since 1966, from Guinea since 1967, from Burma since 1965, from Juan Fernandez since 1967, and from Wallis Is since late 1968.

Awards

The Helvetia 22 Award

USKA Awards Manager, HB9RK, PO Box 384, 1701 Fribourg, Switzerland.

For submitting QSLs from each of Switzerland's 22 cantons (phone, cw or mixed) plus a list and adequate return postage. Your scribe offers no apologies for reminding readers that this is a very attractive award and that the rarer cantons are frequently activated during the Helvetia 22 Contest (see *Contests*).

The SP Powiat Award

PZK Awards Manager, PO Box 320, Warszawa 1, Poland.

For contacts with at least 100 powiats since 1 January 1946, with stickers at 200, 300, 400 and all powiats stages. A certified list plus seven IRCs should be submitted and applications may also be made by those working the required number of powiats during the SP DX Contest in which case QSLs are not needed but an SPPA application form should be completed.

The Polska Award

PZK (see above).

For working stations in each of the 17 Polish provinces since 1 January 1946. Apply with seven IRCs as for the SPPA. Contest QSOs may also be used for this certificate.

The Diploma Arturo Ferrarin

ARI Vicenza Section, I1BBZ, PO Box 52—36016 Thiene, Italy.

To commemorate the 50th anniversary of the first Rome-Tokyo flight this award is for two contacts (between 1 January 1970 and 31 December 1971), one with a station in Vicenza province and the other with a "Jolly" station (?) in Thiene. Alternatively two "Jolly" stations (I1s BBZ, MEK, PAT, REH and ZCH) may be worked. QSLs and six IRCs should be sent to the address above.

Contests

The Helvetia 22 Contest

1500 13 March to 1700 14 March (Phone and cw are one contest).

All bands 1·8 to 28MHz. Contacts with Swiss stations count three points, each station may only be worked once per band—either on phone or cw. Participants exchange RS/T plus serial number of QSO (starting from 001) and Swiss stations also indicate their canton with a two-letter suffix. The final score is total QSO points multiplied by the number of cantons worked on each band added together (maximum $22 \times 6 = 132$). Certificates will be awarded to top scorers in each country. Separate log sheets should be used for each band and should indicate each new canton as worked. A summary sheet should show scoring and other information and name and address in capital letters together with a declaration that all rules and regulations have been observed. Entries should be posted within 30 days to: TM, USKA, HB9AAA, PO Box 17, 2500 Bienne 4, Switzerland. Canton abbreviations are as follows: AG, AR, BE, BS, FR, GE, GL, GR, LU, NE, NW, SG, SH, SO, SZ, TG, TI, UR, VD, VS, ZG and ZH.

The WPX SSB Contest

0000 27 March to 2400 28 March.

All bands 1·8 to 28MHz ssb only. Exchange report plus serial number of QSO (starting from 001). Contacts with one's own continent count one point, with other continents three points. QSOs with one's own country only count as a multiplier and not for QSO points, and contacts on 1·8, 3·5, and 7MHz count double. Final score is total QSO points multiplied by the total number of different prefixes worked (each counts once only). There are single-operator (single- or multi-band) and multi-operator (single- or multi-transmitter) categories, and multi-transmitter entrants should note that they may only radiate one signal at a time on any band. Single-operator entrants may only operate for 36 of the 48 hours and may take their break in up to five instalments

which must be clearly indicated in their logs. Multi-transmitter stations should use separate serial numbers on each band. Stations may be worked on each band for credit. Separate log sheets should be used for each band and be similar to those used for the CQ WW DX Contest (40 QSOs per sheet). Summary sheets are available from G3FKM (but **not** log forms or printed rules). Entries should be posted before 15 May to: CQ WPX SSB Contest Committee, 14 Vanderventer Avenue, Port Washington, LI, NY, 11050, USA.

BARTG Spring RTTY Contest
0200 13 March to 0200 15 March.

From 3·5 to 28MHz rtty only. Stations may be worked once per band and messages should consist of time (gmt), message number, and RST. QSOs with one's own country count two points, with other countries 10 points, and a bonus of 200 points is gained for each country worked (including own). Countries may be worked on each band for credit, and the DXCC list (less KH6 and KL7) used. Scoring is (*a*) QSO points times countries worked and (*b*) country points times number of continents worked (maximum six), and the total of these two figures is the final score. Submit logs by 22 May to: BARTG Contest Manager, 89 Linden Gardens, Enfield, Middlesex. Listeners may enter. Note that only 36 hours operating is permitted and breaks (of not less than two hours) must be shown in the log. Use separate log for each band.

Canada CHC Chapter 100 Annual QSO Party
2359 12 March to 0600 15 March.

Open to all. Full information from VE6APN, c/o 12021 67th Street, Edmonton, Alberta, Canada, or from VE1AJJ, RR3 Armedele, Halifax Co, NS, Canada. (Please enclose sae and postage).

The SP DX Contest
1500 3 April to 2400 4 April (cw only).

All bands 3·5 to 28MHz. Single-operator (single- or multi-band) and multi-operator multi-band entries are permitted. Participants exchange RST plus serial QSO number (starting from 001) and Polish stations will send RST plus two letters indicating their powiat. QSOs count three points and stations may be worked once per band, the multiplier is the number of powiats worked (each counts once only). Separate logs should be submitted for each band and the usual summary sheet with declaration that rules and regulations have been observed should be provided. They should be posted before 1 May to: Contest Manager of PZK, PO Box 320, Warszawa 1, Poland. A separate list of powiats worked, with the log, would be appreciated.

In the 1970 event UK scores were as follows:

G3ESF (All band) 34,080 points
G3INW (All band) 7,134 points
G3WJS (14 MHz) 6,888 points
G3OCA (14 MHz) 675 points
G3VHL (3·5MHz) 3,774 points
G3TXF (3·5MHz) 867 points

Although not mentioned in the rules received from PZK it would appear that listeners may also enter this contest.

Jussi Hartikainen, OH7OQ, has the distinction of being the youngest licence holder in Europe—he received his novice licence when just over 12 years old (see News from overseas)

Many thanks to all those who supplied information used in compiling this column and especially to the following for items obtained from their publications: **DX'press** (*PA0TO*), **DX News Sheet** (*Geoff Watts*), the **DX'ers Magazine** (*W4BPD*), **Long Skip** (*VE3DID*), and the **West Coast Dx Bulletin** (*WA6AUD*). Please send all items for **April** issue **to reach G3FKM no later than 15 March,** for **May** issue by **12 April,** and for **June** issue by **12 May.**

QTH Corner.

A2CAK Box 23 Gaberones, Botswana.
CT2BB via WA3NRV, T.Nickle, RFD 2—Box 283, Camden, Del, 19934, USA.
EP2YL via K3ZZS, Roselyn Frisbie, W. Oak St, Rahns, Pa, 19426, USA.
FG7TD via WB8ABN,1745 Oakstone Drive, Rochester, Mich, 48063, USA.
FM7WN (new) via K2KGB, Larry Cohen, Box 73, Coram, NY, 11727, USA.
FR7AF Michel Piollet, BP 207, St Denis, Reunion Is.
FR7AG Francoise Pepin, BP 819 St Denis, Reunion Is.
FR7AH Claude Nerac, BP 819, St Denis, Reunion Is.
FR7AI Box 4, Clotilde, Reunion Is.
HL9WI via W6HTH, W. E. Boykin, 38237 N. 171st St, E. Palmdale, Calif, USA.
WA5KPL/HR1 c/o American Embassy, Tegucigalpa, Honduras.
HS1ADX via W4VFP, 4741 Playfield St, Annandale, Va, 22003, USA.
HS4ABL via K4TZU, 5637 Walton St, Pensacola, Fla, USA.
IR0WX via WA2DWE, 120 Esplanade Drive, Rochester, NY, USA.
KG4DS via VE3BYN, 449 Dovewood Drive, Niagara Falls, Ont, Canada.
KG6SY Box 209, Capitol Hill, Saipan, Mariana Is. 96950.
KV4GK via W2HYO, 12 Jordan Drive, Great Neck, NY, 11021, USA.
PZ5WW cia W9IGW, Wayne Warden Jr, RFD 3, Bloomington, Ind, USA.
SV0WOO via W3MNE, 1104 Agnew Drive, Rockville, Md, 20851, USA.
TA3GB via VE3MR, 161 Old Forest Hill Rd, Toronto 10, Ont, Canada.
TY1ABE R. Saleur, Box 29, Porto Novo, Dahomey.
VP2AAC via WB4GGA, 9 Campbell St, Greenville, SC, 29607, USA.
VP2AAP Fred Perkins, RCA Antigua AS, Box 4187, Patrick AFB, Fla, 32925, USA.
VP2MM via W1URM, Dominic Bruno, 65 Garden St, Torrington, Conn, USA.
VU5KV PO Box 3031, New Delhi, India.
YB1AK Box 288, Bandung, Indonesia.
YB5AAQ via W5ADZ, 2030 Quenby Rd, Houston 5, Texas.
YB7AAH Box 2932, Djakarta, Indonesia.
YB0AAN via K7DVK, 9999 S.E. French Acres Drive, Portland, Ore, 97266, USA.
YB0AAO (new) via DJ0RR, Barthelstr. 83, 5 Koeln-Ehrenfeld,W. Germany.
5H3MT via LA9PF, Kokkerudaasen 22, Hovik, Norway.
5U7AR via F6ACT, 33 Rte de Versailles, 78 La Colle Saint-Cloud, France.
5U7AW via VE2DCY, 8900 Lacordaire, St Leonard de Port Maurice, Que, Canada.
9G1CO via G3WEQ, 32 Barn Hill Gardens, Marlow, Bucks.
ex-9G1GT Ron Hockey, "Rosaburn", Garelochhead, Dunbartonshire.
RSGB QSL Bureau, G2MI, Bromley, Kent, BR27 NH.

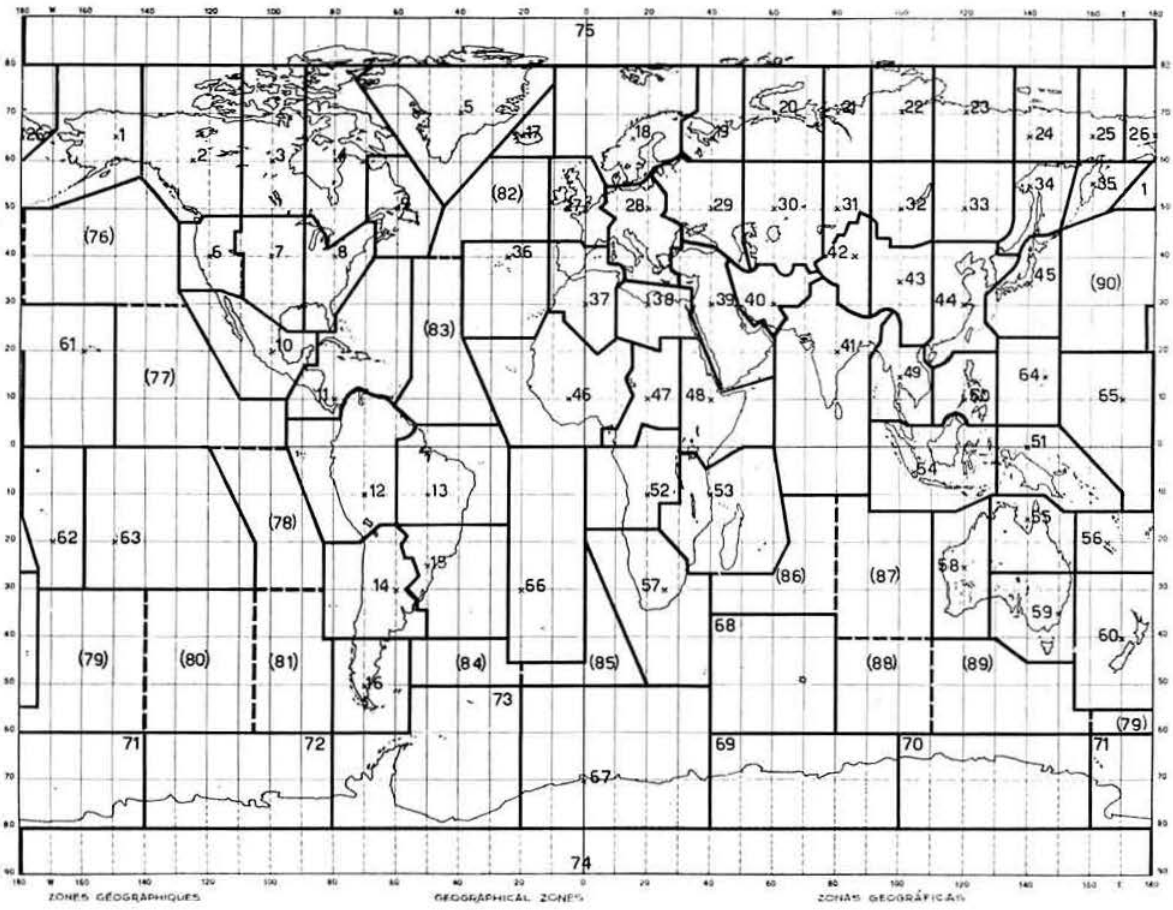
ITU ZONE LIST

Prefix	Country	Zone
A2	Botswana	57
*AC1, 2, 3, 0	Bhutan	41
*AC3	Sikkim	42
*AC4	Tibet	42,43
AP	East Pakistan	41
AP	West Pakistan	41
BV	Taiwan	44
BY	Chinese P. R.	33, 42, 43, 44
C21	Nauru Is	65
C31	Andorra	27
CE1, 2, 3, 4, 5	Chile	14
CE6, 7, 8	Chile	16
CE9A	Chile (Antarctica)	73
CE0A	Easter Is	63
CE0X	San Felix Is	14
CE0Z	Juan Fernandez Is	14
CM, CO	Cuba	11
CN	Morocco	37
CP1, 8, 9	Bolivia	12
CP2, 3, 4, 5, 6, 7	Bolivia	14
CR3	Portuguese Guinea	46
CR4	Cape Verde Is	46
CR5	Sao Thome & Principe	47
CR6	Angola	52
CR7	Mozambique	53
CR8	Timor	54
CR9	Macao	44
CT1	Portugal	37
CT2	Azores Is	36
CT3	Madeira Is	36
CX	Uruguay	14
DC, DI, DJ, DK, DL	F. R. of Germany	28
DM	East Germany	28
DU, DX	Philippines	50
EA	Spain	37
EA6	Balearic Is	37
EA8	Canary Is	36
EA9	Rio de Oro	46
EA9	Spanish Morocco	37
3C	R. of Equatorial Guinea	47
EI	R. of Ireland	27
EL, 5L	Liberia	46
EP, EQ	Iran	40
ET, 9E, 9F	Ethiopia	48
F	France	27
FB8W	Crozet Is	68
FB8X	Kerguelen Is	68
FB8Y	Terre Adelie	70
FB8Z	Amsterdam & St. Paul Is	68
FC	Corsica	28
FG	Guadeloupe Is	11
FH8	Comoro Is	53
FK8	New Caledonia	56
FL8	French Somaliland	48
FM	Martinique	11
FO8	Chesterfield Is	56
FO8	Clipperton Is	10
FO8	Gambier Is	63
FO8	Loyalty Is	56
FO8	Marquesas Is	63
FO8	Rapa Is	63
FO8	Society Is (Tahiti)	63
FO8	Tubuai Is	63
FP8, FP0	St. Pierre et Miquelon	09
FR7	Europa Is	53
FR7	Glorioso Is	53
FR7	Juan de Nova Is	53
FR7	Reunion Is	53
FR7	Tromelin Is	53
FS7	St. Martin	11
FW8	Wallis & Fortuna Is	62
FY7	French Guiana	12
G, GB	England	27
GC	Guernsey & Dep.	27
GC	Jersey Is	27
GD	Isle of Man	27
GI	Northern Ireland	27
GM	Scotland	27
GW	Wales	27
HA, HG	Hungary	28
HB9	Switzerland	28
HB0	Liechtenstein	28
HC	Ecuador	12
HC8	Galapagos Is	12
HH	Haiti	11
HI	Dominican Republic	11
HK	Colombia	11
HK0	Bajo Nuevo	11
HK0	Malpelo Is	12
HK0	San Andres & Providencia	11
HK0, KS4	Serrana Bank	11
HL, HM	Korea	44
HP	R. of Panama	11
HR	Honduras	11
HS	Thailand	49
HU, YS	El Salvador	11
HV	Vatican City	28
HZ, 7Z	Saudi Arabia	39
I	Italy	28
IS	Sardinia	28
IT	Sicily	28
JA, JH, JR	Japar	45
JD	Marcus Is	45
JD	Bonin & Volcano Is	45
JT	Mongolia	43
JW	Bear Is	18
JW	Svalbard	18
JX	Jan Mayen Is	18
JY	Jordan	39
K, W	(see W)	
KA	Japan	45
KB6	Baker & Howland Is	61
KB6	Canton, Enderbury & Amer. Phoenix Is	62
KC4	Navassa Is	11
KC4AAC	Vostok Station	70
KC4AAD	Byrd Long Wire	72
KC4USB	Byrd Station	72
KC4USH	Hallett Station	71
KC4USL	Brockton Station	74
KC4USM	Byrd Noise Facility	72
KC4USN	South Pole	74
KC4USP	Palmer Station	73
KC4USV	McMurdo Station	71
KC4USX	Williams Field	71
KC6	Eastern Caroline Is	64
KC6	Western Caroline Is	64
KG4	Guantanamo Naval Stn.	11
KG6	Guam	64
KG6S	Saipan	64
KG6T	Tinian	64
KH6	Hawaii	61
KH6	Kure Is	61
KJ6	Johnston Is	61
KL7	Alaska	01
KM6	Midway Is	61
KP4	Puerto Rico	11
KP6	Palmyra Is	61
KP6	Jarvis Is	62
KR6, 8	Ryukyu Is	45
KS4	Swan Is	11
KS4, HK0	Serrana Bank	11
KS6	American Samoa	62
KV4	US Virgin Is	11
KW6	Wake Is	65
KX6	Marshall Is	65
KZ5	Panama Canal Zone	11
LA, LG	Norway	18
LA	Antarctica	67, 69
LU-A/U, Y	Argentina	14
LU-V, W, X	Argentina	16
LU-Z	Antarctica	73
LX	Luxembourg	27
LZ	Bulgaria	28
MP4B	Bahrain Is	39
MP4D	Das Is	39
MP4M, VS9O	Masira Is	39
MP4M	Muscat & Oman	39
MP4Q	Qatar	39
MP4T	Abu Dhabi	39
MP4T	Ajman	39
MP4T	Dubai	29
MP4T	Fujairah	39
MP4T	Ras Al Khaima	39
MP4T	Sharjah	39
MP4T	Umm Al Qawain	39
OA	Peru	12
OD5	Lebanon	39
OE	Austria	28
OH, OF	Finland	18
OH0	Aaland Is	18
OJ0	Market Reef	18
OK, OL, OM	Czechoslovakia	28
ON	Belgium	27
OR4	Antarctica	67
OX, XP	Greenland	05
OY	Faeroe Is	18
OZ	Denmark	18
PA, PE, PI	Netherlands	27
PJ2	Curacao	11
PJ3	Aruba	11
PJ4	Bonaire	11
PJ5	St. Eustatius	11
PJ6	Saba	11
PJ7	Sint Maartin	11
†PY1, 2, 3, 4, 5, 9	Brazil	15
†PY6, 7, 8	Brazil	13
PY0	Fernando da Noronha	13
PY0	St. Peter & Paul Rocks	13
PY0	Trinidade	15
PY0	Martim Vaz. Is	15
PZ1	Surinam	12
SK, SL, SM	Sweden	18
SP, 3Z	Poland	28
ST	Sudan	48
SU	Egypt (UAR)	38
SV	Greece	28
SV	Crete	28
SV	Dodecanese Is	28
TA, TC	Turkey	39
TF	Iceland	17
TG	Guatemala	11
TI	Costa Rica	11
TI9	Cocos Is	11
TJ	Cameroon	47
TL	Central Africa R.	47
TN	Congo Republic	52
TR	Gabon	52
TT	Tchad	47
TU	Ivory Coast	46
TY	Dahomey	46
TZ	Mali	46
UA1KAE	Mirny Station	69
UA1KED	Franz Josef Land	75
‡UA1A/D, F/M, NA, NB, QN, R/T, V, W	European USSR	29
UA1E, NO/NZ, O, P, QA/QG, U, Y, Z	European USSR	19
UA1OP, PO	European USSR	20
UA2	Kaliningradsk	29
UA3, 6	European USSR	29
UA4A/G, K/M, S/U, Y	European USSR	29
UA4H/J, N/R, W	European USSR	30
UA9A/F, M, Q/T, W	Asiatic USSR	30
UA9H, O, P, U, V, Y	Asiatic USSR	31
UA9J	Asiatic USSR	21
UA9X	Asiatic USSR	20
UA0A, B, N, W	Asiatic USSR	22
UA0C/G, K/M	Asiatic USSR	34
UA0I	Asiatic USSR	24/26
UA0J, U, V	Asiatic USSR	33
UA0O/Q, S, T, Y	Asiatic USSR	32
UA0R	Asiatic USSR	23
UA0Z	Asiatic USSR	35
U5ARTEK	Ukraine	29
UB, UT, UY5	Ukraine	29
UC2	White Russian SSR	29
UD6	Azerbaijan	29
UF6	Georgia	29
UG6	Armenia	29
UH8	Turkomen	30
UI8	Uzbekh	30
UJ8	Tadzhik	31
UL7	Kazakh	30
UM8	Kirghiz	31
UN1	Karelo-Finnish Region	19
UO5	Moldavia	29
UP2	Lithuania	29
UQ2	Latvia	29
UR2	Estonia	29
VE1, 2	Canada	09
VE3	Canada	04
VE4, 5	Canada	03
VE6, 7	Canada	02
VE8	Canada	02, 03, 04, 75
VE8RCS	Canada	75
VK1, 2, 3, 5, 7	Australia	59
VK2	Lord Howe Is	60
VK4, 8	Australia	55
VK4	Willis Is	60
VK6	Australia	58
VK9	Christmas Is	54
VK9	Cocos-Keeling Is	54
VK9	New Guinea	51
VK9	Norfolk Is	60
VK9	Papua	51
VK0	Heard Is	68
VK0	Mawson Base	69
VK0	McQuarie Is	60
VK0	Wilkes Base	70
VO	Newfoundland & Labrador	09
VP1	British Honduras	11
VP2A	Anglilula, Antigua & Barbuda	11
VP2D	Dominica	11
VP2G	Grenada & Dependencies	11
VP2K	St. Kitts & Nevis	11
VP2L	St. Lucia	11
VP2M	Montserrat	11
VP2S	St. Vincent & Dep.	11
VP2V	British Virgin Is	11
VP5	Turks & Caicos Is	11
VP7	Bahama Is	11
VP8	Falkland Is	16
VP8	Graham Land	73
VP8	South Georgia Is	73
VP8	South Orkney Is	73
VP8	South Sandwich Is	73
VP8	South Shetland Is	73
VP9	Bermuda Is	11
VQ9	Chagos Is	41
VQ9	Aldabra Is	53
VQ9	Desroches Is	53
VQ9	Farquhar Is	53
VQ9	Seychelles Is	53
VR1	British Phoenix Is	62
VR1	Gilbert, Ellis, Ocean	65
VR2	Fiji Is	56
VR3	Fanning & Christmas	61
VR4	Solomon Is	51
VR5	Tonga Is	62
VR6	Pitcairn Is	63
VS5	Brunei	54
VS6	Hong Kong	44
VS9M, 8Q	Maldive Is	41
VS9O, MP4M	Masira Is	39

*These callsigns are not in accordance with ITU Rules and are subject to change
†Brazil also uses PQ, PR, PS, PT, PU & PX
‡USSR also uses UV, UW, and 4J

Prefix	Country	Zone	Prefix	Country	Zone	Prefix	Country	Zone	Prefix	Country	Zone
VU	Andaman & Nicobar Is	49	ZB2	Gibraltar	37	3B9	Rodrigues Is	53	*70	Socotra Is	48
VU	India	41	ZC4, 5B4	Cyprus	39	3V8	Tunisia	37	7P8	Lesotho	57
VU	Laccadive Is	41	ZD3	The Gambia	46	3W, XV	Vietnam	49	7Q7	Malawi	53
W, K1, 2, 3, 4, 8, 9	USA	08	ZD5	Swaziland	57	3X	R. of Guinea	46	7X	Algeria	37
W, K5, 0	USA	07	ZD7	St Helena Is	66	3Y	Bouvet Is	67	7Z, HZ	Saudi Arabia	39
W, K6, 7	USA	06	ZD8	Ascension Is	66	3Z, SP	Poland	28	8J	Antarctica (Japan)	67
XE, XF, 4A	Mexico	10	ZD9	Tristan da Cunha & Gough Is	66	4A,XE, XF	Mexico	10	8P	Barbados	11
XF4	Revilla Gigedo Is	10	ZE	Rhodesia	53	4J, 4K, 4L	(see UA)		8Q, VS9M	Maldive Is	41
XP, OX	Greenland	05	ZF1	Cayman Is	11	4M, YV	Venezuela	12	8R	Guyana	12
XT	Voltaic R.	46	ZK1	Cook Is	63	4U1ITU	UN Geneva	28	8Z4	Saudi Arabia/Iraq Neutral Zone	39
XU	Cambodia	49	ZK1	Manihiki Is	63	4W	Yemen	39	8Z5, 9K3	Saudi Arabia/Kuwait Neutral Zone	39
XV, 3W	Vietnam	49	ZK2	Niue Is	63	4X, 4Z	Israel	39	9A	San Marino	28
XW8	Laos	49	ZL	Auckland & Campbell Is	60	5A	Libya	38	9G1	Ghana	46
XZ	Burma	49	ZL	Chatham Is	60	5B4, ZC4	Cyprus	39	9H1	Malta	28
YA	Afghanistan	40	ZL	Kermadec Is	60	5H3	Tanzania	53	9J	Zambia	53
YB, YC, YD, 8F	Indonesia	54	ZL	New Zealand	60	5H3	Zanzibar	53	9K2	Kuwait	39
YI	raq	39	ZL5	Antarctica	71	5L, EL	Liberia	46	9K3, 8Z5	Kuwait/Saudi Arabia Neutral Zone	39
YJ, FU8	New Hebrides Is	56	ZM7	Tokelau Is	62	5N2	Nigeria	46	9L1	Sierra Leone	46
YK	Syria	39	ZP	Paraguay	14	5R8	Malagasy R.	53	9M2, 4	West Malaysia	54
YN, YN0	Nicaragua	11	ZS1, 2, 4, 5, 6	South Africa	57	5T	Mauritania	46	9M6, 8	East Malaysia	54
YO	Romania	28	ZS3	Southwest Africa	57	5U7	R. of Niger	46	9N1	Nepal	42
YS, HU	El Salvador	11	1M	Minerva Reef	63	5V	Togo	46	9Q5	R. of Congo	52
YU	Yugoslavia	28	1S	Spratly Is	50	5W1	Western Samoa	62	9U5	Burundi	52
YV, 4M	Venezuela	12	3A	Monaco	27	5X5	Uganda	48	9V1	Singapore	54
YV0	Aves Is	11	3B, 3C	(see VE/VO)		5Z4	Kenya	48	9X5	Rwanda	52
ZA	Albania	28	3B6	Agalega Is	53	*601, 2, 6	Somali Republic	48	9Y4	Trinidad	11
			3B7	St. Brandon Is	53	6W8	Senegal	46	—	Blenheim Reef	53
			3B8	Mauritius	53	6Y5	Jamaica	11	—	Geyser Reef	53
						*70	R. of South Yemen	39			

*These callsigns are not in accordance with ITU Rules and are subject to change
†Brazil also uses PQ, PR, PS, PT, PU & PX
‡USSR also uses UV, UW and 4J



SOCIETY AFFAIRS

A brief report of the Council meeting held at Society HQ on 14 January 1971.

Present: *Mr F. C. Ward (President, in the Chair), Dr E. J. Allaway, Messrs B. D. A. Armstrong, R. J. Hughes, E. G. Ingram, G. R. Jessop, W. F. McGonigle, A. C. Morris, L. E. Newnham, C. H. Parsons, Dr J. A. Saxton,* Messrs *W. A. Scarr, A. W. Smith, R. F. Stevens, G. M. C. Stone (members of Council), D. A. Findlay, general manager, and J. O. Brown.*

An apology for absence was received from Mr A.W. Hutchinson, editor.

Welcome to new members

The President welcomed the new members to Council, Mr W. F. McGonigle, GI3GXP, representing Zone F, and Mr A. W. Smith, GM3AEL, representing Zone G.

Appointments

It was resolved:

(i) that Mr R. J. Hughes, G3GVV, be appointed Executive Vice-President for 1971;
(ii) that Mr John Bazley, G3HCT, be appointed to serve as Council member for Zone B in place of Mr F. C. Ward, who relinquished the office on assuming the presidency;
(iii) that Mr J. R. Petty, G4JW, be appointed member for Zone A to fill the casual vacancy that had arisen.

Membership and affiliation

It was resolved:

(i) to elect 115 corporate members and 42 associate members;
(ii) to grant corporate membership to 12 associates;
(iii) to waive the subscriptions of seven members on the grounds of blindness or other disability;
(iv) to grant life membership to one member;
(v) to reduce the subscriptions of six members.

Constitution of committees

Council resolved to invite the following members to serve for 1971 on the committees indicated:

Education Committee
Council members: Messrs R. J. Hughes and L. E. Newnham.
Other members: Messrs G. L. Benbow, D. M. Pratt, J. W. Swinnerton and R. Wallwork.

Exhibition Committee
Council member: Mr L. E. Newnham.
Other members: Messrs W. R. Andrews, P. Balestrini, D. C. French, G. W. Norris, P. A. Thorogood and M. G. Wallace.

Finance & Staff Committee
Council members: Dr J. A. Saxton, Messrs B. D. A. Armstrong, R. J. Hughes, A. C. Morris, L. E. Newnham, W. A. Scarr and R. F. Stevens.
Other members: Messrs J. O. Brown and J. W. Swinnerton.

HF Contests Committee
Council members: Dr E. J. Allaway and Mr J. Bazley.
Other members: Messrs D. Andrews, R. L. Glaisher, J. C. Graham, M. Harrington, G. T. Peck (corresponding member of events), R. Polley, D. Thom and R. G. B. Vaughan.

MPT Liaison Committee
Council members: Dr E. J. Allaway, Messrs R. J. Hughes, G. Jessop, L. E. Newnham and R. F. Stevens.

Membership & Representation Committee
Council members: Messrs J. Bazley, R. J. Hughes, E. G. Ingram, A.W. Smith, C. H. Parsons, J. Petty and W. F. McGonigle.

Mobile Committee
Council member: Mr J. Petty.
Other members: Messrs M. E. Livermore, M. A. C. MacBrayne, W. J. McClintock, N. O. Miller, J. G. H. Pearce and G. E. Slimville.

Raynet Committee
Council members: Messrs L. E. Newnham and E.W. Yeomanson.
Other members: Messrs P. Balestrini, E. R. L. Bassett, R. Ferguson, Dr A. C. Gee, Messrs A. F. Hunter, S. W. Law, R. A. Ledgerton, T. I. Lundegarde and S. J. Scarborough.

Scientific Studies Committee
Council members: Messrs R. F. Stevens and G. M. C. Stone.
Other members: Messrs R. Flavell, R. A. Ham, M. Harrison*, D. Hayter, A. Law*, G. Mills*, C. E. Newton. A. Oliphant* and A. Taylor. (* corresponding members).

Technical Committee
Council members: Messrs B. D. A. Armstrong, G. R. Jessop and R. F. Stevens.
Other members: Messrs W. H. Allen, R. Baker, D. N. Corfield (corresponding member), G. C. Fox, J. P. Hawker, T. L. Herdman, P. Horwood, J. W. Mathews, H. W. Rees and D. M. Thomas (corresponding member).

VHF Committee
Council member: Mr G. M. C. Stone.
Other members: Messrs W. H. Allen, P. Balestrini, Dr D. Evans, F. E. A. Green, D. Hayter, J. H. Hum, A. Mynett and M. Wallace.

VHF Contests Committee
Council members: Messrs B. D. A. Armstrong and G. M. C. Stone.
Other members: Messrs J. Butcher, S. Harden, W. J. McClintock, C. Sharpe, R. Whitbread and I. F. White.

IARU Working Group
Council members: Messrs R. J. Hughes, E. G. Ingram, L. E. Newnham, R. F. Stevens, G. M. C. Stone and E. W. Yeomanson.
Other member: Mr J. C. Graham.

TVI Committee

Mr Stevens commented that at present tvi matters were dealt with by MPT Liaison Committee. He felt that this was not a satisfactory arrangement and suggested that tvi matters should be dealt with by a committee formed for that purpose.

It was proposed, therefore, that there should be a separate TVI Committee, and that Mr Swinnerton be asked to organize it. Mr D. Thomas was invited to serve on the TVI Committee.

Managers for 1971

It was resolved that the following managers be appointed for 1971:
QSL Bureau Manager—Mr A. O. Milne, G2MI;
Recorded Lecture Library Curator—Mr A. O. Milne, G2MI;
VHF Manager—Mr G. M. C. Stone, G3FZL;
Certificates Manager (HF)—Mr C. R. Emary, G5GH;
Certificates Manager (VHF)—Mr J. H. Hum, G5UM;
Slow Morse Practice Transmissions Organizer—Mr M. A. C. MacBrayne, G3KGU;
Intruder Watch Organizer—Mr C. J. Thomas, G3PSM.

It was also resolved that Mr P. J. E. Carey, G3UXH, be invited to act as Honorary Trophies Manager to the Society for 1971.

Representation—external bodies

The appointment to external bodies of the following members was confirmed by Council:
Mr R. F. Stevens—CCIR UK General Purposes Committee;
Mr R. F. Stevens—BSI Tele 24/1 and 25/2;
Mr L. E. Newnham—Frequency Advisory Committee;
Messrs R. J. Hughes, L. E. Newnham and W. A. Scarr—City and Guilds Radio Amateurs' Examination Advisory Board.
It was agreed that Mr R. G. Flavell should be invited to represent the Society on UK CCIR Study Group 5.

Dates of Council meetings for 1971

The dates for Council meetings for 1971 were agreed as follows:

Monday 8 February	Friday 6 August
Friday 5 March	Tuesday 7 September
Monday 5 April	Tuesday 5 October
Monday 3 May	Monday 8 November
Monday 7 June	Thursday 2 December
Wednesday 7 July	

It was also agreed that the Annual General Meeting should be held on Friday 3 December.

(Due to the postal strike the dates of the February and March meetings were subsequently amended to 15th and 12th respectively).

Regional Meetings
Council agreed to Mr W. A. Scarr's request for authority to hold a Region 9 ORM at Weston-super-Mare on 19 September 1971.

It was reported that the Region 12 ORM, originally to be held on 9 October 1971, was now to be held on 23 October 1971.

Secretary
Council approved the appointment of Mr D. A. Findlay as Secretary to the Society.

Committee minutes and recommendations
Council approved the minutes of the following committee meetings: VHF Committee (2.12.70); Membership & Representation Committee (3.12.70); HF Contests Committee (17.12.70).

Council also approved the following recommendations of the VHF Committee:

(i) that the Arthur Watts Trophy for work on 2,300MHz and above be awarded to the G5FK Group (GEC Research Centre Social Club, Radio Section);

(ii) that the Thorogood Trophy for an outstanding contribution to international vhf should be awarded to Mr John Stace, G3CCH.

G3EDD in the Antipodes

During a business visit to Australia and New Zealand towards the end of 1970, Mr B. Armstrong, G3EDD, 1970 Executive Vice-President of RSGB, was able to meet several radio amateurs in both countries. Here he is seen with Michael Owen, VK3KI (left) and Les Jenkins, VK3ZBJ (right)

Contests calendar

6–7 March—ARRL DX Contest (phone)
6–7 March—144/432MHz Fixed Station Contest (Rules in February issue)
13–14 March—BERU
14 March—WAB HF Phone Contest
20 March—Grafton's Annual Top Band Contest (phone a.m.)
20–21 March—ARRL DX Contest (cw)
21 March—1,296MHz Fixed Station Contest (Rules in February issue)
27 March—Grafton's Annual Top Band Contest (cw)
27–28 March—WPX SSB Contest
28 March—WAB HF CW Contest
3 April—Grafton's Annual Top Band Contest (phone ssb)
3–4 April—70MHz Open Contest (Rules in February issue)
3–4 April—70MHz Listeners Contest (Rules in February issue)
4 April—LP 80m (Rules in this issue)
4 April—WAB LF Phone Contest
11 April—WAB LF CW Contest
1–2 May—144MHz Portable (Rules in this issue)
21–23 May—YL ISSB QSO Party
22–23 May—432MHz Open (Rules in this issue)
5–6 June—NFD (Rules in February issue)
5–7 June—CHC/FHC (phone and cw)
20 June—WAB VHF Phone Contest
20 June—Microwave
27 June—70MHz Portable
3–4 July—Summer 1·8MHz
3–4 July—144MHz Open
3–4 July—144MHz Listeners Contest
10–11 July—HP FD (Rules in this issue)
18 July—432MHz Open
18 July—432MHz Listeners Contest
9 August—144MHz SSB
14–15 August—70MHz CW
4–5 September—VHF NFD (Rules in this issue)
12 September—80m FD
2–3 October—UHF NFD (Rules in this issue)
9 Oct–30 Dec—70MHz Cumulative
9–10 October—21/28MHz
23–24 October—7MHz (cw)
30–31 October—432MHz Fixed
6–7 November—144/432MHz CW
6–7 November—7MHz (phone)
6–8 November—CHC/FHC (phone and cw)
13–14 November—2nd 1·8MHz
5 December—144MHz Fixed

YOUR OPINION

The Editor
Radio Communication

Sir—In the light of my article "New Techniques for Amateurs" in the September 1969 issue of *Radio Communication*, I was particularly interested to see the article on trapezoid modulation by Dr Gschwindt, HA8WH, in the January issue. It is particularly interesting to compare the relative degrees of improvement of a clipper producing a trapezoid waveform and that using a sinusoidal waveform.

In the case of the former, Dr Gschwindt claims an improvement of only 3-4dB and indicates the probability of severe audio distortion by saying that speech clipping is undesirable at high signal levels. The distortion is, of course, masked under high noise conditions, nevertheless it is still there.

In the case of sideband clipping with a sinusoidal output at all frequencies, a measureable increase of 8-9dB on an integrating wattmeter is obtained, while an audible improvement of between 10 and 13dB is obtained under high noise conditions and with a limiting range of 20dB. Thus, where Dr Gschwindt indicates an effective power increase from 100W to 200-250W, the sinusoidal systems results in an effective power increase to 1kW at least. Furthermore, the system is still effective at high signal levels because of the relative absence of distortion.

It is assumed that the improvement cited by Dr Gschwindt refers to ordinary amplitude modulated transmitters (A3) since this kind of transmitter is shown in the block diagram. I notice that it is claimed that the described limiter can also be used with ssb, although the author cautiously recommends envelope clipping. This is because an ssb transmitter seriously loses efficiency if modulated

with square or irregularly shaped waveforms, there can even be a loss of gain in extreme cases. The inference is that if Dr Gschwindt's circuit was used with ssb, there would be a net gain of zero, and, I note with interest, he recommends envelope clipping and filtering for ssb use.

However, the author does everyone using some form of clipping a service in pointing out the need for what he calls a high frequency corrector, or pre-emphasis, to avoid the increase in bass response usually experienced with limiters. It does not seem to be generally realized that the voice energy spectrum shows a continuous drop with increasing frequency, so that for all speech frequencies to be limited equally a corrector that is the inverse of the energy spectrum should be used. Also pointed out is the need for the transmitter power supplies to be able to supply full power on a continuous basis because of the increased duty cycle with limited modulation.

Since I wrote my article I have been made aware of a very neat limiter unit put out by Comdel Inc of Beverly, Mass, USA, and now becoming available in this country. This unit, which fits between the microphone and the audio input, comprises a microphone amplifier, ssb generator and filter and ssb demodulator in one box. The degree of limiting is about 20dB and the unit provides all the advantages of a built-in sideband limiter while being utilizable with any kind of transmitter be it a.m., ssb or nbfm. The amount of circuitry involved is about the same as that described by HA8WH.

Yours faithfully
Geoffrey M. Ward, G3BOB

The Editor
Radio Communication

Sir—I refer to the article in the December 1970 issue of *Radio Communication* by G8AOD describing a stable vfo. The author has measured at —76dB at +400kHz. This is effectively a single sideband with carrier and can be resolved into a pair of fm sidebands plus a pair of a.m. sidebands, both at ±400kHz and both —6dB down on the resultant single sideband. Limiting in the frequency multiplier will remove the a.m. pair but the fm pair will be increased by the frequency multiplication factor of 18 times (25dB) or 54 times (35dB). Thus the final output will have ±400kHz sidebands at —76, —6 and +25 = —57dB on 435MHz or —71, —6 and +35 = —47dB at 1,296MHz. This seems at least potentially serious as other constructors making the device may drive the mixer harder to get more output. It is thought that a warning of the effect of multiplication on spurii may be worthwhile.

Yours faithfully,
B. Priestley, G3JGO

The Editor
Radio Communication

Sir—There is in existence in this country an "Air Training Corps Point-to-Point Network", licensed by the MPT and authorized by the Air Ministry for purposes of inter-squadron working in Great Britain, in order to train cadets in the correct procedures for cw and a.m. phone operation. In nearly all cases the officers and instructors are themselves licensed amateurs who are passing on their experience to the future amateur generation.

The network is divided into three groups, and callsigns consist of two letters one figure one letter two figures (eg the callsign of my squadron is VQ5X37). Nine spot frequencies between 3·2 and 5·6MHz are allocated for our use, four of these falling within the 80m shared band.

For years we instructors have tried to avoid using the 80m band for our communication so as not to upset our fellow amateurs. However, this year with the bands going dx'y early in the evening we have been forced to abandon our higher frequencies and come down to 80m. We are not allowed to divulge our QTH or Squadron Number on the air, and we refer to the various channels as A1-2-3 etc. The exchanges are very similar to those of amateurs and we get a fair amount of pirate trouble which we avoid by using this security. Recently, while working a squadron in Staffordshire, an amateur station, whose call I will not repeat for obvious reasons, came on the air on our frequency and said "Get off the air you bloody pirates—get a proper callsign and get out of our band". Despite my assurances that we were licensed, he persisted in this attitude till eventually for the sake of the young cadets I decided to go to another channel. This amateur by his action and language was seriously jeopardizing his licence since, even if we were pirates, his licence strictly forbids contact with anyone other than amateurs.

Now just suppose I had not been an amateur myself and had reported this to my group HQ—it's a sobering thought, isn't it? The point is that with 160m in the balance—any amateur who carries on in this fashion is also putting 80 in jeopardy, a stupid action dangerous to us all.

So please, a little tolerance for the ATC. If you hear us, move slightly up or down, we can't because we are forced to use spot frequencies.

Yours faithfully,
Ron Edwards, GW3BQY

RADIO AMATEURS' EMERGENCY NETWORK

by S. W. LAW, G3PAZ*

WHILE expressing some degree of gratitude to the anonymous correspondent to a national newspaper, during the postal strike, who pointed out that Raynet was available for urgent messages, we breathed a sigh of relief that the editor left in that portion of the letter which made it clear that this could only be done at the request of the police. We trust that no heart-burning was caused to any member of the public who might have misinterpreted the contents of the letter concerned.

RAEN Committee
Due to obvious publication difficulties the report on the meeting of 13 February has to be held over to the next issue. This also applies to the SE Controllers meeting at RSGB HQ on Sunday 7 February.

Water over the bridges?
Reference to this column in the February 1970 issue will remind members that we commented on the possibility of controllers listing residents in their areas who had the use of boats on trailers with a view to having such information available for user services during floods. So far we have not heard of any such lists being compiled, but we still feel that such information could be of value in flood-prone areas. Certainly it is a point to raise during discussions with user services.

As to overseas disasters, we are indebted to G8PX for information passed on in the form of a request from a very well-known charitable relief organisation regarding the possibility of radio communication with their members when engaged on disasters in other countries. This is a thorny question indeed. How the authorities in the UK would view the matter we cannot say, so for the moment the matter rests. We must first go further into our own extensions of privilege before touching the international angle.

Keeping your cool
We are indebted to GM4QK for a very informative letter on the subject of cooling problems in cars when at rest and generating. Not only are thermostatically controlled fans mentioned but the availability of the ac supply from the modern car alternator. The problem appears to be a challenging one but it would seem that GM4QK is working on the matter with determination.

Devon
It has been pointed out that we gave the new QTH of G4CG incorrectly some time ago. It should of course be N Devon and G4CG is in the process of getting a Raynet group under way. For the benefit of those in the Barnstaple area who are interested, G4CG is QTHR.

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

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

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

RSGB SLOW MORSE PRACTICE TRANSMISSIONS

These slow morse practice transmissions are sponsored by the RSGB. Alterations and additions to this list should be sent to the honorary organizer, Mr M. A. C. MacBrayne, G3KGU, 25 Purlieu Way, Theydon Bois, Essex.

Clock time	Callsign	MHz	Town
Sundays			
1000	G3WNR	1·920	South Shields, Co Durham
0930	G3HZL	1·940	Isleworth, Middlesex
0945	G3YRO	1·860	Fareham, Hants
0945	G3USK	1·975	Mablethorpe, Lincs
1000	G2FXA	437·000 to north	Stockton-on-Tees
1015	G3CGD	1·875	Cheltenham
1030	G2FXA	437·000 to south	Stockton-on-Tees
1030	G3NPB	1·875	St Ives, Cornwall
1030	G3ZNW	144·520 to east	West Molesey, Surrey
1030 †	G3YPG / G3XOQ	1·965	Horley, Surrey / Redhill, Surrey
1100	G2FXA	1·900	Stockton-on-Tees
1100	GW3UMB	1·880	Colwyn Bay
1130	G3KKU	1·940	Liverpool
1130	GW3VPL	1·918	Porthcawl, Glam
1130	G3VVP	1·880	Plymouth Devon
1200	G3HVI	1·890	Stoke-on-Trent
1200	G8GNS	1·910	Weston-super-Mare
1330	G3FWW	1·880	Burnham-on-Sea, Soms
1330	G3XDV	1·910	Canterbury, Kent
1400	G3XGJ	1·830	Huddersfield, Yorks
1930	G3YFO	144·19 to south	Burnham, Bucks
† Alternately			
Mondays			
1800	G3SWR	1·980	Birmingham
1830	G3NCZ	1·920	Blackburn, Lancs
1830	G3RXH	1·910	Skipton, Yorks
1900	G3WGU	1·880	Bispham, Lancs
1900	GC2FMV	3·600	Jersey, CI
1900	G3YJA	1·920	Coventry, Warks
1900 †	G3WFY / G3YEI	1·850	Thornton Cleveleys, Fleetwood, Lancs
1930	G2ABC	144·060 omni-directional	Woodford, Essex
2000	G3XWZ	1·910	Mansfield, Notts.
2000	G3KAN	1·990	Northampton
2000	G3IBJ	1·910	Southampton, Hants
2000 †	G3WDW / G3VTY	1·915	Leeds, Yorks
2015	G3YMH	1·845	Wraysbury, Middlesex
2030 †	G3YEB / G3PRN	1·915	Harlow, Essex
2030	G3JHM	70·050	Worthing, Sussex
† Alternately			
Tuesdays			
1800	G3XDV	1·910	Canterbury, Kent
1900 †	G3UFO / G3XAM	1·980	Wirral, Cheshire
1930	G3SWP	1·850	Doncaster, Yorks
1930	G3WGU	433·500 to south-east	Bispham, Lancs
1930	G3ZUM	144·144 to south	Iver Heath, Bucks
2000	G3TUW	145·200 to south-east	Banbury, Oxon.
2000	G3UPA	1·850	Merlden, Warks
2000 †	G3FAU / G3KSS / G3OVT	1·980	Stevenage, Herts
2000	G3FWW	1·880	Burnham-on-Sea, Soms
2000	G3WGD	1·860	Leicester
2000	GM3PIP	3·590	Mintlaw, Aberdeen
2030	G3HZL	1·845	Isleworth, Middlesex
2030	G3YMJ	1·915	Harlow, Essex
2030	G3RB	1·975	Whitley Bay, Nth'land
2100	G4RS	1·865	Blandford, Dorset
2200	G3HZM	1·925	Manchester
†Alternately			

Clock time	Callsign	MHz	Town
Wednesdays			
1830	G2FXA	1·900	Stockton-on-Tees
1900	G3YPZ	28·700	Harlow, Essex
1930	G3VVP	1·880	Plymouth, Devon
1930	G3WGU	433·500 to south-east	Bispham, Lancs
1930	G3YFO	144·19 to north	Burnham, Bucks
1930	G3UJD	1·825	Farnborough, Hants
2000 †	G3AJX / G3TWP / G3YSK	1·925	Winchester, Hants
2000	G8QU	1·970	London, N22
2000	G3JHM	70·050	Worthing, Sussex
2000	G3XGY	144,054	Weston-super-Mare
2015	G3UNV	1·845	Ashford, Middlesex
2030	G3KGU	1·915	Theydon Bois, Essex
2100	G3HVI	1·890	Stoke-on-Trent
† Alternately			
Thursdays			
1800	G3SWR	1·980	Birmingham
1830	GW3VBP	3·590	Barry, Glam
1830	GW3UMB	1·880	Colwyn Bay
1830	G3NC	1·968	Swindon, Wilts
1900 †	G3WFY / G3YEI	1·850	Thornton Cleveleys, Fleetwood, Lancs
1900	G3WGU	1·880	Bispham, Lancs
1930	G3GNS	1·910	Weston-super-Mare
1930	G2ABC	145·300 omni-directional	Woodford, Essex
1930	G3ZNW	144·520 to north	West Molesey, Surrey
2000	G3WDS	1·975	Carlisle
2030 †	G3SJE / G3GC	1·875	Harrow, Middlesex
2030	G3RSF	1·915	Harlow, Essex
2100	G4RS	1·865	Blandford, Dorset
2100	GW3XNI	1·930	Crosskeys, Mon
† Alternately			
Fridays			
1800	G3XDV	1·910	Canterbury, Kent
1830	G3NCZ	1·920	Blackburn, Lancs
1900	G3NPB	1·875	St Ives, Cornwall
1930	G3PQF	1·825	Farnborough, Hants
1930	G3ZUM	144·144 to south	Iver Heath, Bucks
2000	G3EEL	1·980	Peterborough
2000	G3WGD	1·860	Leicester
2000 †	G3KEP / G3UCZ / G3WTF	1·910	Bingley, Yorks / Pudsey, Yorks / Bradford, Yorks
2015	G3SAZ	1·845	Ashford, Middlesex
2030	G3JHM	70·050	Worthing, Sussex
† Alternately			
Saturdays			
0930	G3UNV	1·935	Ashford, Middlesex
0930	G3YZZ	3·590	Maidenhead, Berks
1000	G3PLE	1·820	Stourbridge, Worcs
1300	G2FXA	1·900	Stockton-on-Tees
1400	GC2FMV	3·600	Jersey, CI
1730	G3TNF	1·980	Gateshead
1930 †	G3ZEN / G3ZRR	1·915	Mitcham, Surrey / Thornton Heath, Surrey
2000	G3KPO	1·980	Peterborough
† Alternately			

G3BZU morse proficiency transmissions at 20, 25, 30, 35 and 40wpm are made at 1900 gmt on the first Tuesday of each month on a frequency of 3·520MHz. For 100 per cent copy at 20wpm a certificate is awarded, and endorsement stickers are available for 100 per cent copy at the higher speeds. A charge of 10p or two IRCs is made for the basic certificate, and 2½p or one IRC for each endorsement sticker claimed. All claims should be sent to–The QRQ Manager, RNARS, HMS *Mercury*, Leydene, Petersfield, Hants.

CONTEST NEWS

Ninth 7MHz Contest Results

The **CW Section** of the above contest held on 24–25 October 1970 brought in 150 entries, only two less than in the previous year.

The winner of the Thomas (G6QB) Memorial Trophy was a newcomer to the event, J. Bazley, G3HCT, with a score of 3,479 points from 297 logged contacts. The runner-up, with 2,817 points, was D. G. Alexander, G3KLH, with 273 logged contacts, while K. Spicer, G3RPB, another newcomer, was third with 2,771 points from 250 contacts. The leading overseas entrant was C. Coleman, W2NQ, with a score of 1,685, followed by A. I. Brusentzov, UV9CO, with 1,408 points.

The entry from listeners was very poor, with two from the UK and five from overseas. Yet another newcomer, N. J. Whiting, A5811, was the leader with 794 points, and H. G. T. Newman, BRS31430, was second with 762 points. The leading overseas listener was T. P. Kaikiev, LZ1-I-133, with 595 points.

The **Phone Section** held on 7–8 November 1970 also had a slightly lower entry than 1969. The winner, by a margin of 530 points, was L. M. Lyske, GI3CDF, giving him a total of three wins in this section, the two previous ones being in 1964 and 1965. The runner-up was last year's winner, J. H. Fish, G4MH/P, once again operated, under supervision, by G3WAH. Third place went to R. Balister, G3KMA, who was fourth in 1969 and fifth in 1968.

The leading overseas entrant was J. W. Stratton, ZC4JW, with a score of 1,050 points; H. McQuillan, EP2BQ, third highest last year and leader in 1968, being runner-up with 883 points.

Listeners sent in 31 entries this year compared to 33 in 1969. Once again J. Skidmore, BRS26431, was the winner, thereby recording his fourth consecutive win in this event. Runner-up was S. Cole, A6148, who was third last year (as GW-13149), while N. Peacock, A5489, was third.

In the cw section G3HCT used a Drake T4X with R4A together with a ground-plane, an inverted-V and a $3\frac{1}{2}\lambda$-long wire, while G3KLH used an NFD transmitter with a linear, a home-brew receiver with an inverted-V dipole; G3RPB had a home-brew transmitter, HRO receiver and $\frac{1}{2}\lambda$ inverted-L end-fed aerial.

The phone section leader had a KWM-2 with a linear, a dipole at 60ft and a ground plane with 48 radials, while G4MH/P used a Trio TS510 with KW600 feeding a G8KW trap dipole and a ground-plane. K3KMA had a KW2000A with an inverted-V at 50ft.

The listeners cw section winner used a modified 19 set with a converter and a G8KW trap dipole, while the phone section winner continued with his Trio JR-500SE and 100ft-long end-fed aerial.

Once again there were very few comments from contestants apart from those on the contest clashing with other contests.

Many entrants in the cw section will find that their scores have been increased. This is due to the new Russian callsigns in use by club stations. Details are given on page 396 in the June 1970 issue of *Radio Communication*, and all logs were rescored as many entrants combined, for example, all UK2 contacts as one country whereas they could be four countries.

In the phone section all contacts with W/K stations have been deleted, as contacts between USA amateurs between 7·1 and 7·3MHz and UK amateurs below 7·1MHz are not permitted (see page 868 December 1969 *Radio Communication*).

On the whole, logs were of a satisfactory standard with only three that caused a lot of trouble. Two were in pencil (for one a 3H appeared to be used) and in one log the handwriting left a lot to be desired. There were many duplicate contacts logged and claiming points, and two entrants just escaped disqualification under General Rule 11(e). Several entrants in the receiving section overlooked Rule 6(ii), which necessitated considerable reductions in their scores, and five entrants did not give an address.

The committee gratefully acknowledges check-logs from DM4HG, F8VA, HA8CH, LA2GN, OK1AHN, SM5UU, SM5EUL, SP6DED, SP6DLZ, SP8BAB, UA1DX, UB5EX, UK5UAO, UW6CW, YO3QK and DM4223/G.

CW SECTION, TRANSMITTING

Posn	Callsign	Points
1	G3HCT*	3,479
2	G3KLH*	2,817
3	G3RPB*	2,771
4	G3ESF	2,553
5	G3YDX	2,526
6	G3BRK	2,300
7	G3PDL	2,240
8	G8PB	2,190
9	G2DC	2,095
10	G2QT	2,003
11	G3XAP	1,925
12	G3MGL/A	1,730
13	G3VYI	1,700
14	W2NQ*	1,685
15	G3TVW	1,625
16	G3TBK	1,505
17	UV9CO*	1,408
18	W2LXK*	1,335
19	G3JKY	1,265
20	EI9ONE	1,208
21	DJ8CRA	1,201
22	UF6DA	1,175
23	DJ2PJ	1,155
24	G5AQO	1,120
25	F8OP	1,115
26	G3UFY	1,070
27	G3XWZ	1,067
28	G3GSZ	1,055
	G8QZ	1,055
30	UW9AI	1,025
31	F6BBQ	1,015
	G8KU	1,015
33	G8HX	988
34	UA2CD	965
35	PA0JR	960
36	OK2BKV	955
37	F6AAV	950
38	G8YCT	945
39	UP2CT	942
40	DJ3XK	915
41	F9LT	880
42	HA8AC	865
43	UK5KAA	864
44	UK2ABC	855
45	G3ZDD	847
46	G3ZOQ	845
47	UK5VAA	835
48	UA1ZX	822
49	G2GM	820
50	UB5MZ	805
51	UA3DAK	800
52	UC2RL	795
53	UK3AAO	790
54	F9NF	780
55	UK2GAA	772
56	G3ICH	750
	UF6FAL	750
58	OK3TBY	740
59	UL7JE	733
60	UR2TAX	730
61	DJ1QQ	725
	SP8ECV	725
	UK5UAR	725
64	9H1BP	715
65	LZ1SS	705
66	OZ2UA	705
67	F8TM	690
68	LA1OA	680
69	YU1SF	660
70	LZ2IM	655
71	F6ACD	650
72	G3XFG	645
73	OK1KYS	640
74	UA3NP	635
75	SM7BUG	625
76	UA3LAA	620
77	G3YWX	610
78	OK1AFN	605
	YO8AFP	605
80	OK1ASG	595
81	UK1AAG	582
82	G3KSH	575
83	UK6LDX	565
84	SM7DCW	560
85	F6ABI	555
86	OK2PAW	550
	SP5ATO	550
	UL7GW	550
89	UK5MAG	545
90	UB5VK	544
91	DM3XHF	530
	UR2RJ	530
93	G5DZ	520
	PA0HOP	520
95	SM0BDS	505
	UK4WAC	505
97	LZ1NJ	500
98	ON5EU	500
99	F2VO	495
100	UK5MAA	482
101	UA1SW	480
102	SP5AIB	475
	UT5BW	475
104	YU1KA	470
105	G2FNK	465
106	LZ2KWR	460
	SM2ALU	460
108	OH7NW	455
	UA3QO	455
110	F9KP	445
	UA3VA	445
112	UV3HD	435
113	UC2WG	430
114	UK6FAA	425
	UQ2PP	425

Posn	Callsign	Points
116	UT5XB	417
117	UA6UX	410
	UK4WAB	410
119	UY5TH	400
120	UW1LW	395
121	OK1MSP	365
122	OK1BLC	355
	UQ2AQ	355
124	HA6NA	345
125	UK2FAM	342
126	F6AMA	340
127	SP9DBK	330
128	G3ZOD	325
129	SP8MJ	320
130	OK2PDL	305
	WA2LDX	305
132	OK1AIA	300
133	OK1AIN	290
	UP2AW	290

Posn	Callsign	Points
135	G3LCH	265
136	UY5OO	250
137	W5TVW	240
138	UA4SD	237
139	OK1KLX	235
140	YU4VXW	225
141	SP2MBX	220
142	LA9M	205
	LZ2RF	205
144	SP5ASY	185
145	SM7CMV	175
146	OK2BBQ	170
	UB5ZAL	170
148	DM3BE	155
149	F3BX	130
150	K2EKM	110

PHONE SECTION, TRANSMITTING

Posn	Callsign	Points
1	GI3CDF*	1,922
2	G4MH/P*	1,392
3	G3KMA*	1,323
4	G3SWX	1,287
5	G2FNK/A	1,090
6	ZC4JW*	1,050
7	G2QT	1,040
8	EP2BQ*	883
9	SM6BZV*	830
10	PZ1AH	825
11	G3KSH	810
12	G3SNN	795
13	DL8JS	784
14	G3WFT/A	767
15	G2DC	750
16	OD5BA	720
17	F2VX	660
18	F9KP	642
19	GC3YIZ	570
20	G5DZ	550
21	OZ3SK	450
22	SM7AIL	442
23	HB9DX	395
24	LA5UJ	385
25	UK2BBB	380
26	LA5KO	350
27	YU1NOL	335
28	LA3LC	250

CW SECTION, RECEIVING

Posn	Callsign	Points
1	A5811*	794
2	BRS31430	762
3	LZ1-I-133*	595
4	UA4-1522*	530
5	OK1-12233*	522
6	UA2-125-57	450
7	SP8-1079	60

PHONE SECTION, RECEIVING

Posn	Callsign	Points
1	BRS26431*	1,732
2	A6148*	1,340
3	A5489	1,240
4	A6075*	1,070
	BRS25429	1,070
6	A6768	1,045
7	BRS31341	1,020
8	A6265	970
9	BRS28198	870
10	BRS26870	810
11	L. Randall	737
12	BRS28201	715
13	A7199	675
14	SM5-2735*	617
15	BRS20249	570
16	DM-EA-5101/O*	564
17	SM0-3589	540*
18	BRS29592	535
	A6979	535
20	DM2703/A	527
21	A4253	525
22	SP-1-8189	480
23	DM4238/0	465
24	SP2-1157	460
25	BRS31172	440
26	I1-12387	400
27	A6117	320
28	D. Kientzel (21295)	300
29	SP8-1079	255
30	DM-EA-4836/0	230
31	ONL-1090	205

* Certificate winners.

28MHz Telephony Contest 1970

John Graham, G3TR, a Past President of the RSGB, won the Whitworth Trophy, awarded to the UK winner of this contest, after three attempts. After operating non-stop throughout from 0700 to 2030 on the first day and 0615 to the close on the second day, he had amassed over 770 contacts. Contained in this total were 107 bonus contacts including all USA and Canadian call areas.

Placed second, some 600 points behind, was R. Hassell-Bennett, G3WJN, who made more than 720 contacts with 93 bonus areas. G3WJN, like G3TR, operated practically continuously over similar times.

Third place was contested very closely by two stations. After being checked and re-checked by the Contests Committee, L. M. Lyske, GI3CDF, was finally adjudged to be third, just 41 points ahead of D. F. Beattie, G3OZF. GI3CDF operated as EP2GI on the last occasion he entered the competition.

Conditions for the event were stated almost without exception to have been excellent on the Saturday but only fair on the Sunday. This can be judged from the fact that G3TR made 670 contacts on the first day. On the second day, so far as can be gleaned from the entries, the USA and Canada were completely blanked out for the UK. If this had not been so it is possible that the leading stations would have topped the 1,000 contacts mark. There were many dx stations on, including some rare callsigns such as HS, TR8, DU, HM, TA and 8P6.

Western European stations were as rare as some of the dx prefixes; DL, F, SM, LA and OH were very scarce and were very popular for bonus points. The USSR contributed a considerable number of stations and many sent in entries, as reference to the overseas results table will show. The change in prefixes for club stations in Russia appeared to cause confusion with UK operators and listeners. This has resulted in adjustments to bonus claims. Details can be found regarding the changes on p396 on the June 1970 issue and p38 of the January 1971 issue of *Radio Communication*.

The overseas section was won by T. A. Wilson, EP2TW, with a 700 points margin. The following four places were fought for so closely by Russian stations that less than 100 points separates them all. EP2TW made 375 contacts with Great Britain, which is a remarkable figure. The HF Contests Committee wishes to express its disappointment that only 41 UK operators submitted an entry; this is surprising when it can be seen that some made hundreds of contacts with overseas stations.

The receiving section was won by J. Skidmore, BRS26431, with a near faultless entry. Second was J. K. Harvey, BRS19682, with S. D. Williams, A5904, third. This section maintains its popularity but the HF Contests Committee feels that it must point out that some logs leave a little to be desired. Inaccuracies were common and simple addition was also a difficulty. On the other hand the committee does appreciate that a listener cannot ask for a repeat over a doubtful figure, and some bad practices by operators regarding their callsigns do make it difficult for a receiving station.

Comments received were generally favourable regarding the duration and rules of the contest. There were criticisms of non-participants calling the dx stations, creating excessive QRM, despite the fact that the dx operator said "CQ G Contest only". As this happens in all contests of this nature it seems we have to live with it despite our appeals.

G3TR used an FL200B into an Elan at 72ft with an FR100B receiver. G3WJN also had an FL200B to a G3HCT aerial with a Drake R4B receiver. GI3CDF used a KWM-2 to a Hy-Gain TH3. The overseas winner, EP2TW, used a Heathkit SB101 transceiver with an SB640 remote vfo and an SB200 linear amplifier. This was used with a TA33jr 3-element beam at 45ft.

The HF Contests Committee wishes to thank the following stations for their welcome check logs. AX4RZ, G2FLG, K4OVE, PY1CZL, RA3ABP, RA0UBG, UV3DN, UW6FB and 7P8AB. An illegible log was also received from WA2BYJ and could not be accepted.

OVERSEAS, TRANSMITTING

Posn	Callsign	Points
1	EP2TW	2,770*
2	UW3IN	2,062*
3	UB5FG	2,030*
4	UK6LEZ	2,025
5	UY5HB	1,970
6	MP4BHL	1,815
7	UA3OG	1,730
	9H1CB	1,730
9	G3LZQ/ZS4	1,600
10	TA3HC/1	1,580
11	RB5VAS	1,545
12	ZS6ACK	1,505
13	UY5EM	1,400
14	UK5QAU	1,390
15	RB5IIB	1,380
16	UA6DV	1,370
17	RB5QAO	1,310
18	UW3FW	1,255
19	K1CSJ	1,250
20	W2DKM	1,240
21	UW3EH	1,215
22	RA3NAM	1,185
23	AX6HT	1,175
24	UA4CZ	1,170
25	VE3GCO	1,150
26	W3AZD	1,140
27	CR7IZ	1,135
28	OH5UQ	1,120
29	OA8V	1,115
30	W1TSL	1,095
31	UT5OV	1,090
32	VP9GE	1,085
33	UD6BD	1,060
34	RO5OAU	1,055
35	CE8AO	1,035
36	RC2WAQ	1,025
37	RJ8JBR	1,005
38	CT1LN	990
39	UY5HG	980
40	UW6LC	970
41	W8IMZ/8	945
42	W2LEJ	920
	WA8OWG	920
44	CR6TP	910
45	UV9PI	895
	W4DQD	895
47	OD5BA	890
48	K8ONV	850
	W0MGI	850
50	RA1AAT	845
	RA3DBQ	845
52	K7PXI	800
	UK5IAZ	800
54	W1FLN	757
55	K3TVE	755
56	UK3WAB	745
57	RA3UAF	720
	UA6HBE	720
59	LZ1KDZ	710
60	UA9TT	705
61	UH8BO	685
62	K7RDH	667

Posn	Callsign	Points	Posn	Callsign	Points
63	UB5RZ	650	79	UC2DN	325
64	TR8DG	635	80	RA1AET	320
65	W5KHP	630	81	CE3ZW	305
66	UP2ER	605	82	W9ITD	265
67	OH9NV	600	83	UW9CR	250
68	UA6PG	550	84	UK9HAB	240
69	WA0KDI	510	85	RA0LEH	235
70	UA1KAE	505	86	UK4ABA	215
71	WA6GLD	470	87	AX2AHH	205
72	OH80W	440	88	UK2GBI	180
	RA3DCF	440	89	RD6DEQ	165
	UA0TO	440	90	YO2QC	125
	UK8HAA	440	91	JA3HTT	115
76	UA0SH	430		RP2PBF	115
77	K8AEY	410	93	WA0EPG	77
78	W3CBF	370	94	JA6IYF	65

UK, RECEIVING

Posn	Identification	Points	Posn	Identification	Points
1	BRS26431	7,131*†	22	A7199	4,190
2	BRS19682	6,925*	23	G-13124	4,187
3	A5904	6,870*	24	BRS28005	4,175
4	BRS29473	6,386	25	BRS31152	4,045
5	BRS31976	6,280	26	BRS27330	4,035
6	BRS21108	6,125	27	A5032	3,935
7	R. Shilvock	5,895	28	BRS28201	3,885
8	BRS29909	5,595	29	A6830	3,880
9	A6148	5,540	30	BRS32123	3,792
10	G-10058	5,415	31	BRS30628	3,635
11	A5489	5,405	32	BRS26234	3,465
12	BRS26407	5,330	33	BRS31172	2,850
13	A6003	5,165	34	BRS26870	2,720
14	A6768	5,040	35	G-6903	2,670
15	BRS26003	4,845	36	A6403	2,645
16	BRS27806	4,835	37	BRS20249	2,325
17	A6248	4,815	38	A7065	1,995
18	BRS28198	4,580	39	BRS29592	1,970
19	A6214	4,335	40	A6098	1,645
20	BRS32117	4,325	41	A6607	1,535
21	BRS24957	4,250	42	A4253	935

OVERSEAS, RECEIVING

Posn	Identification	Points	Posn	Identification	Points
1	UB5-07325	1,715*	4	UC2-009-108	1,010
2	UB5-073-389	1,335*	5	UD6-00162	730
3	WPE2QKU	1,145*	6	JA1-11539	165

UK, TRANSMITTING

Posn	Callsign	Points	Posn	Callsign	Points
1	G3TR	8,871*†	22	G3YBH	3,289
2	G3WJN	8,239*	23	G3KWH	2,800
3	GI3CDF	7,799*	24	G3MWZ	2,790
4	G3OZF	7,756	25	G3YFZ	2,750
5	G3VVU	7,597	26	G3NXT	2,690
6	G6PD	7,305	27	G3WZM	2,565
7	G5HZ	7,040	28	G3MGW	2,500
8	G3YBM	6,955	29	GC3XOJ	2,275
8	G2QT	6,730	30	G3VPS	2,165
10	G3LHJ	6,710	31	G2AJB	2,080
11	G3WZT	6,545	32	G3SEM	1,885
12	G3UQR	6,260	33	G3ZOQ	1,805
13	G3YBT	6,085	34	G3WOU	1,775
14	G3NAS	6,065	35	G3KMA	1,765
15	GW3NWV	5,200	36	G3KS	1,700
16	G3FWA	4,822	37	G3GXO	1,592
17	G3SWX	4,795	30	G3NSY	1,265
18	GC3YIZ	4,780	39	GC3ZIP	1,145
19	G5DZ	3,685	40	G8KU	885
20	G3ILO	3,475	41	G3WDI	875
21	GW3BOC	3,350			

* Certificate winner
† Trophy winner

80m Low Power Contest

1. **The General Rules** for RSGB HF Contests, as published in the January 1971 issue of *Radio Communication*, will apply.
2. **When.** 0900gmt to 1600gmt Sunday 4 April 1971.
3. **Contacts.** CW (A1) only in the 3·5–3·6MHz band. The location of the station must be sent.
4. **Scoring.**

Max power to pa	0·5	1	2	3	4	5 (watts)
Points	100	50	25	15	10	5

5. **Logs.** Column (5) must be headed "Location as received" and (6) "My Power". Entries must be addressed to HF Contests Committee, c/o D. Thom (G3NKS), 6 Bracken Close, Copthorne, Crawley, Sussex.
6. **Trophy.** The 1930 Committee Cup will be awarded to the winner.

High-power Phone CW HF Field Day, 10–11 July

In view of the limited support given to the experimental cw high-power hf field day events, the HF Contests Committee has been considering whether to include this particular contest in the 1971 calendar. As an alternative to its deletion it has been decided to widen the scope of the contest by permitting both cw and telephony operation. It is hoped that this change in rules will encourage those groups who are finding it difficult to field a full team of cw operators.

1. **The General Rules for HF Contests**, as published in the January 1971 issue of *Radio Communication*, will apply, except as amended below. For the purpose of Rule 4 this is a portable contest as defined in (b).
2. **When.** From 1700gmt on Saturday 10 July to 1700gmt on Sunday 11 July 1971.
3. **Eligible entrants.** Any group of RSGB members resident in the British Isles, or any affiliated society either in the British Isles or overseas.
4. **Stations.** Each group may operate one portable station on any or all of the 3·5, 7, 14, 21 or 28MHz bands. Simultaneous operation on two or more bands is not allowed.
5. **Power.** The dc input to the final stage(s) of the transmitter must not exceed 150W (or the equivalent rating for ssb operation.
6. **Contacts.** Entrants may use cw (A1) or telephony (any mode as permitted by their licence conditions), or any combination of modes as desired.
7. **Scoring.** Three points may be claimed for each completed contact with a fixed station, and six points for each completed contact with a portable station.
8. **Logs** must show if the contact was on cw or telephony.
9. **Awards.** Certificates will be awarded to the three leading groups and to the fixed station whose check log shows that he gave the highest number of contacts to entrants.
10. **Entries** must be addressed to HF Contests Committee, c/o R. L. Glaisher, G6LX, 279 Addiscombe Road, Croydon, CR0 7HY.

May 1971 144MHz Portable Station Contest

The contest has again been divided into two sections.
Section 1 1800gmt 1 May to 1800gmt 2 May.
Section 2 0900gmt 1 May to 1800gmt 2 May.
All entries and check logs must be sent to the adjudicator addressed to VHF Contests Committee, c/o J. B. Butcher, G3LAS, 7 Barclay Close, Hertford Heath, Hertford, Herts.
The following **General Rules,** as published in the January issue of *Radio Communication,* will apply: 1, 2, 3, 4b, 5a, 6a, 7a, 8c, 9a, 10a, 11–24.

Grafton's Annual G2AAN Top Band Contest

Dates: Phone a.m. only Section—20 March.
CW only Section—27 March.
Phone ssb only Section—3 April.
Times: 2130 gmt to 2400gmt all sections.
Rules: As always before, one point per contact, any station may be worked only once in each section of the contest. RST (or RS) reports shall be exchanged followed by a serial number starting anywhere between 001 and 100 increasing by one throughout the whole contest.

All reports to be acknowledged, Competing stations shall call "CQ GRS" on cw, "CQ Grafton AM Contest" on phone, "CQ Grafton SSB Contest" on ssb phone.

Logs bearing the usual signed declaration should be sent to G3KEB at 23 Richmond House, East Street, London SE17, and must be postmarked not later than 14 April, 1971. Logs are required for two sections only—cw is a "must" plus one phone section, a.m. or ssb. Blank log sheets and copies of the rules are available from G3KEB on receipt of an sae.

Certificates will be awarded to the two highest scores in the whole contest, and further certificates to the winners of each section.

NFD 1971

Rules for NFD 1971 were published on page 130 of the February 1971 issue of *Radio Communication*. Each year the HF Contests Committee is obliged to disqualify a number of entrants who have neglected to comply with the rules. Please get your club contest organizer to read the rules carefully **now.**

Rules for VHF NFD 1971

There have been several changes in the rules for this event. The duration of the contest has been reduced by two hours. Band multipliers have been revised and rule 13(c) should be noted.

Groups wishing to enter the IARU Region 1 VHF Contest, which coincides with VHF/NFD should note Rule 19. Entries for Fixed Station sections of the IARU event should be sent to the address given in Rule 20.

1. Duration
From 1800gmt 4 September to 1600gmt 5 September. Entrants should note that the IARU Contest continues for a further two hours until 1800gmt.

2. Bands
The 70MHz, 144MHz, 432MHz and 1,296MHz bands only will be used.

3. Eligible entrants
Any RSGB member or group of members operating within the British Isles may take part.

4. Operators
(a) Operators of stations taking part in the contest must each hold a current British Isles amateur (sound) licence and must be fully paid up corporate members of the RSGB at the time of the contest.
(b) Points may not be claimed for contacts with stations operated by, or using the callsigns of, operators of the competing station or group of stations.

5. Power supplies
Stations may not use public supply mains. Power for all equipment must be derived from an on-site portable generator or battery.

6. Stations
Each competing group will be permitted a maximum of three stations, each using a different callsign. Only one station may operate on a given band. There is no restriction on the way in which the bands are divided between the stations (eg 70MHz and 432MHz on one station, 144MHz on another, to form a two station entry). Special event callsigns (eg GB) may not be used.

7. Sites
All the stations forming one entry must operate from the same site. The Field Day site is defined as a circle of 1km radius centred on the operating position of any of the stations.

8. Groups
Any two groups may combine their score to form one entry, subject to the requirements of Rules 6 and 7.

9. Setting-up time
All equipment, including aerials, must be installed on the site (as defined in Rule 7) during the 12 hours preceding the contest or during the contest. The site may not be used for any transmitting activities by the group or member during the five days before this time.

10. Power
The dc input power (as defined by the terms of the licence) shall not exceed 25W to any rf stage of the transmitter.

11. Scoring
(a) On the 70, 144 and 432MHz bands, contacts will be scored as follows:

km	Points	km	Points	km	Points
0–50	1	200–300	10	600–700	26
50–100	3	300–400	14	700–800	30
100–150	5	400–500	18	800–900	34
150–200	7	500–600	22	900–1,000	38
				over 1,000	50

(b) Band multipliers will be applied as follows: 70MHz—2, 144MHz—1, 432MHz—6.
(c) On 1,296MHz scoring will be at one point per kilometre plus 30 points per QSO.

12. Contest exchanges
(a) Contestants must exchange RS or RST reports followed by a serial number. Serial numbers start at 001 on each band and advance by one for each contact.
(b) Contestants must send and log both QTH and QRA Locator. The QTH must be a point which is identifiable on the Ordnance Survey Ten-mile Map, or a distance in kilometres and a bearing from such a point. The distance must not exceed 25 kilometres and should be given to the nearest kilometre. The QRA Locator is the standard location fixing system.
(c) The QTH given on 1,296MHz must differ in form from that given on the other bands, eg a location given as "10km north of Marlborough" on 432MHz could be given as "8km south-east of Swindon" on 1,296MHz.

13. Contacts
(a) Only one contact may be made with a given station (ie callsigns that are fixed, /P, /A or /M, or the same set of equipment used under a different callsign, all count as one station). If a station that has moved location is contacted a second time, only the higher scoring contact may be claimed.
(b) Repeat contacts must be clearly marked as such and the points column left blank.
(c) Contacts on any band shall not be pre-arranged on any other band.

14. Calling CQ
Contestants are asked to indicate on which band they are calling CQ and are strongly urged to state their tuning intentions, and to call CQ in the frequency zone as defined in the January 1970 *Radio Communication*.

15. CW segments
Any station operating on modes other than A1 or F1 in the segments 70·025–70·1, 144–144·15, 432–432·1 or 1,296–1,296·15MHz is liable to be disqualified.

16. Defective signals
Stations that persistently overmodulate, radiate key clicks or poor quality signals, or transmit excessive harmonics, are liable to disqualification or loss of points. Monitoring stations will be in operation.

17. Proof
Proof of contacts may be required.

18. Disputes
The decision of the Council of the RSGB is final in any cases of dispute.

19. Logs
(a) Logs must be submitted on RSGB Contest Log Sheets. Separate logs must be submitted for each band. Groups wishing to have their logs forwarded to the IARU Region 1 VHF Contest should enter the distance in kilometres in the points column and the score as Rule 11 on the rear of the sheet.
(b) Entrants must keep their own log records in accordance with the licence requirements.

20. Entries
(a) Entries must be post-marked not later than 20 September 1971.
(b) Entries must be marked VHF NFD in the top left-hand corner of the envelope and addressed to: The Secretary, VHF Contests Committee, 108 Gascoigne Road, New Addington, Croydon, Surrey, CR0 0NE.
(c) A cover sheet (Form 427) must be made out for each band and must show the callsigns of all operators.
(d) In addition to the Forms 427, a special summary sheet must be forwarded, even by single-band entries. The declaration must be signed by one member of the group, who will be considered responsible for the entry.

21. Awards
At the discretion of Council, the Surrey Trophy will be awarded to the overall winners, and Certificates of Merit will be awarded to the overall runner-up, the leading entry from each country and the highest scoring station on each band.

May 1971 432MHz Open Contest

1700gmt 22 May to 1600gmt 23 May.
All entries and check logs must be sent to the adjudicator addressed to VHF Contests Committee, c/o C. Sharpe, G2HIF, 20 Harcourt Road, Wantage, Berkshire.
The following **General Rules,** as published in the January issue of *Radio Communication*, will apply: 1, 2, 3, 4b, 5a, 6a, 7a, 8a, 9a, 10a, 11–24.

Looking ahead

26 March—RSGB Dinner Club, Kingsley Hotel, London WC1.
17 April—VHF Convention, Whitton.
9 May—NRSA Convention.
17 May—World Telecommunication Day.

CLUB NEWS

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

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

REGION 1 — RR B. O'Brien, G2AMV

Special regional event:
9 May, 1971 Belle Vue Convention.

Merseyside Luncheon Club—First Monday each month, 12.30 for 12.45pm, HMS *Landfall*. Please advise G3VQT or G2AMV beforehand if you wish to attend.
Ainsdale (ARC)—3, 17 and 31 March, 8pm, "The Morris Dancers" Scarisbrick.
Allerton (Liverpool) Scout ARS North West Region—Thursdays, 8pm, 1st Allerton Group headquarters, Aigburth Vale, Liverpoo l17. All Scouts interested in amateur radio are welcome.
Blackburn (East Lancs ARC)—First Thursday 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 at 7.30pm.
Bolton (B & DARS)—Please note new meeting place. Clarence Hotel, 176 Bradshawgate, Bolton. Meetings will in future be held on alternate Wednesdays, 10, 24 March, 7 April. (Note, not Tuesdays as before).
Bury (B & RRS)—Meetings take place once a month on the second Tuesday at 8pm, in the George Hotel, Market Street, Bury. Secretary, A. Cooper, G3VVQ, 411 Holcombe Road, Greenmount, Bury.
Carlisle (C & DARS)—Mondays, 7.30pm, Currock House, Lediard Avenue, Currock. Secretary, A. Harper, 23 Roman Way, Carlisle.
Cheshire (Mid-Cheshire ARC)—Wednesdays, 7pm, Technical Activities Centre, Winsford Verdin Grammar School, Grange Lane, Winsford. All meetings begin with a morse class, the main feature is at 8pm.
Chester (C & DARS)—Tuesdays, except the first Tuesday in the month which is net night, 8pm, YMCA, Chester.
Crewe—Local members continue to meet at the QTH of R. Owen, 10 Circle Avenue, Willaston, Nantwich, from whom further details may be obtained.
Douglas (D & DARS)—Second and fourth Wednesdays in the month, 7pm, Douglas Holiday Camp, Victoria Road, Douglas, Isle of Man. Secretary, J. Parnell, Upper Cronkbane Farm, Quines Hill, Port Soderick, Braddan, Isle of Man.
Eccles (E & DRC)—Tuesdays, 8pm, Bridgewater School, Worsley, Lancs. Thursdays—Club top-band net, 2030gmt.
Leyland Hundred (LHARG)—Net nights: Thursdays at 2000gmt, 1,915kHz. Saturdays at 1900gmt, 145·8MHz.
Liverpool (L & DARS)—Tuesdays 8pm, Conservative Association Rooms, Church Road, Wavertree. Secretary, G3WCS, Ken Wood, 90 Childwall Valley Road, Liverpool 16.
Liverpool (NLRC)—12, 26 March, 9 April, 8pm, Labour Party HQ, 13 Crosby Road South, Liverpool 22. Secretary, M. Graham, G3XMG, 14 Albert Road, Waterloo, Liverpool 22.
Manchester (M & DARS)—Wednesdays, 7.30pm, 203 Droylesden Road, Newton Heath, Manchester 10.
Manchester (SMRC)—The vhf section of the club (G3UHF) meets Mondays at 8pm, at the club shack, "Greeba", Shady Lane, Manchester 23. Visitors are welcome on both Mondays and Fridays. Main club meetings at Conservative Association Divisional Office, 449 Palantine Road, Northenden, Manchester 22, at 8pm.
Preston (PARS)—4, 18 March, 1 April 7.30pm, "Windsor Castle" (private room), St Paul's Square. Secretary, G. Windsor, 26 St Gregory's Road, Preston.
Salford (Dial House Radio Society)—A society of GPO Engineers. Wednesdays, 6pm, 8th floor (river end), Dial House, Chapel Street, Salford 3. Further details from secretary at the same address.
Stockport (SRS)—Second and fourth Wednesdays, 8pm, The Blossoms Hotel, Buxton Road, Stockport. Further details from the secretary, G8BCG.
Thornton Cleveleys (TCARS)—First and third Wednesdays each month, 8pm, St John Ambulance Brigade Hall, Fleetwood Road North, Thornton, Blackpool. Secretary, G3YWH. ASR, G3ZBO.
Warrington (Culcheth ARC)—Fridays, 7.30pm, Chat Moss Hotel, Glazebury. All visitors are welcome. Secretary, K. Bulgess, 32 Hendon Street, Leigh.
Westmorland—Fridays, 7.30pm, 24 Park Road, Milnthorpe. All visitors are welcome. Secretary, J. Forrester, 44 New Street, Carnforth.
Windscale—Cumberland (WAR & ES)—Fridays, 7pm, c/o Falcon Club, Falcon Field, Egremont. Further details from N. Ramsden G3RHE.
Wirral (WARS)—First and third Wednesdays in the month, 7.45pm, Scout's HQ, Harding House, Park Road West, Claughton, Birkenhead. Secretary, A. Fisher, G3WSD, 34 Glenmore Road, Oxton, Birkenhead.
Wirral (Wirral DX Association)—Last Thursday each month at members' homes. Secretary, J. Share, G3OKA.

REGION 3 — RR R. W. Fisher, G3PWJ

Birmingham (MARS)—9 March ("Vhf/uhf working", by A. Wakeman, G3EEZ), 8pm, Midland Institute, Margaret Street, Birmingham 3. *G8VHE*.
(Slade)—12 March "(Land's End to John O'Groats", an almost humorous talk by Mr L. Evans), 26 March (Junk sale), Church House, High Street, Erdington.
Bromsgrove (B & DARC)—12 March (AGM), 7.30pm, J. Dufrane, 44 Hazelton Road.
Cannock (CCARS)—Meetings monthly on first Thursday in each month, but a natter nite every Thursday, 8pm, Bridgtown Social Club,Walsall Road, Bridgtown, Cannock.
Coventry (CARS)—5 March (Night on the air), 12 March (Film show), 19 March (Night on the air), 26 March (Visit to studios of Radio Birmingham), 8pm, City of Coventry Scout HQ, 121 St Nicholas Street, Radford.
Dudley (DARC)—2, 16, 30 March, 8pm, Central Library, St James' Road. Club station "The Windmill", Vale Street, Ruiton, Dudley. *G3PWJ*.
Hereford (HARS)—Every Friday, Civil Defence HQ, Goal Street, Hereford.
Lichfield (LARS)—First Monday and third Tuesday of each month, The Swan Hotel, Lichfield. *G8CNB*.
Nuneaton (NARC)—First Friday in each month at Caldecote Grange. The club has now reformed; for further details contact D. Smith, 2 Niton Road, Nuneaton.

Rugby (R & DAR & EC)—First Tuesday in each month, 10 Drury Lane, Rugby. *G3VQC.*
Shrewsbury (SARS)—Every Thursday, 7.30pm, Harlescott Youth Centre, 218 Sundorne Road, Shrewsbury. *G3UDA.*
Stoke on Trent (NSARS)—Every Monday, 7.30pm, Harold Clowes Community Association Centre, Bentilee.
(S-o-TARS)—Every Thursday, 7.30pm, 2a Racecourse Road, Oakhill, Stoke.
Solihull (SARS)—16 March ("How to become a radio amateur", by members), 7.30pm, Manor House, High Street, Solihull. 6 April (Informal), "Malt Shovel". G3ZXO (ex G8BYM).
Sutton Coldfield (SCRS)—8 March ("What goes up must come down", by John Badley), 22 March (Natter nite), Club House, Sutton Town Football Club, Coles Lane. *G8CZM.*
Telford (WARS)—Every Wednesday evening, 8pm, Ketley Bank Youth Club, Main Road. First Wednesday in each month during college term at Walker Technical College, Wellington. *G3UKV.*
Worcester (W & DARC)—20 March (Four short talks by members), 7.30pm, Crown Hotel, Broad Street. New treasurer, Mr S. Parry G8BVP; secretary, Mr D. Spink, G3WUI.

REGION 4 — RR T. Darn, G3FGY

Derby (DADARS)—10 March (Direction finding—discussion on the start of the season), 17 March (AGM), 24 March (Electronic gadgets), 26 March (Preparing for the Diamond Jubilee Exhibition), 3 April (Official opening of the Diamond Jubilee Exhibition), at 3pm by the Mayor, Miss Grimwood-Taylor, daughter of one of the founder members of Derby Wireless Club 1911. The exhibition will last for 14 days at the Art Gallery, Derby Museum, The Wardwick, Derby, from 9am to 9pm daily. GB3ERD operating on all bands hf to uhf). Club meets at 7.30pm, 104 Green Lane, Derby. Visitors are most welcome.
Grimsby (GARS)—4 March (Project night—GDO), 18 March (Old timers' night, visitors welcome). All meetings at 8pm, rear of 80 Welolm Road, Lincoln. *G8DEN.*
Heanor (SEDRS)—9 March ("How to increase the life span of a battery", by Mr F. A. Smith), 16 March ("Loudspeakers", talk and slides by Mr W. A. Hickingbottom), 23 March ("50/50" night), 30 March (Forum—questions and answers), 7.30pm, South East Derbyshire College of Further Education, Ilkeston Road, Heanor *W. A. Clarke.*
Leicester (LRS)—Meetings are every Sunday at 10.30am and Monday at 7.30pm. At the recent AGM Derek Wills, G3XKX, was appointed chairman for the third successive year. The new secretary is Trevor Adcock, 38 Wykes Road, Leicester, who will be pleased to hear from intending members who wish to join (or rejoin) this old established society. The latest attraction is a club shop.

REGION 6 — RR L. W. Lewis, G8ML

Mid-Thames RAEN Group—26 April (Message procedure), 7.30 pm, Bassetsbury Manor, High Wycombe, Bucks. For further details contact G3FSN, QTHR.

REGION 7 — RR P. A. Thorogood, G4KD

For latest regional news and future programmes received listen on Sundays 12 noon, 145MHz, G4KD.
Acton, Brentford & Chiswick (ABCRC)—16 March ("Integrated circuits") by G3OJX. 7.30pm, Chiswick Trades & Social Club, 66 High Road, Chiswick.
Addiscombe (AARC)—Second and fourth Tuesdays, 7.30pm, Toc H Hall, 158 Lower Addiscombe Road.
Ashford, Echelford (ARS)—Second Monday and last Thursday of month. 8 March (Construction night—bring your equipment even if you brought it before—let newcomers see it. £5 offered for best G3SAZ valve tester; also two other prizes. 25 March, AGM. 12 April, still open. 29 April, "Radio astronomy for amateurs," by G3OZY 7.30pm, St Martins Court, Kingston Crescent, Ashford, Middlesex.
Barking (B & DREC)—Tuesdays and Thursdays, 7.30pm, Gascoigne Recreation Centre, Gascoigne School, Morley Road, Barking.
Bexleyheath (NKRS)—Second and fourth Thursdays. 11 March, Vero Electronics. 25 March, to be arranged. 7.30pm, Congregational Church Hall, Chapel Road, Bexleyheath.
Cheshunt (CDRC)—First Friday of month, 7.30pm, Methodist Church Hall, opp Theobalds Station, Cheshunt.
Chingford (RSGB Group)—Fridays. Telephone 01-524 0308.
Chingford (SRC)—Fridays, 7.30pm, Friday Hill House, Simmons Lane, Chingford E4.
Croydon (SRCC)—Third Tuesday in the month, 7.30pm, Swan & Sugarloaf, South Croydon.
Crystal Palace (CP & DRC)—20 March, "Electronic components and materials", by G3OOU/G3FZL/G3IIR/G3XFT. 8pm, Emmanuel Church Hall, Barry Road, London SE22.
Dorking (DR & DRS)—Second and fourth Tuesdays. 7.30pm. "Wheatshaft".
Ealing (E & DARS)—Tuesdays, 7.30pm, Northfields Community Centre, Northcroft Road, W13.
East London—21 March, Sunday. 2.30 for 3pm, Wanstead House, The Green, Wanstead, E11. (200 yards from Wanstead Station, Central Line).
Edgware & Hendon (E & DRS)—Second and fourth Mondays, 8pm, St George's Hall, 51 Flower Lane, Mill Hill, NW7.
Farnham, Bucks (Burnham Beeches RC)—Fortnightly on Mondays, 7.30pm, Farnhalm Common, Village Hall, Victoria Road.
Gravesend (GRS)—Every Thursday, 8pm, Northfleet Recreation Centre, Springfield Road, Northfleet, Gravesend.
Guildford (G & DRS)—Second and fourth Fridays. 12 March, coming events. 26 March ,"How to construct a frequency counter", by R. T. Greenwood. 8pm.
Hampton Court (TVARTS)—First Wednesday in the month, 7.30pm, The Three Pigeons, Portsmouth Road, Surbiton.
Harlow (DRS)—Tuesdays (General and cw practice. Fridays (Junior), 7.30pm, Mark Hall Barn, First Avenue.
Harrow (RSH)—Every Friday, 8pm, Harrow County School for Boys, Sheepcote Road, Harrow.
Havering (H & DARC)—Fortnightly, 8pm, British Legion House, Western Road, Romford.
Hemel Hempstead (HH & DARS)—First and third Fridays, 8pm, "Addmult " Sports Club, Hemel Hempstead.
Holloway (GRS)—Mondays (RAE), 7pm; Wednesdays (Morse), 7.30pm; Fridays (Club), 7.30pm, Archway School Annexe, Whittington School, Highgate Hill, N19.
Ilford—Every Thursday, 8pm, 50 Mortlake Road (off Ilford Lane), Ilford.
Kingston (K & DARS)—Second Wednesday in the month. 10 March (Junk sale, lots of goodies under the hammer), 8pm, Penguin Lounge, 37 Brighton Road, Surbiton.
London (UHF Group)—First Thursday in the month, 7.30pm. Club now meets at 32 Russell Chambers, Bury Place, adjoining Bloomsbury Square, WC1.
Loughton—Fortnightly on Fridays, Loughton Hall, Rectory Lane (nr Debden Station).
New Cross—Second and fourth Fridays, 8pm, 225 New Cross Road, SE14.
Paddington (P & DARS)—Thursdays, 7.30pm, Beauchamp Lodge, 2 Warwick Crescent, W2.
Purley (P & DARS)—First and third Fridays, 8pm, Railwaymen's Hall, side entrance, 58 Whytecliffe Road, Purley.
Reigate (RATS)—First Wednesday, 7.45pm, George and Dragon, Cromwell Road, Redhill.
Romford (R & DARS)—Tuesdays, 8.15pm, RAFTA House, 18 Carlton Road.
Scouts (ARS)—Third Thursday in the month, 7.30pm, Baden Powell House, Queensgate South Kensington, SW7.
Sidcup (CVRS)—4 March (Rtty), 18 March, Natter night. Congregational Church Hall, Court Road, Eltham SE9.
Southgate (SRC)—Second Thursday in the month, 7.30pm, Civil Defence Hut, Bowes Road, N11.
St Albans (Verulam ARC)—24 March, "Printed circuits", by F. W. Henshaw, G8BBO. 7.45 for 8pm. Town Hall, St Peter's Street, St Albans. On 17 February, Barry Priestley provided a most enjoyable evening.
Sutton & Cheam (SCRS)—Third Tuesday in the month. 16 March, Junk sale. 27 March, Sutton & Cheam dinner. 20 April, AGM. 8pm, The Harrow Inn, High Street, Cheam.
Welwyn (Mid-Herts ARS)—Second Thursday in the month. 8pm, Welwyn Civic Centre, Welwyn.
Wimbledon (W & DRS)—Second and last Fridays, 8pm, St John Hall, 124 Kingston Road, South Wimbledon, SW19.
Wembley (GECARS)—Thursdays, 7pm, Sports Club, St Augustin Avenue, North Wembley. (This club is open to non-GEC employees by invitation. Telephone Dain Evans, G3RPE, at 904 1262 for details).

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

Blackwood (ARC)—Fridays, 7pm, Blanche Cottage, off High Street, Blackwood, Monmouth.
Barry College of Further Education (ARS)—Thursdays, 7pm, Barry College of Further Education, Colcot Road, Barry, Glam. *GW3VPB.*
Cardiff (RSGB Group)—Monday 8 March, 7.30pm. TA Centre, Park Street, Cardiff. *GW3GHC.*
East Glamorgan Raynet Group—Meetings irregular at the moment. Full details of activities can be obtained from GW3ZFG, Cardiff 62411.
Hoover (ARC)—Mondays, 7.30pm, Hoover Social Club, Hoover Works, Pentrebach, Nr Merthyr, Glam. Secretary: Mr F. E. Tribe.
Port Talbot (ARC)—Meetings second Tuesday of month, 7.30pm, Trefelin Club & Institute, Port Talbot, Glam. *GW5VX.*
Pontypool (ARC)—Tuesdays, 7 pm, Educational Settlement, Rockhill Road, Pontypool, Mon. *GW3JBH.*
Pembroke (ARC)—Last Friday in each month, 7.30pm, Defensible Barracks, Pembroke Dock. *GW3LXI.*
Rhondda (ARS)—Meetings at Rhondda Transport Employees Club & Institute, Porth, Rhondda, Glam. *GW3PHH.*
Sully & District Short-wave Club—Tuesdays, 7pm, The Annexe, Sully Bowls & Social Club, 59 South Road, Sully, Glam. Secretary: Mr Gyn Maggs, 3 Thorley Close, Cyncoed, Cardiff.
Swansea Telephone Area (ARS)—Tuesdays, 7.30pm, Telephone Engineering Centre, Gors Road, Swansea. Club callsign is GW3XTK. Secretary: Mr D. E. Connor, 7 Glanmon Park Road, Sketty, Swansea, Glam.
University College, Cardiff (ARS)—Details of meetings from the secretary, c/o Students' Union, Dumfries Place, Cardiff. Callsign GW3UWC.
University College, Swansea (ARS)—Details of activities from the secretary, c/o Students' Union, University College, Singleton Park, Swansea.

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

Chelmsford (CARS)—First Tuesday in each month. 6 April ("Capacitors", a lecture by a representative from a leading manufacturer), 7.30pm, Marconi College, Arbour Lane, Chelmsford. *G3VCF.*

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

Basingstoke (BARC)—Meetings on the first and third Saturday in each month, 7pm, Chineham House, Shakespeare Road, Popley, Basingstoke, Hants. *G3CBU.*
Maidenhead (M & DARC)—Informal meetings on the first Monday, and formal meetings on the third Tuesday in each month. 1 March (Informal), 15 March ("An expedition to the west country", by G8AXZ), 7.30pm, Victory Hall, Cox Green Lane, Maidenhead, Berks. *G3VMR.*
Newbury (N & DARC)—Meetings on the first Monday in each month, AGM on 5 April, 7.30pm, South Berkshire Technical College at the A4/A34 roundabout, Newbury, Berks. *G3KJC.*
N Berks (AERE Harwell, ARC)—Meetings on the third Tuesday in each month, also informal meetings and junk sales every Friday lunchtime. 15 March (Basic semiconductor circuit design), 7.30pm, Social Club, AERE Harwell, Nr Didcot, Berks. *G3NNG.*
Southampton (RSGB Group)—Monthly meetings at Southampton University, Lanchester Building, Southampton.
(Southampton Radio Club)—Meetings on each Wednesday and Friday evening at the clubroom, Kent Road, Southampton. Tel 73378. *G3ZKR.*
Swindon (S & DARC)—10 March (Informal), 24 March ("Vhf linear amplifiers", by C. L. Desborough, G3NNG), 31 March (Joint meeting with the Bristol ARC at the "Pheasant" in Chippenham), 7.30pm, Penhill Junior School, Swindon. *G3JAP.*

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

AR88D with spare valves, £25 ono. HT40 with vfo for 40m and 20m, auto trans, c/o rel, £20. Both £40. GC166 coil pack, £5. 2m fet cnvtr, 28–30MHz i.f., £8 ono. G3ZNW, 341 Walton Road, West Molesey, Surrey. Tel 01-432 2239.

KW swr meter, unmarked, £8. Class D wavemeter mains operated, phones, manual, £5·50. *Practical Wireless* Sept 1965–Jan 1969, £1·50. Callers only (evenings). G3WXT,QTHR.

Cossor double beam T1049 scope, gd cond, £20 ono. Carr extra, del free within 20 miles of Ripon, Yorks. Two Pye 45MHz i.f. strips wideband, £2 ea. G3JLZ, QTHR.

SP600-JX-10, £120. Rebuilt Ranger, £10. Hunts RC bridge, £10. Colt Woodsman match target, £38. All del free xcpt Ranger. Part exch offers considered for SP600. GW3UCJ, QTHR. Tel Briton Ferry 2376.

Tiger 2m cnvtr with cascoded nuvistors, has slight fault, £8 bargain. Instant heat soldering iron, saves current, £2. Wanted: coax c/o switch. G3KH, 133 Station Road, Cropston, Leics. LE7 7HH.

Eddystone 840C, vgc, £35. Will del up to 30 miles. Hill, 5 Burnfort Road, Newport, Mon. NPT 3EU. Tel Newport 66710.

JXK 2m cnvtr, 18–20MHz, in vgc, £12. HRO-MX with four coils 1·7–30MHz, overhauled, new capacitors, psu, £15. Marconi 52 set, psu, £10. Japanese bug, £2·50, half-built Cornishman, gd case, offers. G3WWC, QTHR. Tel Medway 33184.

KW Valiant less psu, £15. B44 Mk 3 less psu, £3. Large 1200–0–1200 trnsfmr + swinging choke, £3. 550–0–550 180mA and 5V 3A trnsfmr £1. BBC type PPMs, 1·5mA right-hand zero, £1 ea. Hall, 109 Daws Lane, Mill Hill, London. NW7 4SJ. Tel 01-959 8415.

Two 10ft triangular mast sections, £1 ea. 50Ω heavy duty coax cable, 15p/yd. Heathkit 465kHz Q mult, £4. 44-core tel cable, 15p/yd. 8MFD 600V block paper caps, 15p ea. Carr extra. G3RUD, 121 Norton Road, Coleshill, Birmingham. Tel Coleshill 62222.

Constant voltage trnsfmr advance type MT267A input 190–260, output 230rms 240W, £8. GW3NUO, 27 Garnlwyd Road, Morriston, Swansea.

829, 62½p. New boxed 6AC7s, 12½p pp. Most 19 set accessories. R107 12V psu, 85½p pp. Denco CT7/B turret, £2 pp. 1967–68 *PW*s. Many boxed octal, ux valves. Callers welcome but phone first. GZ2TX, Littlemead, 46 Upton Park, Slough, SL1 2DE. Tel Slough 21086.

Swan 500c and 230XC psu, newly revalved and aligned, 18 mnths old, £250 ono. G3VYF, QTHR. Tel Crayford 22040, weekdays.

Collins KWM-2, 516F-2, PM-2, MP-1, 312B-4, 30L-1, 312B-3, £485, might split. Hygain TH3 Mk 2 with Hygain balun, £45. Heath twoer, £10. ETM-2, £12. G3OBJ, 47 Hargrave Road, Maidenhead, Berks. Tel 20399.

KW2000A ssb tx/rxr with ac psu, hardly used, exc cond, £140 ono. Jason am/fm tuner. Leak varislope, Williamson valve-amp, £20, or split.

Radiogram, old but working, free! Please coll. G3SGK, 13 Earls Terrace, London W3. Tel 01-937 1356.

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70cm valve cavity cnvtr, gd results, £5·50p post paid. Mallory 6V vibrator kit, 75p post paid. Command rx. Various lengths coax 80Ω cable. Tx inc modulator 6L6 mod with mod trans. G3JGV, Rose Cottage, Pepperdon, Moreton-Hampstead, Newton Abbot, Devon.

KW Viceroy Mk 3, £65 ono. View by arrangement. Jones, G8ASO, QTHR. Tel Worcester 23434 extn 113 (office hours).

CR100 S meter noise limiter, £15. BC221 charts and psu, £16. Both in gd cond. Sae. G3LLX, QTHR.

Tx Geloso G212TR + psu, 10–80m, 60W, perf wkg order, press to talk oprn, £23 ono. Buyer coll. GW8CCA, 19 Pantycelyn Road, Llandough, Penarth, Glam. CF6 1PF.

Hammarlund HQ170 exc cond with manual, £67. Buyer coll. Major 13 Braintree Road, Ruislip, Middx. Tel 01-485 0920.

Creed 54 with perforator attachment; Creed 54; Creed 75; Creed 54 rx only; Creed 7B; Creed 7TR reperf; Creed 6S/54 auto. All at reasonable prices. G6JF, QTHR.

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Valves: 813, 805, TZ40, 866, 866VR, U19, 12EI, PX4, VCR138. Tube screen base. Offers. G3DFS, QTHR.

Heathkit Mohican, hardly used, £27. Bennett, 13 Dickinson Road, Formby, Liverpool L37 4BX. Tel Formby 73502.

Double conversion rx BC348 comp with S meter, xtal filt, electroniques front end, ham bands cnvtr, external Q mult and generous psu, circ diagrams and full details supplied, £30 the lot. Grieve, Freshfields, Crouch House Road, Eden Bridge, Kent. Tel Eden Bridge 2526.

898 dial, Drake 2C, Green 2M20, Avo sig gen Mk 3, Green varactor 70cm, vintage 216A valve, aerial rotator, 70cm wavemeter, Nombrex audio generator, odd valves, trnsfmrs etc, QP166. Donati, 20 The Ridgeway, Herstmonceux, Sussex.

Bridge megger 250V in leather case, perf cond, £15 ono. Will exch for rx for swl. Codar preselector, self powered, unused, £4·50. R Shams-Nia, 11 Holsworthy Square, Elm Street, London WC1. Tel 01-278 5839.

4X150 bases (3), several 4X150A, QQVO2-6, DET22 valves. CK3 chopper, other bits inc digital ICs. Part brand new. Sae or phone. G3OCB, QTHR. Tel Stithians 480.

Two 572B/T160L valves for Heathkit linear etc, as new, £9 pair or £5 ea. GW3OGG, QTHR. Tel Bishopston 2828.

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Manual info available, B2, BC312, BC342, CR100, AR88, HRO, S27, BRT400, R1155, T1154, BC221, ET4332, Pye Ranger, Wilcox Gay vfo. Sae pse stating specific req. G3ANK, QTHR.

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AR88LF, exc cond, £30 or would pt exch for Hammarlund HQ170, cash adjustment. King, 6 Grange Crescent, Rubery, Rednal, Birmingham.

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Trio 9R–59D ex cond, optg manual + orig pckg case, £25. G8CPZ, QTHR. Tel Upminster 26839.

Swan 350 calibrator, £160 pp. TA33jr AR22 rotator cables and coax, £30. KW dummy load swr meter coax switch EZ match, £20. 4m Ranger, new tx/rx xtals, £10. G3HEA, QTHR. Tel Longfield 4118.

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Crystal calibrator No 5 (for wavemeter GL/T/No 3) Marconi TF 712. G8CLG QTHR. Tel 01-673 1420 (day), 01-778-2739 (evng).

Buy or borrow service manual for info on Hartley 13A. Scope without time base. G2CLP, QTHR. Tel Bedford 68152 evenings.

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December 1970 *Practical Wireless*. Clark, 55 Hodgsonites, Charterhouse, Godalming, Surrey.

Buy or borrow circ and info on vhf rx R1392D. G3YYO, QTHR. Tel 01-942 6164.

Sommerkamp FL200B ssb tx. Goodwin, 'Chestnuts,' Holmer Green Road, Hazlemere, High Wycombe, Bucks. Tel High Wycombe 23984.

Wisden cricket almanacks before 1950. Quote prices. Norgate, 103 Harvey Lane, Norwich, Norfolk. NOR 63S.

Borrow or buy Hambander rx by Radiovision, circ diagram and/or valve line up. G3SGH, QTHR. Tel Ashford, Kent 21158.

Info req on using old turret tuner as a convtr for two and four metres. Also modifications needed to do this. Southam, Conway Cottage, Cornfield Road, Seaford, Sussex.

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Hndbk and/or circ for telegraph display unit type TDU2 manufactured by AT&E. Also 1in vidicon with scan coils. G8AWN, QTHR.

Decon pot for beam rotator or would consider comp rotator. G2BNZ, 29 Rumworth Street, Bolton, BL3 6LW.

DX100 or similar. Any cond, coll London area. Willetts, 23 Crewys Road, London NW2. Tel 01-432 4628 (office hours).

G2DAF tx Mk 2, gd cond. Unfinished model considered. Lyall, G8SG, Kenora, Cornhill on Tweed.

Radio Communication Handbook (4th edition). G3UAA, 28 Loxley Road, Glenfield, Leicester LE3 8PB.

Pye Cambridge, pref high band, also Command rx 3-6MHz or 6–9MHz. G8CBE, QTHR.

Xtals 9060 8030–10X. 7685, 7765, 7640, 7765–FT243 or near. G8CO, 2 Whitehall Road, Grays, Essex.

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WS19 tx/rx in wkg order. External appearance unimportant but state price. All letters answered. Roberts, 7 Oundle Road, Moreton, Wirral L46 8SR. Tel 051-677 9143 (after 6pm only).

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Young schoolboy, just starting, needs rx, about £10. G3RDK, QTHR. Tel 01-856 7478.

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Cub Scouts req extremely cheap ex-govnt rx or sim to start swl, will coll up to 40 miles. Raven, 69 Leicester Road, Glen Parva, Leicester LE2 9HJ. Tel Wigston 2655.

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in April issue of PRACTICAL WIRELESS

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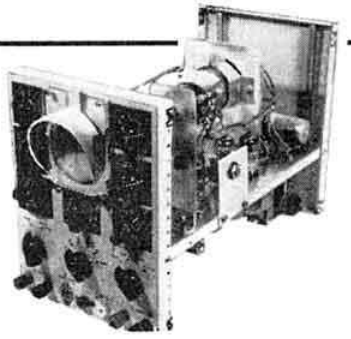

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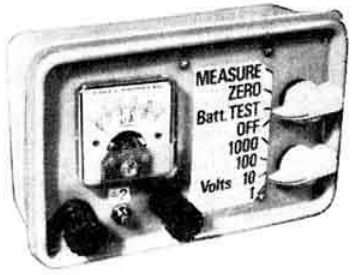

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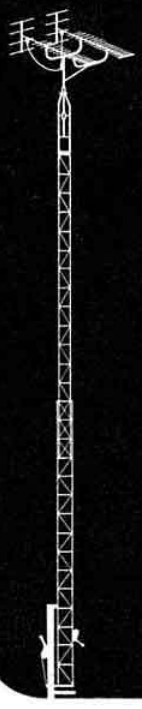

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INDEX TO ADVERTISERS

Radio Society of Great Britain

FOUNDED 1913
INCORPORATED 1926

PATRON H.R.H. THE PRINCE PHILIP
DUKE OF EDINBURGH, KG

APPLICATION FOR CORPORATE* OR ASSOCIATE* MEMBERSHIP

RADIO SOCIETY OF GREAT BRITAIN,
35 DOUGHTY STREET,
LONDON WC1N 2AE
Tel 01-837 8688
Giro A/C No 533 5256

* I hereby apply for election as a Corporate Member of the Society and enclose a remittance for £4, being the amount of my first annual subscription.

* Being under 21 years of age and not holding a current Amateur Radio Transmitting Licence I hereby apply for election as a Non-Corporate (Associate) Member of the Society and enclose herewith a remittance of £2, being the amount of my first annual subscription.

I, the undersigned, agree that in the event of my election to Membership of the Radio Society of Great Britain, I will be governed by the Memorandum and Articles of Association of the Society and the rules and regulations thereof as they now are or as they may hereafter be altered; and that I will advance the objects of the Society as far as may be in my power; providing that whenever I shall signify in writing to the Society addressed to the Secretary that I am desirous of withdrawing from the Society I shall at the end of one year thereafter after the payment of any arrears which may be due by me at that period to be free from my undertaking to contribute to the assets of the Society in accordance with Clause 8 of the Memorandum of Association of the Society.

Date _____

Signed _____

PERSONAL DETAILS TO BE COMPLETED BY APPLICANT

SURNAME (BLOCK LETTERS) _____

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* Please delete where inapplicable.

† If the applicant is not acquainted with a Corporate Member willing to propose him for election he may submit a suitable reference in writing as to his interest in Amateur Radio.

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35 DOUGHTY ST.,

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