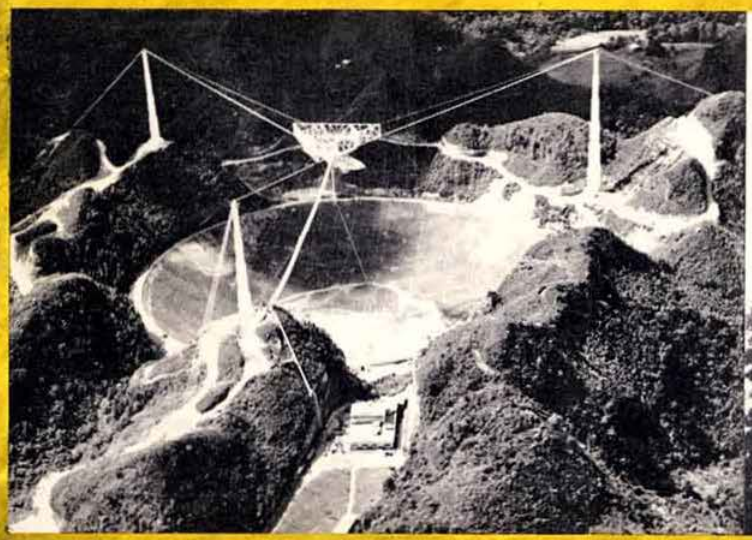
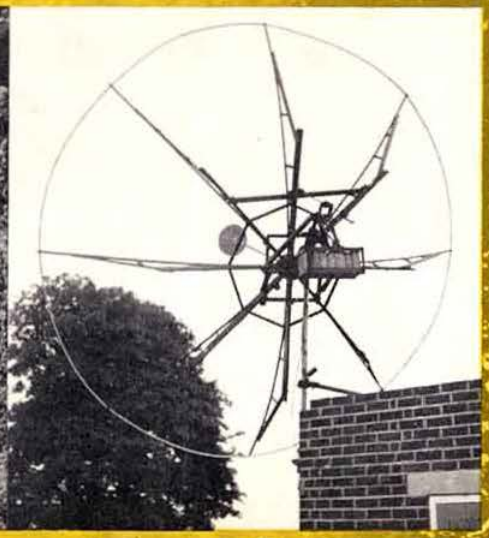
RSGB

BULLETIN

JULY 1964
VOL. 40, No. 7





JOURNAL OF THE RADIO SOCIETY OF GREAT BRITAIN

Volume 40 No. 7

July 1964

3/- Monthly

R.S.G.B. BULLETIN

CONTENTS

Front Cover: On June 13, KP4BPZ contacted G3LTF on 430 Mc/s by moonbounce. The radio-telescope dish aerial used by KP4BPZ is shown on the left, and the aerial used by G3LTF is on the right. A more detailed report is given in *Four Metres and Down* on page 458.

Photographs of the moon's surface and the radio telescope at Puerto Rico by courtesy of Mount Wilson and Palomar Observatories and the US Information Service respectively.

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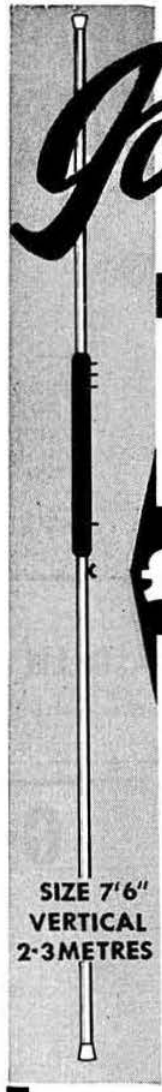
As many of these as are known must be given, though in many cases equipments are known to us and in these cases crystals may be made from either (a) and (e), or (b) and (e) only.



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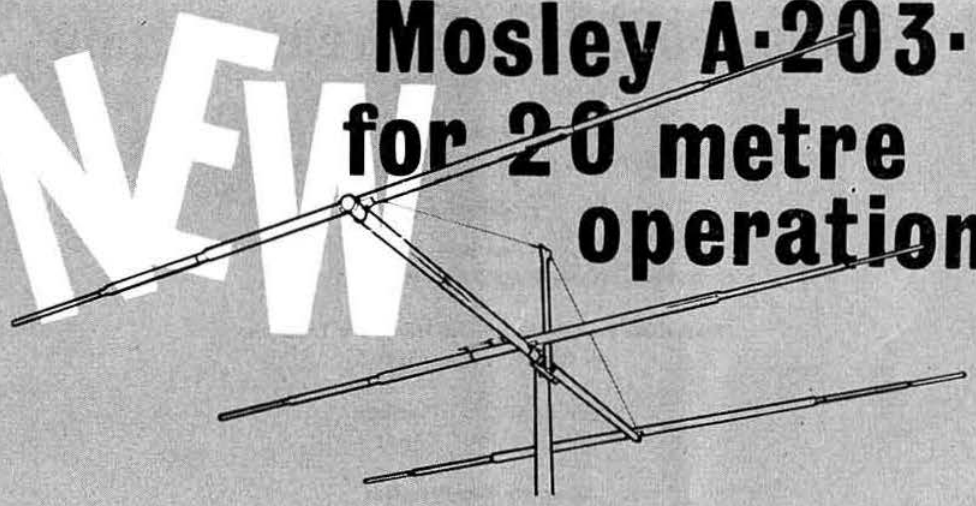
NEW Mosley A-203-C for 20 metre operation



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Current Comment

discusses topics of the day

Reciprocal Licensing

ON May 28, 1964, President Johnson signed the US bill to amend the Communications Act of 1934 to permit the Federal Communications Commission to authorize, but not license, "alien amateur radio operators to operate their amateur radio stations in the United States, its possessions and the Commonwealth of Puerto Rico, provided there is in effect a bilateral agreement between the United States and the alien's government for such operation by United States amateurs on a reciprocal basis." The bill makes it clear that the alien must be licensed by his own government as an amateur radio operator and that authorization will be subject to clearance by "appropriate agencies of the Government" as "bears upon compatibility of the request with national security."

So far so good, but it must be made clear that there is no immediate prospect of US amateurs operating in Great Britain or UK amateurs operating in the United States. There is, in fact, no indication at the present moment that the United Kingdom government will be prepared to enter into a bilateral agreement with the USA or any other country. Nevertheless, the Society has already taken action to get the British authorities to agree to make reciprocal licensing arrangements with foreign governments. The most recent moves, taken since President Johnson's signature to the US legislation, are the latest in a long series of attempts to obtain reciprocal licensing initiated by RSGB soon after the Second World War.

While the licensing of foreign nationals in the United Kingdom has always been turned down in the past, the Society hopes that the passing of the American legislation may change the climate of opinion. But the fact remains that at this moment British nationality is an essential qualification for those wishing to obtain a UK amateur licence.

Even if the British government's attitude can now be changed, working out the practical details between the governments concerned will require a considerable amount of time as do all diplomatic negotiations.

It is worth bearing in mind that the United Kingdom does in fact, if not as a result of formal agreement, grant licences to the citizens of more overseas countries than possibly any other. Citizens of the British Commonwealth can and do frequently obtain UK licences while amateurs from the British Isles generally have no difficulty in obtaining licences to operate in other Commonwealth countries. In many cases, all that is required is production of the current home licence as proof of technical and Morse proficiency.

It is hoped to report on developments in reciprocal licensing in the RSGB BULLETIN shortly.

REGION 10 LECTURE

Saturday, September 19, 1964, at 3 p.m.

"A PHILOSOPHY OF OSCILLATORS"

by

Professor Emrys Williams, B.Eng., Ph.D., M.I.E.E., M.I.E.R.E.

(Professor of Electrical Engineering, University College, Cardiff)

at

University College, Newport Road, Cardiff, in the New Department of Electrical Engineering.

Members will be conducted around the laboratories at the conclusion of the Lecture.

Admission will be by ticket, obtainable free of charge on receipt of s.a.e., from the Regional Representative, Mr. C. H. Parsons, 90 Maesycoed Road, Heath, Cardiff.

Ample car parking facilities are available.

The Princess Transmitter

Table Top Design for A.M. and C.W. on 3·5–28 Mc/s

By G. F. GEARING, G3JJG *

DURING the spring of 1962, the writer was involved in the inception of a project, the design of a transmitter to follow the "Elizabethan,"† one of the most popular transmitters described in the RSGB BULLETIN.

A study of British amateur publications over the last five years revealed many designs catering for sideband enthusiasts. For the amateur whose main interest lies in operating telegraphy, or for the telephony operator not yet ready to try sideband, very little was presented. Articles covered various facets, such as Top Band only or just the DX bands, or perhaps c.w. only. What about the amateur desiring five band capability, A1 and A3, in one self-contained box? He was forced to "roll his own" or purchase a commercial rig.

So this project initiated by the RSGB Technical Development Sub-Committee was commenced, to study modern requirements and then to produce the prototype, to be known as the "Princess." It was first shown in public at the RSGB International Radio Communications Exhibition in November, 1963, and the details are presented here in the hope that it will interest both a.m. and c.w. enthusiasts.

Design Aims

The terms of reference laid down were that the equipment should cover the amateur bands from 80m to 10m, providing c.w. and a.m. at the maximum licensed power input. It had to be completely self-contained, of reasonable proportions and weight and, of the utmost importance, must not cost too much to duplicate. Obviously, a piece of gear such as this will cost more than the odd pound, but an effort has been made to avoid individually expensive items.

Stability requirements, both short-term and long-term, must be good, even at the highest operating frequency. Purity of note and total absence of a spacer-wave are obligatory as is the necessity for a low harmonic content to avoid television interference.

It was considered that the design must be capable of exact duplication on the one hand, with all parts specified and readily available, or alternatively, tolerant of relatively wide deviations from the prototype if the overall size can be varied. The block diagram shown in Fig. 1 gives a broad outline of the final design. Mechanical detail will be fairly comprehensive and should permit the individual to follow what has been done in the prototype.

Results of the Design Study

Most of the design aims were met, perhaps the biggest compromise being the provision of no more than 75 watts input on a.m. If the dimensions of the transmitter were to

* 65 Ringwood Close, Furnace Green, Crawley, Sussex.

† "The Elizabethan," Louis Varney, G5RV, RSGB BULLETIN, July 1953.

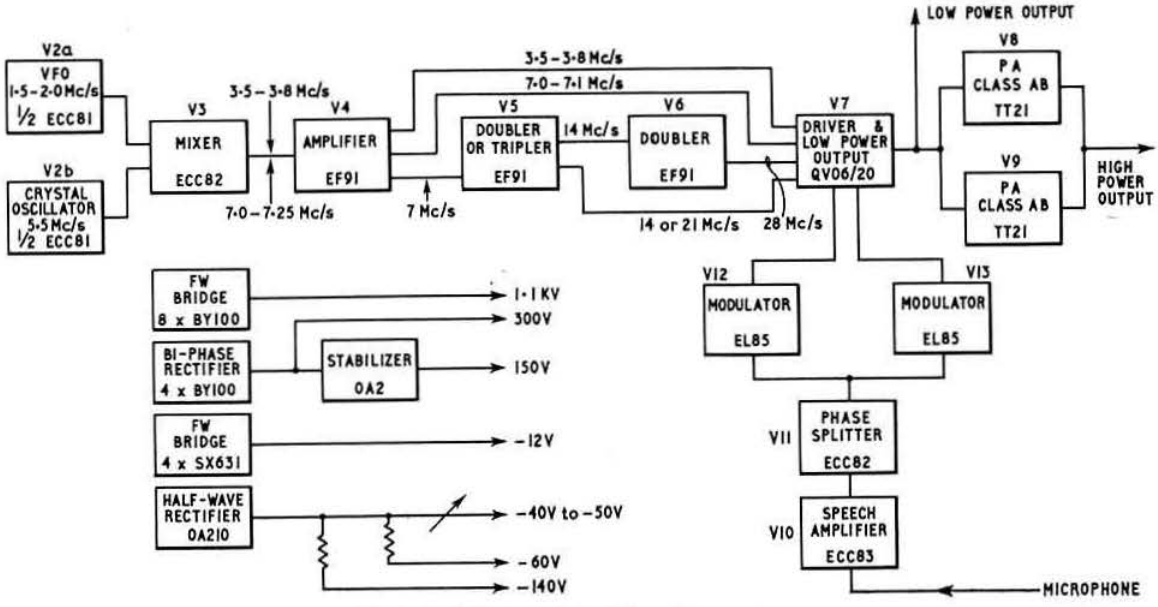
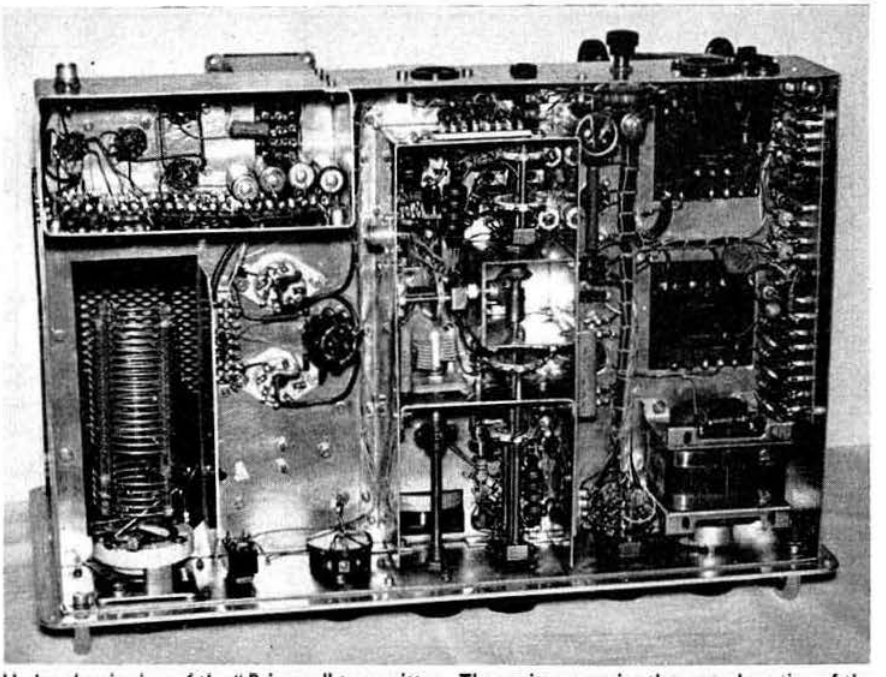


Fig. 1. Block diagram of the "Princess" transmitter.

be reasonable, 150 watts a.m. seemed out of the question. However, it is felt that in meeting the other terms of reference, over-complication of the circuitry has been avoided. Circuits have been tailored to fit requirements and little originality is claimed. The design may be viewed as a logical development of an earlier transmitter which had less flexibility.

Stability considerations dictated the use of the crystal oscillator/mixer/v.f.o. technique which has already been used very successfully by amateurs. To use one crystal per band was felt to be too extravagant, and in fact one crystal in total is all that is used. A degree of frequency multiplication is employed to gain the higher frequency bands; even so, the stability is four times better on the 10m band than by using more conventional techniques.

Although it is desirable to include full c.w. break-in facilities with a transmitter of this kind it is not as easy as it sounds. It is relatively easy to deaden the transmitter during key-up, but more difficult to silence the receiver when the key is pressed without causing the most excruciating whistles and bangs in the headphones. Unless a very sophisticated system of control is used, it is felt that more operator fatigue results from the noise than by using smooth single-switch control. These comments are quite apart from the difficulty of rapid aerial change-over. Single switch control of the station is built in to this design.



Under chassis view of the "Princess" transmitter. The exciter occupies the central portion of the chassis and the modulator is at the top left corner.
(Photo by M. L. Marques, Horley)

The overall size of the transmitter, 19 in. × 10 in. × 12 in., is considered to be as small as practicable whilst keeping to conventional chassis and panel layout. Size could be reduced by the use of three dimensional techniques but the mechanical complexity nullifies any benefit which may be gained. As it is constructed, the weight of the equipment is about 65 lb.

It should be noted that the decision to limit the effective a.m. power to 75 watts input was not taken without much deliberation. To provide about 80 watts of audio, necessary for high level modulation of a 150 watt p.a. stage, with suitable power supplies, would greatly increase the dimensions and weight. Other considerations, such as initial cost and the attractiveness of a final amplifier running in class AB1 make the drop in power, which is only half an S point, seem much less important.

A pair of small tetrode valves anode and screen modulate the driver valve, thus comprising a transmitter of about 15 watts input which feeds a low impedance load, across which a sufficiently great r.f. voltage swing is obtained to drive the linear. With such a low value of resistor in the p.a. grid circuit, instability is most unlikely and neutralization is not required.

In the power supply full advantage has been taken of solid state rectifiers; they are used exclusively, resulting in great savings of space but involving a somewhat higher initial cost. All 17 rectifiers in the prototype are mounted side by side on a plate 7 in. × 2½ in. To obtain the e.h.t. potential, a standard transformer is used with a full-wave bridge rectifier, no smoothing choke, and a high value of smoothing capacitance. This gives excellent results with good dynamic regulation of the supply, an important consideration in the present context.

Control and metering facilities are adequate. Switching is interlocked and should avoid most expensive accidents. Receiver muting and aerial change-over facilities may be controlled directly from the transmitter. Metering positions provided are sufficient for normal operation of the equipment. One other test point, for an external meter, is carried internally, for use during initial alignment.

Having introduced the various parts of the design, each section will be considered in greater detail.

The Master Oscillator

The master oscillator encompasses the circuitry around V2, V3 and V4 (Fig. 2). V2a will be seen to be a modified Colpitts type oscillator between grid and cathode. Frequency coverage is from 1·5 Mc/s to 2·0 Mc/s, across about 150° of the traverse of C13, the v.f.o. tuning control. Circuit values have been adjusted to give as close a pure sine wave output from the oscillator as is consistent with relatively constant r.f. voltage delivered to V3.

Temperature compensation is effected by C14, 10 pF, which has a negative temperature coefficient of 750 parts per million. This capacitor, in series with the air-spaced trimmer, C15, gives close control of the overall thermal stability. Final adjustment of this trimmer should not be attempted during the first four weeks of use to allow component ageing. The transmitter, in its case, should be checked for drift against a high-stability receiver which has been switched on for several hours, or against a frequency meter or crystal oscillator. If the v.f.o. appears to drift, C15 should be altered slightly and the process repeated. Short-term drift is excellent even without careful setting of C15, but an improvement in the long-term stability results from patience used in its adjustment.

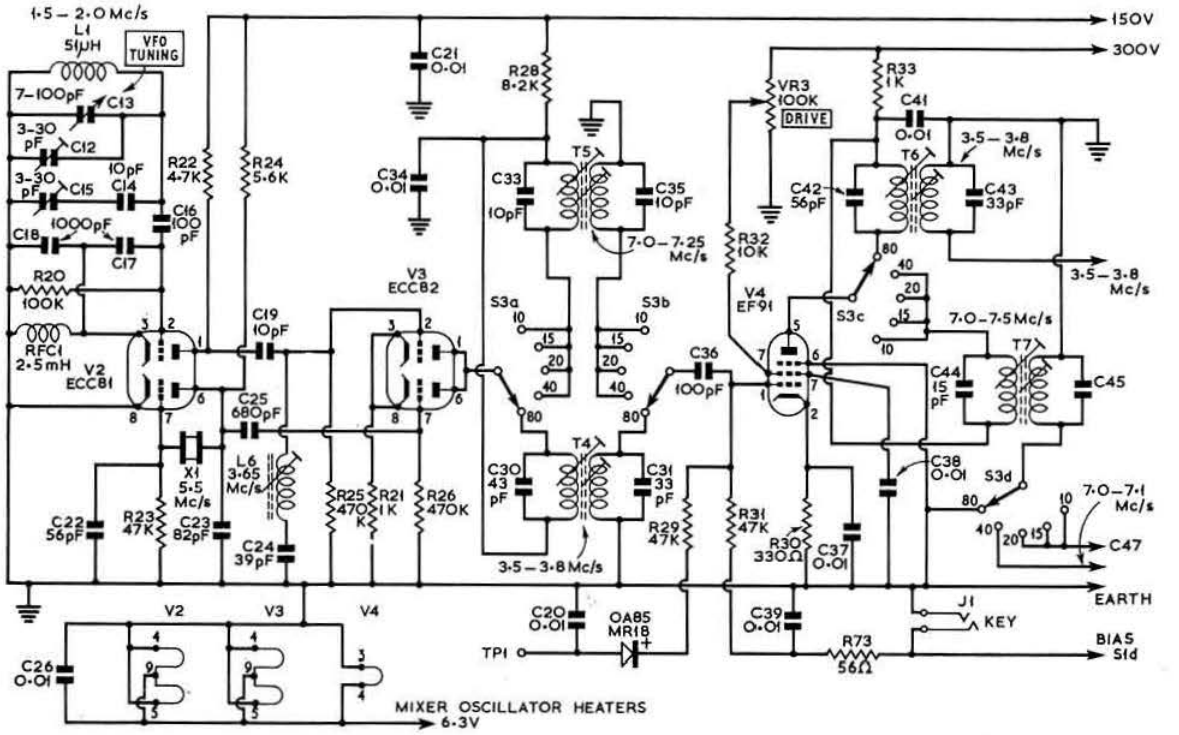


Fig. 2. Circuit diagram of the mixer-master oscillator.

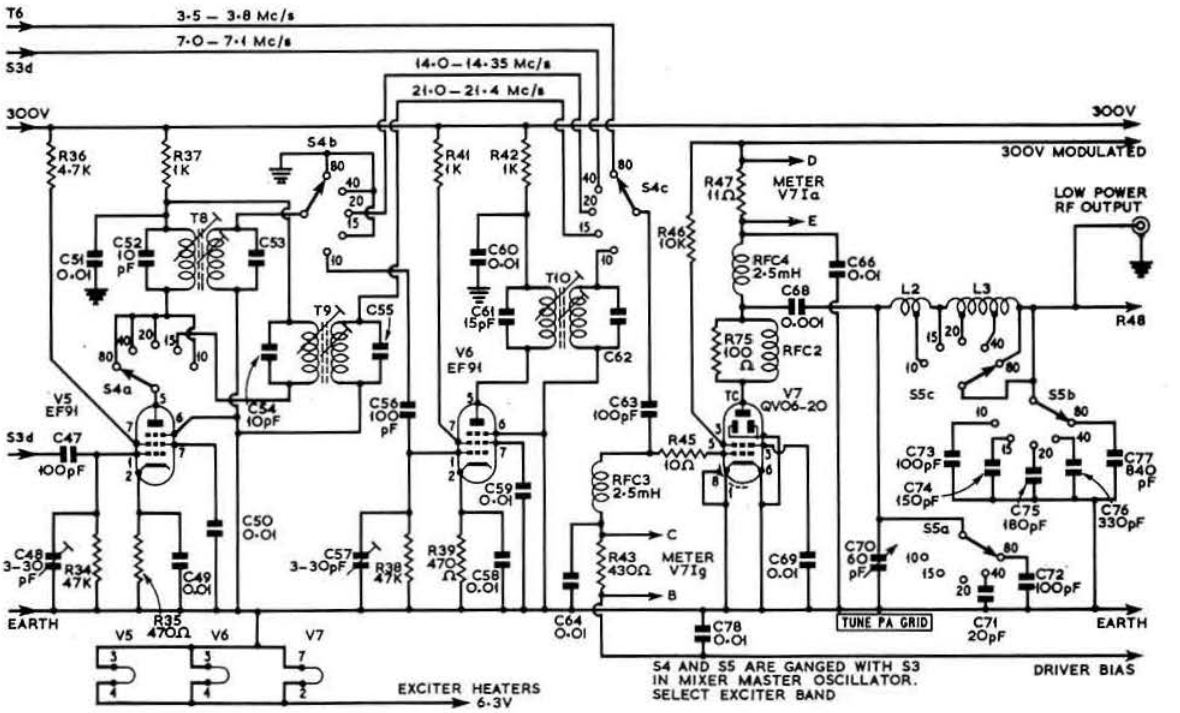


Fig. 3. Circuit diagram of the frequency multipliers and driver.

The series circuit L6/C24 is resonated at approximately 3·6 Mc/s. It is necessary because the oscillator second harmonic from 1800 kc/s is within the passband of the following stages and would cause some interference. Satisfactory rejection is obtained in the prototype.

The second half of V2 functions as a fixed frequency crystal oscillator at 5·50 Mc/s. Output taken from the anode is fed to the mixer valve V3. The anodes of V2 and V3 are fed from the 150 volt stabilized d.c. supply.

From the mixer valve, V3, the v.f.o. and crystal oscillator signals and their sum and difference products appear at S3a. For 80m operation, the difference product is selected by the broad-band transformer T4. The v.f.o., tuning from right to left of the dial, supplies 2·0 Mc/s to 1·5 Mc/s mixing with 5·5 Mc/s to give frequencies of 3·5 Mc/s to 4·0 Mc/s. The original v.f.o. and crystal oscillator products, as also the sum, are far enough from the passband of T4 and subsequent circuits to be rejected.

For 40m operation, the sum product is selected by T5. The v.f.o., tuning from left to right, gives 1·5 Mc/s to 2·0 Mc/s which when mixed with 5·5 Mc/s, provides output frequencies in the range 7·0 Mc/s to 7·25 Mc/s and beyond. For higher frequency bands this output is multiplied.

The design of the broadband transformers T4 to T10 is as simple as it is possible to make it. Two identical windings on the same former, with a given spacing between the end of one winding and the start of the second give a controlled degree of inductive coupling. Because the short 9mm iron dust cores give only a small variation in inductance, and as stray circuit capacitances will vary from model to model, it may be found necessary to alter slightly the values of parallel tuning capacitors; in certain cases these may be omitted altogether.

The output winding of either T4 or T5 feeds the amplifying valve V4 according to the band in use. An r.f. voltmeter, consisting of R29 and MR18, permits the alignment of the mixer anode circuit by connecting a 10,000 ohms per volt testmeter on a low voltage range to TP1. Similar broadband transformers for 80m and 40m are used in the anode circuit of V4, the output windings driving V7 directly on 80m or 40m. However, for operation on 20m, 15m or 10m, the 40m output at S3d is passed to the first doubler/tripler, V5.

Keying of V4 is by the grid-block method. Under key-up conditions, the bias cuts off V4. When the key is depressed, the grid circuit of V4 is earthed but due to the high value of R27 (Fig. 7), the bias to the driver is unaffected. R73 is necessary to make C39, the decoupling capacitor, effective; otherwise the key may be " hot " to r.f. The DRIVE control, VR3, varies the screen potential on V4 up to a maximum value set by R32.

The value of R28 in the anode circuit of V3 is selected to provide the most efficient mixing action. At an anode potential of 100 volts d.c., signal levels to the grids, quoted in r.m.s. values, will be of the order of 2 volts from the v.f.o. and up to 6 volts from the c.o. Wide variations may be due to the particular specimen of valve in use as V2.

Frequency Multipliers and Driver

Valves type EF91 have been specified for V5 and V6 positions (Fig. 3) because they are cheap, a plentiful supply exists in many amateur junk boxes, and they are economical to run. It will probably be necessary to select valves in these positions to obtain the required drive.

V5 is used as a doubler to 20m or as a tripler to 15m. Broadband transformers T8 and T9 cover 14·0 Mc/s to 14·5 Mc/s and 21·0 Mc/s to 21·45 Mc/s respectively. On 20m and 15m, V7 is driven directly. For 10m operation, T8 is switched to V6, which doubles the 20m signal. C48 and C57 are tuned on a signal to equalize circuit capacitances when switching between a following doubler or the driver valve. Care must be exercised on 20, 15 and 10m that the valves are not over-driven, resulting in a reduction of drive at the wanted frequency.

VR3 should be set to the minimum for the band in use consistent with the required drive level.

The driver, V7 (QV06/20 or 6146), has fixed grid bias and a parallel fed pi-network anode tank circuit. Grid current is monitored across R43 and anode current across R47. Anti-parasitic components R45 and R75/RFC2 are mounted as close to the valve connections as possible. The tank circuit is loaded by the passive grid resistor, R48, of the following linear amplifier (Fig. 4). A secondary r.f. output socket is provided, and with the feed to R48 disconnected, V7 becomes a stage of about 15 watts input, for low power applications.

With V7 as a driver, C70 is the p.a. grid tuning control and the loading is pre-set to give sufficient signal across R48 to drive the amplifier up to 150 watts d.c. input. The values for

COIL WINDING DETAILS*

T4, T6	Wideband coupler. 3·5-3·8 Mc/s. Primary and secondary 29·2 μH. Both windings 75 turns 40 s.w.g. enamel, close wound. Spacing between windings $\frac{1}{32}$ in. Aladdin PP5938/S former and can. 9 mm cores.
T5, T7	Wideband coupler. 7·0-7·25 Mc/s. Primary and secondary 16·5 μH. Both windings 57 turns 38 s.w.g. enamel, close wound. Spacing between windings $\frac{3}{32}$ in. Aladdin PP5938/S former and can. 9 mm cores.
T8	Wideband coupler. 14·0-14·5 Mc/s. Primary and secondary 4·2 μH. Both windings 30 turns 32 s.w.g. enamel, close wound. Spacing between windings $\frac{1}{8}$ in. Aladdin PP5938/S former and can. 9 mm cores.
T9	Wideband coupler. 21·0-21·45 Mc/s. Primary and secondary 2·0 μH. Both windings 20 turns 28 s.w.g. enamel, close wound. Spacing between windings $\frac{1}{16}$ in. Aladdin PP5938/S former and can. 9 mm cores.
T10	Wideband coupler. 28·0-29·0 Mc/s. Primary and secondary 1·3 μH. Both windings 14 turns 20 s.w.g. enamel, close wound. Spacing between windings $\frac{1}{16}$ in. Aladdin PP5938/S former and can. 9 mm cores.
L1	V.F.O. coil, 51 μH. 89 turns 40 s.w.g. enamel, close wound on Cambion 1533-0-2 former $\frac{3}{4}$ in. diam. No core. Tag ring at top and bottom.
L2, L3	Driver tank coil, 15 μH. Codar air spaced 35 turns 20 s.w.g. 1 in. diam. 3 in. winding length tapped at 23T (40m), 13½T (20m), 7½T (15m), and 4½T (10m).
L4	Final tank coil, 1·6 μH. Codar air spaced 5 turns 14 s.w.g. 2 in. diam. 1 in. winding length tapped at 3½T (15m), and 2T (10m).
L5	Final tank coil, 7·5 μH. Codar air spaced 17 turns 14 s.w.g. 2 in. diam. 3 in. winding length tapped at 8½T (40m), and 2T (20m).
L6	3·6 Mc/s trap, 25 μH. 70 turns 38 s.w.g. enamel close wound on Aladdin PP5938/S former with 9 mm core.
Note:	The Aladdin PP5938/S former has a nominal diameter of $\frac{13}{32}$ in. and the screening can is $\frac{3}{4}$ in. square. Design inductance values are quoted to assist if other formers are used, and are with cores fitted and the circuits resonated. All cores are h.f. types.

* Ready-wound coils are available from Electroniques (Felixstowe) Ltd.

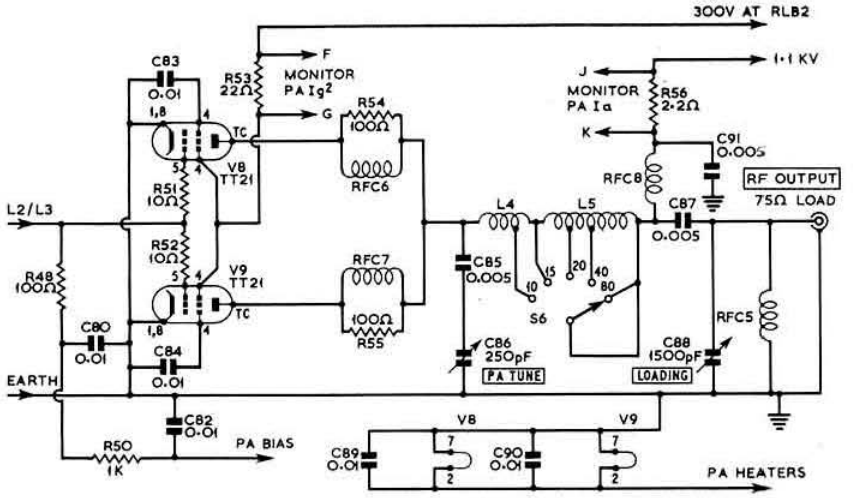


Fig. 4. Circuit diagram of the power amplifier.

It is evident that as long as the peak value of the positive half-cycle of the driving waveform does not exceed this standing bias, the grids of V8 and V9 cannot go positive and so draw grid current. The maximum permissible signal is therefore 32 volts r.m.s. This would correspond, with the present arrangement, to 300 watts input. As only 150 watts is required, the drive will be 3db less, at 22·5 volts r.m.s. Across 100 ohms, this corresponds to a c.w. drive power of about 5 watts. With 85 per cent transfer efficiency in the anode circuit of V7 and 70 per cent anode efficiency in the valve, the power input must be 8·4 watts. Allowing for circuit losses, at the lowest frequencies the fixed loading capacitors are selected for 10 watts input rising to 15 watts at 10m.

C73 to C77 quoted will be at best only typical. Increasing the capacitance decreases the loading and so the drive to the final is reduced.

Modulation is applied to the anode and screen of the driver valve. For reasons to be explained, it is necessary to reduce carrier power on A3 to 75 watts input, effected by switching R76 in series with the h.t. to V7. Full modulation capability of 100 per cent is available.

The Linear Amplifier

The class of operation of the linear amplifier (Fig. 4) is class AB1 with passive grid input, as opposed to tuned grid. As grid current does not flow during any part of the input cycle, no driving power is required, but only an r.f. voltage swing. The standing bias potential is a nominal −45 volts, which is adjusted to give a quiescent anode current of 70 mA.

On telephony use must be made of the full capability of 300 watts peak envelope power. At 100 per cent modulation, this permits the use of a 75 watt carrier so R76 reduces the drive signal by a further 3db. As a point of interest, a 150 watt transmitter at 100 per cent modulation will run up to 600 watts p.e.p. input.

A pi-network tank circuit is used, with the h.t. feed at the low impedance end of the coil. This avoids the necessity for a critical component at RFC8, as would be the case if d.c. was applied through the choke direct to the anode. Blocking capacitors C85 and C87 keep the d.c. from the tuning controls and r.f. output socket. Note that with this system RFC5 is essential, otherwise if C87 fails, the feeder line will become over 1000 volts above earth.

Both anode and screen currents are monitored and with an amplifier running in class AB1, screen indications are of

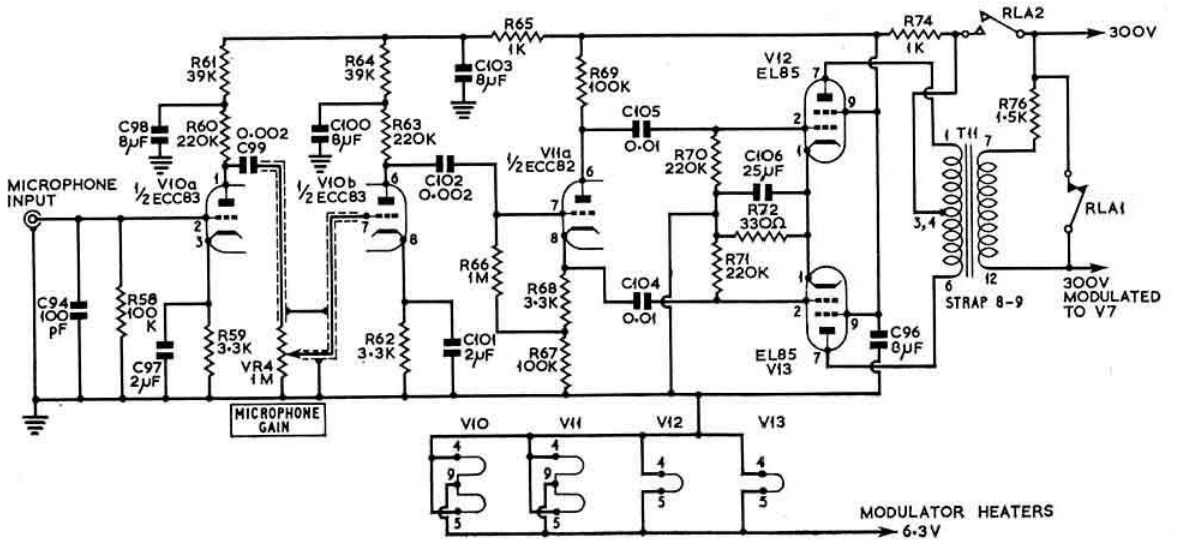


Fig. 5. Circuit diagram of the modulator.

great importance. The p.a tuning control is adjusted for a peak in screen current and the loading control set so that this peak is about 25 mA on c.w. The valves are then running at the manufacturers' recommended figures for class AB1 operation. This method of tuning and loading is more precise than relying only on indications of anode current.

High stability carbon components are used as meter shunts, the values of which may be obtained, where necessary, by series/parallel arrangements. The resistor R57 is of such a value as to increase the internal resistance of the meter to 1100 ohms. By this means, as long as the internal value is known, most 1 mA meters will be suitable.

Speech Amplifier and Modulator

With a maximum input to the driver valve V7 (Fig. 3) of 8 watts on telephony, it follows that about 6 watts of audio will suffice. This can be obtained from a pair of EL84 valves, but the standing anode current for the two is about 80 mA and the full power capability is at no time required.

A slightly smaller version, the EL85, has therefore been used, with a quiescent current of 50 mA. The full circuit of the modulator is given in Fig. 5. Valves such as the 6BW6 and 6AQ5 are suitable subject to the above objection. For differing types of valve the value of R72 must be varied. The Woden UM0 multi-ratio modulation transformer (T11) permits an accurate match in all cases.

V10 is a two-stage resistance-capacitance coupled speech amplifier with the values of C99 and C102 selected to attenuate the lower speech frequencies. Half of V11 is used as a phase splitter, the second part being left for future development. Note that relay contact RLA1 shorts out the secondary of the modulation transformer when not using telephony. If this precaution is not taken, voltage peaks of sufficient amplitude to break down the transformer may result.

Control Sequences

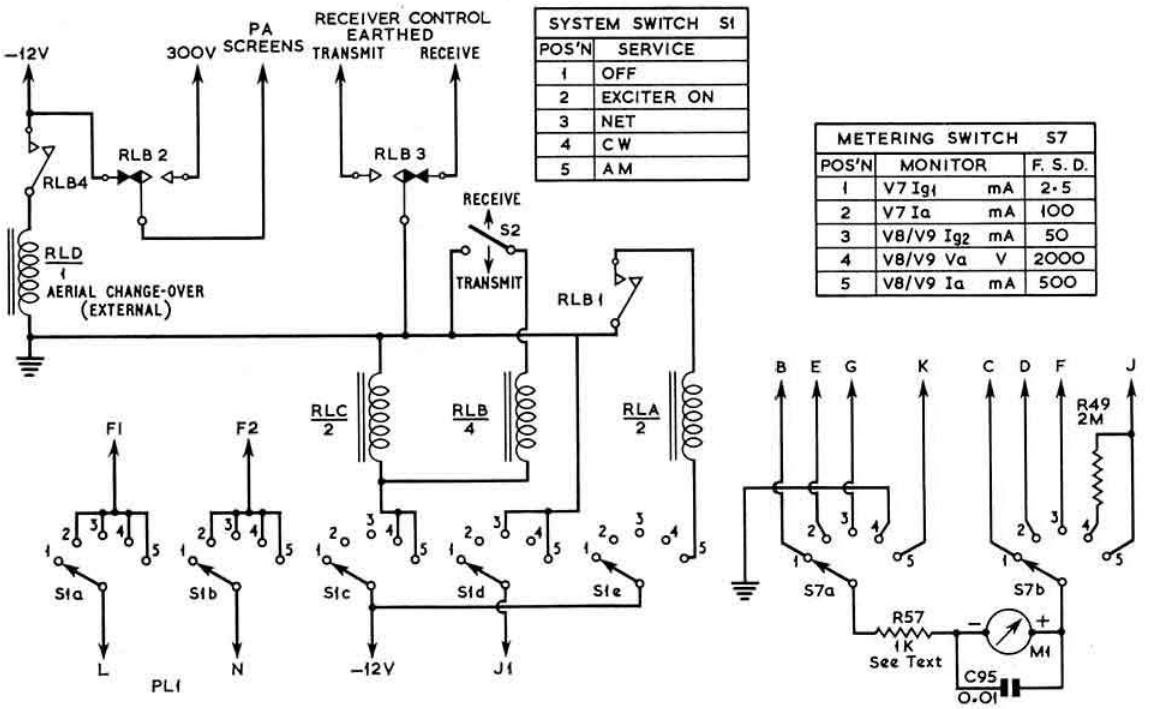
The control and metering circuits are shown in Fig. 6. The system switch, S1, has five positions, the first of which is OFF. At EXCITER ON, all stages up to the linear amplifier are live. The transmitter cannot be switched to TRANSMIT at this stage, nor can the modulator be used. The NET position differs only that the key is short-circuited.

When the fourth position of S1, A1, is selected, relay RLC in the power supply operates, putting high voltage on the linear V8-V9. No anode current flows as the screens are held at −12 volts. S2 may now be used to control the station. At TRANSMIT, relay RLB is energized, the p.a. screens are switched to 300 volts positive, −12 volts is available for the aerial change-over relay RLD, and the receiver is muted. Either short-circuit or open-circuit to earth conditions are provided for receiver control. If S1 is returned to NET, relay RLB opens and the station returns to RECEIVE automatically.

If A3 is selected, relay RLA is energized, providing 300 volts for the modulator and removing the short-circuit across the secondary of the modulation transformer. The key is short-circuited by S1d. Relay RLA can be energized only when S2 is at TRANSMIT. The switching of 240 volts at S1a and S1b presents a problem and is discussed under the heading of components.

Power Supplies

The power supplies (Fig. 7) use two power transformers: T2 supplies all potentials with the exception of the high voltage to the linear amplifier. MR9 to MR12 form a bi-phase rectifier, which could be replaced by a GZ34 valve if a suitable heater winding were available. Choke input filtering is incorporated (CH1 and C6), the nominal 300 volt line rising to about 325 volts on c.w. operation. V1, OA2 (or VR150/30), in conjunction with R19, gives a 150 volt



SYSTEM SWITCH S1	
POS'N	SERVICE
1	OFF
2	EXCITER ON
3	NET
4	CW
5	AM

METERING SWITCH S7			
POS'N	MONITOR		F. S. D.
1	V7 I_{g1}	mA	2·5
2	V7 I_a	mA	100
3	V8/V9 I_{g2}	mA	50
4	V8/V9 V_a	V	2000
5	V8/V9 I_a	mA	500

Fig. 6. Circuit diagram of station control and transmitter metering.

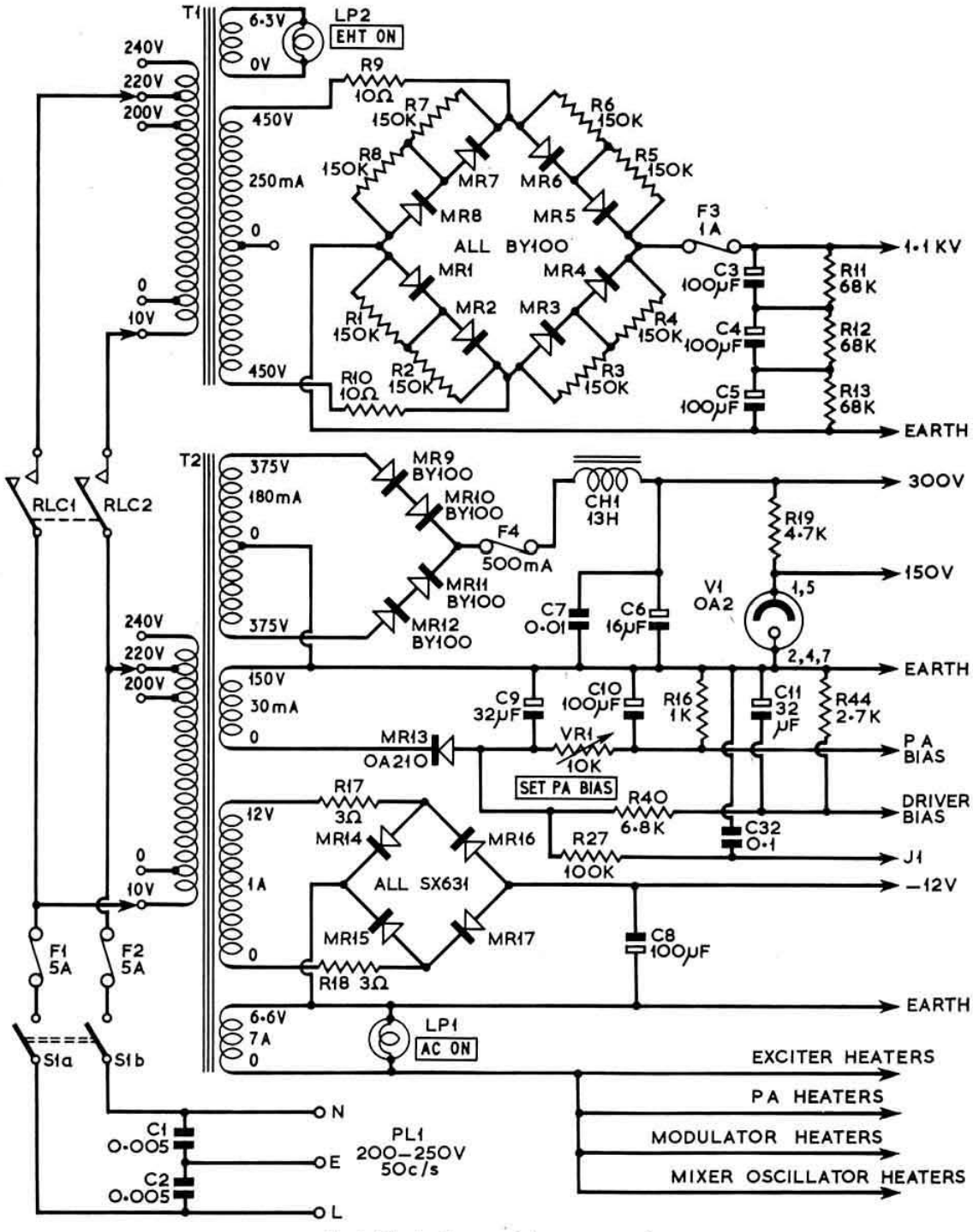


Fig. 7. Circuit diagram of the power supply.

stabilized line for V2 and V3. An anti-surge 500 mA fuse (F4) is used to avoid unnecessary power failures.

All bias supplies are derived from the 150 volt secondary, rectified by MR13 and smoothed by C9, C10 and C11. Three separate lines, one variable, run to the p.a., driver and keyed stages. Note that excellent smoothing is necessary on these lines if ripple is to be avoided, hence the large values of the smoothing capacitors.

For the 12 volt relay supply, four diodes type SX631 are used in a full-wave bridge, partially smoothed by C8. Valve heaters are connected by four separate lines to the 7 amp secondary. This is to avoid a heavy voltage drop and is useful during initial testing for running the exciter separately. LP1 indicates that the transmitter is switched on.

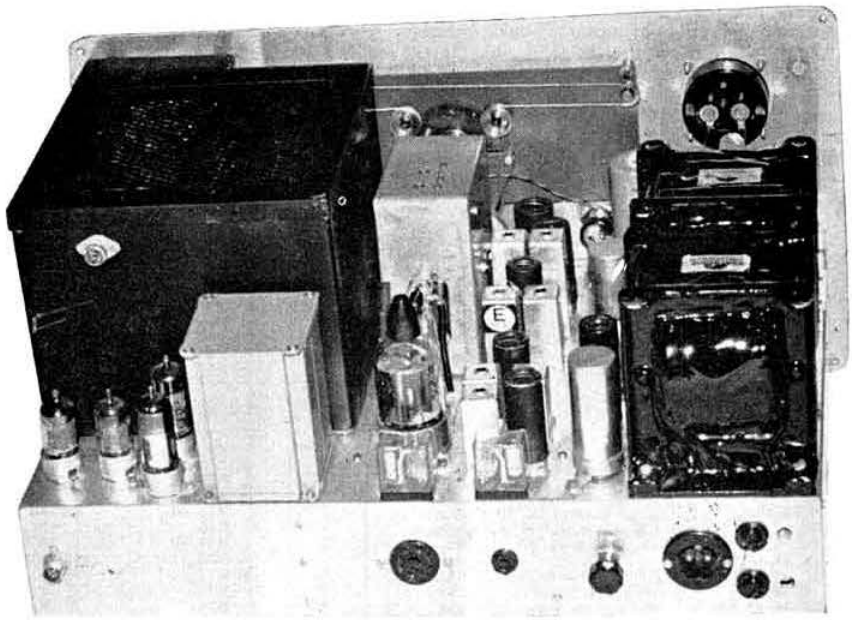
When the system switch S1 (Fig. 6) is at A1 or A3, RLC/2 (Fig. 7) is energized and mains applied to T1, indicated by LP2. A standard 450-0-450 volt 250 mA secondary feeds a full-wave bridge of eight silicon rectifiers. During testing it is recommended that only half the secondary

COMPONENTS LIST

Circuit ref.	Description	Quantity
	Capacitors (fixed)	
C1, 2	0·005 μF, 1500V wkg., 20%	2
C3, 4, 5	100 μF electrolytic, 450V wkg.	3
C6	16 μF electrolytic, 350V wkg.	1
C,7 20, 21, 26, 34, 37, 38, 39, 41, 49, 50, 51, 58, 59, 60, 64, 66, 69, 78, 80, 82, 83, 84, 89, 90, 95	0·01 μF disc ceramic, 350V wkg.	26
C32	0·1 μF paper, 350V wkg.	1
C8	100 μF electrolytic, 18V wkg.	1
C9, 11	32 μF electrolytic, 150V wkg.	2
C10	100 μF electrolytic, 100V wkg.	1
C14	10 pF ceramic, N750L, 20%	1
C16, 36, 47, 56, 63, 94	100 pF silver mica, 350V wkg., 10%	6
C17, 18	1000 pF silver mica, 350V wkg., 2%	2
C19, 33, 35, 52, 54	10 pF silver mica, 350V wkg., 10%	5
C22, 42	56 pF silver mica, 350V wkg., 10%	2
C23	82 pF silver mica, 350V wkg., 10%	1
C24	39 pF silver mica, 350V wkg., 10%	1
C25	680 pF silver mica, 350V wkg., 10%	1
C30	43 pF silver mica, 350V wkg., 2%	1
C31, 43	33 pF silver mica, 350V wkg., 2%	2
C44, 61	15 pF silver mica, 350V wkg., 2%	2
C68	0·001 μF mica, 750V wkg., 10%	1
C71	20 pF ceramic, Hunts CDG, 5%	1
C72, 73	100 pF ceramic, Hunts CDG, 5%	2
C74	150 pF ceramic, Hunts CDG, 5%	1
C75	180 pF ceramic, Hunts CDG, 5%	1
C76	330 pF ceramic, Hunts CDG, 5%	1
C77	840 pF (510 pF + 330 pF)	
C85, 87, 91	0·005 μF mica, 3 kV wkg., 20%	3
C96, 98, 100, 103	8 μF electrolytic, 350V wkg.	4
C97, 101	2 μF electrolytic, 12V wkg.	2
C99, 102	0·002 μF paper, 350V wkg., 20%	2
C104, 105	0·01 μF paper, 350V wkg., 20%	2
C106	25 μF electrolytic, 25V wkg.	1
	Capacitors (variable)	
C12, 15, 48, 57	3-30 pF air spaced trimmers	4
C13	100 pF Eddystone Type 585	1
C70	60 pF Eddystone Type 582	1
C86	250 pF Eddystone Type 817	1
C88	1500 pF (3-gang 500 pF)	1
	Resistors	
R1, 2, 3, 4, 5, 6, 7, 8	150K ohms, ½ watt, 10%	8
R9, 10	10 ohms, 3 watts, wirewound, 10%	2
R11, 12, 13	68K ohms, 6 watts, wirewound, 10%	3
R16, 65	1K ohms, 1 watt, 10%	2
R17, 18	3 ohms, 1 watt, wirewound, 10%	2
R19	4·7K ohms, 6 watts, wirewound, 10%	1
R20, 27, 58	100K ohms, ½ watt, 20%	3
R21, 33, 37, 41, 42, 50	1K ohms, ½ watt, 20%	6
R22, 36	4·7K ohms, ½ watt, 20%	2
R23, 29, 31, 34, 38	47K ohms, ½ watt, 20%	5
R24	5·6K ohms, ½ watt, 20%	1
R25, 26	470K ohms, ½ watt, 20%	2
R28	8·2K ohms, ½ watt, 20%	1
R30	330 ohms, ½ watt, 20%	1
R32, 46	10K ohms, 1 watt, 10%	2
R35, 39	470 ohms, ½ watt, 20%	2
R40	6·8K ohms, 1 watt, 10%	1
R43	430 ohms, ½ watt, 1% hi-stab.	1
R44	2·7K ohms, 1 watt, 10%	1
R45	10 ohms, ½ watt, 20%	1
R47	11 ohms, ½ watt, 1% hi-stab.	1
R48	100 ohms. Consists of 10 1K ohm 1 watt 10% resistors in parallel. See text.	
R49	2M ohms, ½ watt, 1% hi-stab.	1
R51, 52	10 ohms, ½ watt, 10%	2
R53	22 ohms, ½ watt, 1% hi-stab.	1
R54, 55, 75	100 ohms, ½ watt, 20%	3
R56	2·2 ohms, ½ watt, 2%	1
R57	To increase total meter resistance to 1·1K ohms ± 2%, ½ watt. See text.	
R59, 62, 68	3·3K ohms, ½ watt, 10%	3
R60, 63	220K ohms, ½ watt, 5% hi-stab.	2
R61, 64	39K ohms, ½ watt, 20%	2
R66	1M ohm, ½ watt, 20%	1
R67, 69	100K ohms, ½ watt, 10%	2
R70, 71	220K ohms, ½ watt, 10%	2
R72	330 ohms, 3 watts, wirewound, 5%	1
R73	56 ohms, ½ watt, 20%	1
R74	1K ohms, 3 watts, wirewound, 10%	1
R76	1·5K ohms, 5 watts, wirewound, 10%	1
VR1	10K ohms, 3 watts, wirewound, 10%	1
VR3	100K ohms, 3 watts, wirewound, 20%	1
VR4	1M ohm, carbon log, 20%	1
	Miscellaneous	
CH1	13H 200 mA Partridge TF6811	1
F1, 2	Cartridge fuse, 5 amp	2
F3	Cartridge fuse, 1 amp	1
F4	Cartridge fuse, 500 mA, anti-surge	1
LP1, 2	Indicator bulb, 8V 0·15 amp	2
Meter	0-1 mA panel mounting. See R57 re value of internal meter resistance.	1
MR1 to MR12	BY100, 800V p.i.v., 500 mA	12
MR14, 15, 16, 17	SX631, 100V p.i.v., 750 mA	4
MR18	OA85	1
MR13	OA210, 400V p.i.v.	1
RFC1, 3, 4	2·5 mH Elecroniques	3
RFC5	470 μH Electroniques	1
RFC2, 6, 7	7 turns 22 s.w.g. enamel wound over R54, R55, R75	3
RFC8	100 turns 32 s.w.g. on ceramic tube 4 in. × 1 in., winding divided into 3 sections.	1
RLA/2, RLC/2	d.p.d.t. 12V operation	2
RLB/4	4 pole changeover, 12V operation	1
RLD/1	s.p.d.t., aerial changeover	1
S1	4 bank 2 pole 5 way 250V 5A make before break.	1
S2	Toggle, s.p.s.t.	1
S3, 4, 5	2 bank 2 pole 5 way	3
S6	1 bank 1 pole 5 way, heavy duty	1
S7	1 bank 2 pole 5 way, ceramic	1
T1	Mains transformer. Primary 200-250V, 50 c/s. Secondaries 450-0-450V 250 mA, 6·3V 0·3 amp. Partridge TF6809.	1
T2	Mains transformer. Primary 200-250V, 50 c/s. Secondaries 375-0-375V 180 mA, 12V 1 amp, 6·6V 7 amps, 150V 20 mA. Partridge TF6810.	1
T11	Modulation transformer. Woden UM0.	1
V1	OA2-150C2	1
V2	ECC81	1
V3, 11	ECC82	2
V4, 5, 6,	EF91	3
V7	QV06/20	1
V8, 9	TT21	2
V10	ECC83	1
V12, 13	EL85	2
X1	Crystal, 5·5 Mc/s, 0·01%, 30 pF	1

is used until all systems appear to be "go."

The use of a full-wave bridge with valves is usually impracticable because three heater transformers are required. It is here that the saving in space with modern components is most marked. This supply is fused at 1 amp, otherwise the fuse will blow at switch on, due to the very low impedance presented by the series capacitor chain C3, C4 and C5. The parallel resistors which equalize voltages across the electrolytics must on no account be omitted. ***Warning:*** the insulated cans of C3 and C4 will be 800 volts and 400 volts above chassis respectively.



Rear view of the "Princess" transmitter. Note the shaping of the p.a. screen to clear the v.f.o. dial mechanism.

(Photo by M. L. Marques, Horley)

Components

Components in the v.f.o. tuned circuit must be of the highest quality. The inductor, L1, is wound with the wire under tension and is then placed in a warm oven for an hour. After the coil has cooled, it should be coated with polystyrene cement. The capacitors are either silver mica or air-spaced with ceramic insulation. Ideally the main tuning capacitor should be of the double end-bearing type, but availability could be a problem and the item specified is a good compromise.

The crystal frequency specified, 5500 kc/s, may be varied up to 10 kc/s either way if a suitable crystal is already available. In wiring both oscillator circuits use 18 s.w.g. wire in lazy loops; with the wire taut it may contract or expand suddenly accompanied by an instantaneous frequency change.

Wideband couplers T4 to T10 have been mentioned previously. Their construction is very simple: to obtain the correct spacing between the windings, cut a piece of Sellotape to the required dimension and stick it in the centre of the former. Do not forget to remove the Sellotape afterwards and also any pieces used to hold the wire terminations, otherwise the Q value of the coils will deteriorate with time. Use polystyrene cement to fix the turns. If the response of the 80m transformers is too narrow, about 1 pF top capacity coupling will widen the response sufficiently.

Trolex switches are used in all low-power r.f. circuits and have been found very satisfactory. At S5b an inversely shorting wafer is obtainable as an alternative. This results in a saving of space around S5 because of the smaller capacitors usable for C74 to C77.

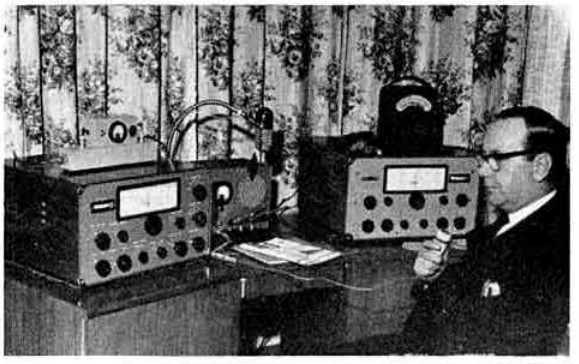
A Trolex switch wafer is not suitable at S1a and S1b but the manufacturers do produce a special double-pole mains switch attachment. In the prototype, a Yaxley switch with each pole of the mains on a separate wafer proved satisfactory. For S7, a ceramic Yaxley is essential with break-before-make contacts; this is most important with a potential difference of 1000 volts between adjacent positions. An ex-TU5B switch is suggested for S6 as it has to carry 1000 volts d.c. as well as the full r.f. potential.

The bias and drive potentiometers must be wire-wound; the tracks of carbon controls in this application would soon fail. The linear amplifier passive grid resistor, R48, is made by forming two circles of 18 s.w.g. wire about 1 in. in diameter; with one wire above the other, each of the ten resistors is spaced around the circle. To decrease or increase r.f. drive, less or more resistors may be used. With only eight in circuit the transmitter will run up to 300 watts d.c. input on c.w. but will produce the wrong conditions for a.m.

If resistors with the value specified for R17, R18 and R56 are not available, they may be made with resistance wire. The valveholders for V5 and V6 must be p.t.f.e.; for V7, V8 and V9 ceramic is suitable.

No components in the speech amplifier and modulator are critical. The resistance of R69 should be higher than that of R67, although both are nominally 100 K ohms. All earth wiring is taken to a bus-bar earthed only at the microphone input socket.

(To be continued)



Judging from the sale of commercially manufactured components for the G2DAF receiver, this is a very popular constructor's design. One amateur who has built both this and the mechanical filter version of the G2DAF Mk II transmitter (described in the March, April and May 1964 issues of the Bulletin) is G3HVU, whose equipment is shown here. This is a good example of how home-constructed equipment can compare with factory produced units.

(Photo by G3APA)

Dry Reed Switches

A New Switching Device with Amateur Applications

By J. D. HARRIS, G3LWM*

OVER the past decade a great deal of effort has been expended in improving the reliability of components. Although most of the normal components used by amateurs have benefited from this research, many of the more specialized devices are either not available or too expensive.

Whilst the dry reed switch may be well known to amateurs working in the telephone or instrumentation fields, it is doubtful whether the average amateur appreciates the usefulness of this component. In the search for more reliable relays it was originally felt that hermetically sealing them and filling the can with an inert gas (usually nitrogen) would cure contact failures. However, due to the various materials used in the manufacture of relays, it was found that unless the coil was completely sealed from the contacts failures still occurred. It will be appreciated that to manufacture a conventional relay to this specification is a costly procedure. Such relays have, nevertheless, been produced for aircraft equipment such as blind landing systems, but the price is far too high for amateur usage.

Research into more reliable relays was carried out by all the major telephone companies throughout the world, and the Bell Research Laboratories in the United States were the first to produce a commercially acceptable dry reed.

The dry reed switch contains all the metallic parts, except the coil, of the conventional relay. Fig. 1 shows the outline of the standard reed switch most commonly used at the present time in telephone switching applications. The glass envelope (*a*) contains two nickel iron blades (*b*) which are accurately positioned during manufacture to give a controlled contact gap (*c*) of 0·2 mm and an overlap of 1·2 mm. The glass tube is filled with an inert gas. The contact material, which may be gold or other precious metal, is deposited on the blades prior to insertion in the tube. If a suitable coil is then placed around the reed, and energized, opposite magnetic poles are induced in the contact blades which attract one another causing the contacts to close in a very short time, typically, 1·5 milliseconds. The release time of the better reeds is in the order of 50 microseconds. It should be noted that this fast release time can only be achieved if the blades are subjected to very careful control

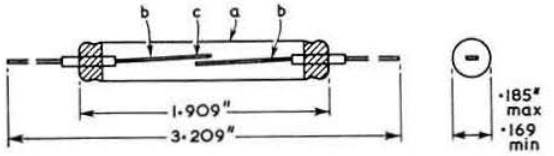


Fig. 1. General arrangement of contact elements in a standard type of dry reed switch.

during manufacture to obviate any residual magnetism, as the " air gap " introduced into the magnetic circuit due to the non-magnetic contact material is only a few microns.

Many applications of dry reeds suggest themselves to the amateur. Due to their small operating power, single reeds can require as little as 45 mW, whilst switching up to 12VA or 10 watts at a maximum of 0·5 amp at 250 volts. They are ideal for mobile and portable applications. Their exceedingly low inter-contact capacitance of less than 1 pF, coupled with the very high insulation resistance of more than 10^8 ohms,

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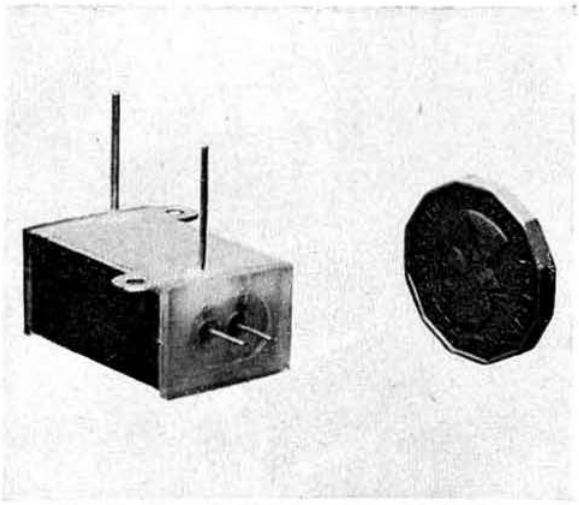


Complete dry reed switch shown larger than full size.

suggests uses in crystal switching for a multi-channel remote control v.h.f. mobile transmitter, or switching parasitic elements on fixed aerial arrays, or the remote switching of aerial tuning units. Several tests have been carried out by the writer indicating their suitability for these applications. Experiments are being conducted into the use of a dry reed

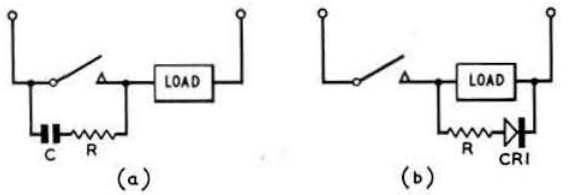
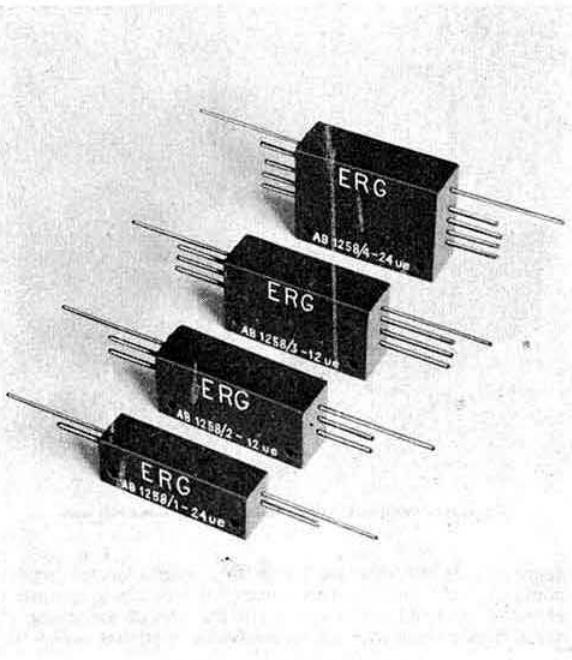


Fig. 2. Suppressor circuits for contact protection. (a) Resistor capacitor and (b) resistor diode networks.

switch as an aerial changeover relay for low power transmitters (10 watts).

It is important to note that, due to the very fast operate and release times, adequate suppression should be used to protect the reed contacts when switching inductive circuits (Fig. 2). A resistor-diode network is most suitable, but it should be remembered that the p.i.v. from inductive loads such as relay coils can be in the order of hundreds, and sometimes thousands, of volts. C/R suppression is also suitable, and the following formulae are applicable: $C = \frac{I^2}{R}$ where I is the closed circuit in amps and C the capacitance in microfarads; $R = \frac{E}{101^{(1+\frac{50}{E})}}$ where E is the open circuit voltage, I is the current in amps and R the resistance in ohms.

It is usual to see data on dry reed switches quoting the operating sensitivity in ampere turns. This is the product of the coil current multiplied by the number of turns required to give reliable operation. This figure can be as low as 30, which in practical terms means relays can be obtained with operating powers in the order of 40 mW, a figure difficult to obtain reliably with small commercial relays. Variations in operate sensitivity in a given size of reed are



A selection of dry reed switches.

usually obtained by varying the contact gap. The following are typical figures for a standard dry reed switch:—

Contact gap: 0·23 ± 0·01 mm.
Operate A/T: 78 ± 12.
Non-operate A/T: 66.
Drop-out A/T: 35.

The differential between the operate and release point can be made either very small or large, depending on require-

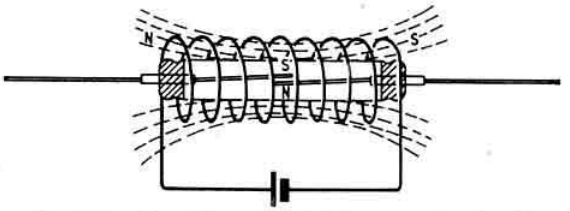


Fig. 3. Operation of dry reed switch by means of a solenoid.

ments, by using an auxiliary coil as a bias winding or obtaining biasing from a permanent magnet.

Fig. 3 shows the lines of force associated with a dry reed when operated by a solenoid. It is interesting to note that it is not always necessary to place the reed inside the coil, and a number of multiple capsule reed relays have the reeds placed round the outside of the coil. Dry reed capsules can also be attached to the outside of GPO Type 3000 relay coils and will operate satisfactorily. It can be readily appreciated that dry reed switches will also operate when a permanent magnet is placed near the capsule. Dry reed switches operated from permanent magnets (Fig. 4) are being used in a number of commercial applications such as level switches (liquids), proximity switches, door interlocks, and burglar alarms. When using reeds care should be taken that no strong magnetic fields are present, as most reeds will operate at a repetition rate well in excess of 50 c/s.

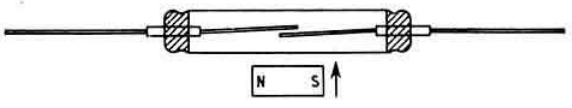


Fig. 4. Operation of dry reed switch by means of a permanent magnet.

The term " dry reed " is used to distinguish these components from the mercury wetted types. This is a most interesting component and was in fact commercially available before the " dry " types. Fig. 5 shows the action of the

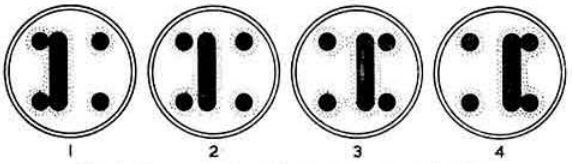


Fig. 5. Contact action of a mercury wetted relay.

mercury wetted relay. When the moving contact moves away from the break contact it draws a filament of mercury with it. This filament spans the gap for a short time giving make before break action. Then, due to the high surface tension of mercury, the filament will rupture, thus completing the contact action. The mercury breaks very much quicker than normal contacts, and quickly extinguishes any arc. Mercury wetting of the contacts also produces a contact area many times greater than normal. The resulting relay has a very long life, typically greater than 10^9 operations, together with very consistent contact resistance and high switching speeds at loads up to 5 amps. Mercury wetted relays are necessarily expensive but are known to be used in one American electronic keyer, where the absence of any contact bounce gives nearly perfect keying waveforms. Adequate suppression must always be provided on mercury wetted relays otherwise the contact life will be seriously reduced.

Should any readers be interested in obtaining reed relays, the writer will be pleased to help.

The writer is grateful to Thorn Electrical Industries Ltd., ERG Industrial Ltd., and T. Withers (Electronics) for assistance in the production of this article.

BOOK REVIEW

THE TRANSISTOR RADIO HANDBOOK by D. L. Stoner and L. A. Earnshaw, published by Editors and Engineers Ltd., Summerland, California. 178 pages, 9 in. × 6½ in. Available from RSGB Publications, price 41s. 6d. post paid.

The authors of this Handbook, better known to the amateur world as W6TNS and ZL1AAX, have succeeded in producing a handbook devoted to transistor principles and practice which is of direct interest to the average operator and constructor. Chapter headings are: 1. *Inside Semiconductors*, which deals with the elementary principles of transistors; 2. *Audio Amplifiers*, which provides design data and a range of circuits from speech amplifiers to ten watt modulators; 3. *R.F. Circuits*, including both receiving and transmitting applications; 4. *Receivers*, providing 18 practical designs ranging from simple crystal sets to a 220 Mc/s converter; 5. *R.F. Power Amplifiers*, which also includes exciters and transceivers, and 6. *Power Supplies*, covering a.c. to d.c. and d.c. to a.c. conversion. As would be expected the transistors used in the various circuits are of US manufacture, but the constructor should have no difficulty in finding equivalents although circuit constants may require alteration. There are several obvious errors and in some cases the reader is left to deduce missing information, but the authors have done a creditable job in producing a handbook of considerable value to the amateur interested in semiconductors. The volume is attractively and durably bound and the text and diagrams are clear and easy to read.

R. F. S.

Wobbulator for Receiver I.F. Alignment

By A. J. HODGKINSON, G3LLJ*

NORMALLY, receiver i.f. alignment is carried out using a signal generator or frequency meter and output indicator, adjusting the i.f. transformer cores for maximum output. Having completed this operation, it is possible to plot a response curve of the system by moving the frequency source in steps of approximately 200 c/s through the passband and tabulating the results shown on the output meter (Fig. 1). One disadvantage of this method is the time factor involved. If the response is not satisfactory, tedious experiments in stagger tuning are required in an endeavour to

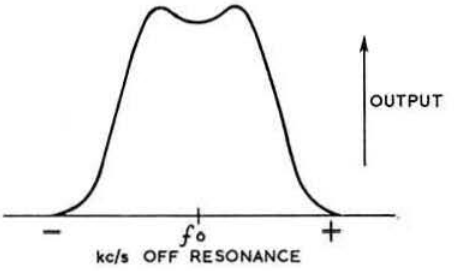


Fig. 1. Receiver i.f. response curve.

improve matters, followed, of course, by more plotting of response curves.

With the introduction of i.f. systems in amateur receivers using several crystal filter stages to reject or select a set of sidebands, the alignment can often be marred by one i.f.t. slug being a quarter of a turn from optimum. It is possible to obtain the correct response required by only using a frequency meter, but if the response can be observed whilst simultaneously making adjustments, the task is obviously easier.

Use of Wobbulators

It is possible, however, to cause a carrier to swing to and fro through the i.f. passband and to observe the response curve on an oscilloscope. With a display of this nature the i.f. amplifier can be adjusted easily for maximum output combined with correct response. Wobbulators are a means of providing a frequency modulated signal for this purpose. The amount of swing and rate of swing being controlled either mechanically or electronically.

To display the response curve on an oscilloscope the output of the wobbulator is applied to the grid of the mixer preceding the i.f. amplifier and the output from across the envelope detector load resistor is applied to the vertical (*Y*) amplifier of the oscilloscope.

In the case of the mechanical method at low frequencies (500 kc/s) it is usual to use a motor driven rotating variable capacitor to swing the carrier (Fig. 2). This rotating capacitor is placed across part or whole of the oscillatory circuit. It will be appreciated that the speed of rotation will decide the rate of change of frequency whilst the total change in capacitance of *CR* will decide the amount of change of frequency. Therefore, for different frequency changes or

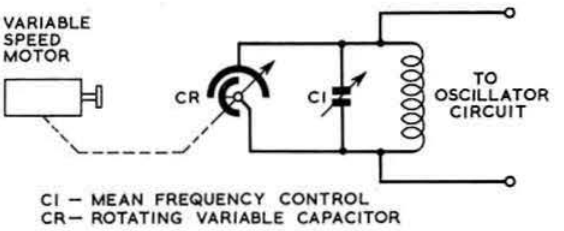


Fig. 2. Frequency modulation by means of motor driven rotating capacitor.

sweeps, several different values of rotating capacitors are required.

Rotating the capacitor through 360° gives two positions for every value of capacitance, i.e., maximum to minimum and back to maximum. The frequency will, therefore, increase and decrease once per revolution. If, however, the horizontal (*X*) time base of the oscilloscope is set to scan once for every revolution of the capacitor the trace seen will be as shown in Fig. 3 and is the double resonance curve. If, however, the speed of the *X* time base is doubled, the trace is as shown in Fig. 4, which shows the superposition of response *a* and *b* of Fig. 3. It should be realized that the

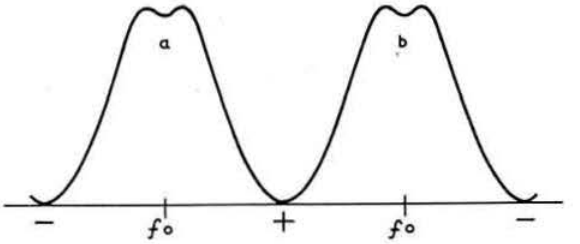


Fig. 3. Double resonance curve obtained when using mechanical method of frequency modulation.

commencement of curve *a* shows an increase of frequency whilst *b* shows a decrease. Alignment in this case calls for maximum amplitude with accurate overlap of both traces.

The writer does not use this method, although it should be possible to obtain good results if the mechanical problems can be overcome. As the signal to the oscilloscope is applied to the *Y* amplifier, *sync* can be applied internally.

Electronic Sweep

Use of the electronic method calls for a reactance valve to vary the oscillator frequency. In turn, the reactor itself is controlled to provide the necessary change across the oscillator. Two methods have been tried at G3LLJ—50 c/s a.c. and sawtooth voltage from the oscilloscope *X* amplifier. 50 c/s a.c. produces either double resonance or superposition

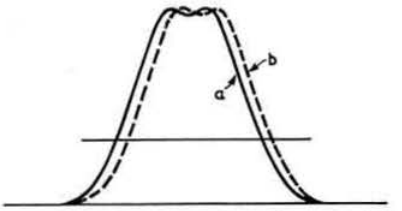


Fig. 4. Superposition of response curves due to doubling speed of time base when using mechanical method of frequency modulation.

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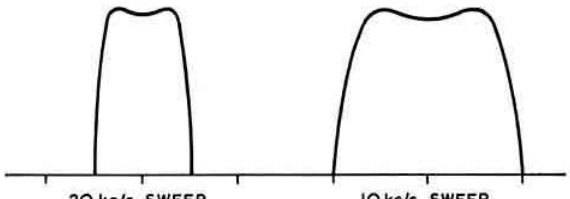

Fig. 5. (a) An i.f. of 10 kc/s overall bandwidth on a sweep of 20 kc/s. (b) The same i.f. on a sweep of 10 kc/s.

resonance curves and for reasons to be described later was not pursued seriously.

The method in use takes advantage of the sawtooth voltage from the *X* time base of the oscilloscope to control the reactor and cause a change of output frequency in sympathy with this sawtooth waveshape. As both *X* time base and output frequency are tied together no *sync* is required, thus with some oscilloscopes avoiding *sync* distortion. It will be seen that varying the *X* sweep speed of the oscilloscope will vary the rate of change of output frequency, also important is the amount of swing of output frequency.

Using a sawtooth waveform to control the reactor changes the output frequency one way slowly. The return swing is at the same speed as flyback and as the flyback trace is normally suppressed, this trace is not displayed.

Fig. 5(a) shows an i.f. of 10 kc/s overall bandwidth on a sweep of 20 kc/s and it will be seen that 5(b) would provide more accurate information. It is, therefore, an added advantage if the amount of change of output frequency be made variable.

The requirements therefore are as follows:

(i) Frequency modulation at preferred intermediate frequencies.
(ii) Rate of sweep tied to oscilloscope *X* time base.
(iii) Amount of sweep variable.
(iv) Simple and easy to duplicate.
(v) Minimum of setting up.

A Practical Design

The circuit shown has been in use for some time and has given excellent results on all types of i.f. amplifiers, from the very simple to three half-lattice crystal filter combinations.

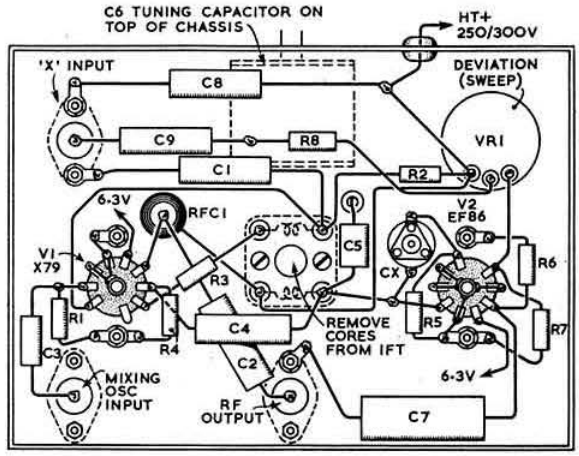

Fig. 7. Component layout.

The layout (Fig. 5) is not important and in the writer's case the instrument was built in a 7 in. by 7 in. box. The oscillator coil is a receiver 450 kc/s i.f.t. with the fixed capacitors removed. The main tuning capacitor is a 200 to 300 pF unit mounted outside the i.f.t. can.

An additional input to the mixer grid is to enable the users of alternative i.f. systems to inject the appropriate oscillator voltage in order to extract the sum or difference from the anode circuit.

Most triode hexodes or heptodes perform well in V1 position but V2 should be an EF86, 6J7, 6BR7, or EF37A.

To set up, check that *CX* is out of mesh, listen on a receiver to ensure correct oscillator function (connections to either primary or secondary may require reversing). Set *X* time base to approximately 50 c/s and turn VR1 to about $\frac{1}{8}$ travel from HT+ end of track. Now increase *CX* in value until a buzz is heard in the receiver. If *CX* is increased too far, oscillation will become weak and eventually cease. The sweep frequency is variable between 0 and 15 kc/s, the sweep speed, of course, is dependent on the *X* time base speed of the oscilloscope. No variation in output voltage is provided for on the unit. This is essential to prevent possible overload of the i.f. amplifier, and in the writer's case an outboard step attenuator is used.

To align an i.f. amplifier the following procedure is adopted at G3LLJ. The i.f. amplifier is aligned using a BC221. The wobbulator and oscilloscope are connected as described. The *X* gain of the oscilloscope is adjusted so that the trace nearly fills the screen. The a.g.c. is switched off, and the tuning control of the wobbulator is swung until a response

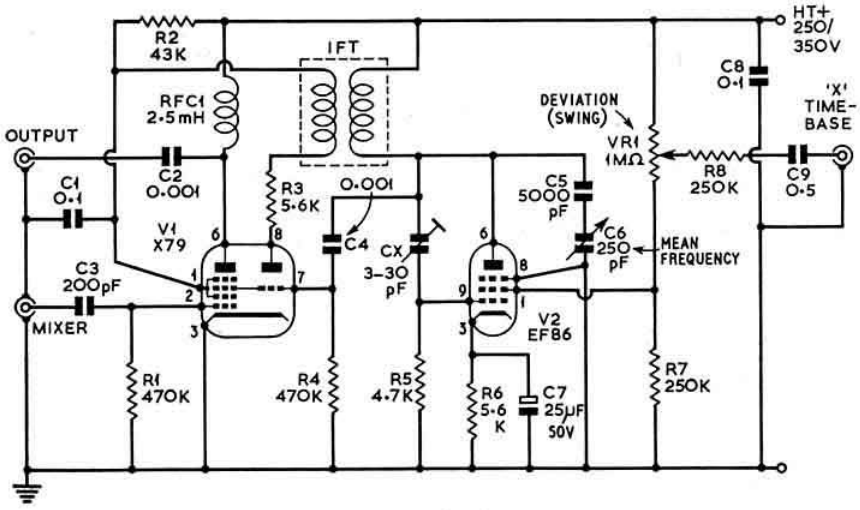

Fig. 6. Circuit diagram of wobbulator for a frequency range of 400 to 500 kc/s.

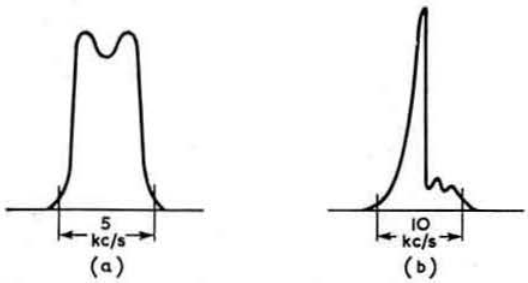

Fig. 8. (a) I.f. response of receiver using triple half-lattice filter and 5 kc/s sweep. (b) Response of Marconi CR100 with crystal in circuit (1200 c/s) on 10 kc/s sweep. Both responses are shown to approximately 40 db down.

appears on screen. Frequency sweep is adjusted so that the scan line is nearly taken up with the trace. As the frequency sweep is varied so will the oscillator tuning control have to be adjusted to keep the trace in the centre of the screen. Output from the wobbulator and *Y* gain control of the oscilloscope are adjusted for minimum distortion. Adjustment can now be carried out whilst actually watching a simultaneous graph of the passband. (Fig. 8.)

Whilst aligning standard i.f. amplifiers, sweep speeds of 50 c/s or even faster may be employed, but if more than about 30 c/s is fed to an amplifier using one or more crystals to

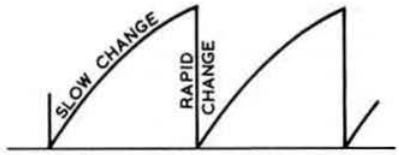

Fig. 9. Sawtooth waveform from oscilloscope time base used to control reactance valve modulator in wobbulator.

steepen the passband, these elements will ring, producing spurious frequencies thus making alignment impossible. If, however, the sweep is much slower than the persistency of vision (1/20 second) then flicker becomes pronounced. Fortunately if about 15 to 30 c/s is employed no ringing appears to occur and alignment is easily accomplished with flicker apparent but not intolerable. If crystal filter work is contemplated then check that the oscilloscope available has a suitably slow *X* range, if not, it is usually easy to slow down the slowest range by adding more charging capacity. Whilst still on the subject of alignment, remember the plot displayed on the screen is a linear one whereas usually a static plot is made to a logarithmic scale. Therefore some mental adjustment is required to enable the correct shape of passband to be appreciated.

Apart from work on receivers, the owner of an s.s.b. transmitter can look at the response curve of its filter* by connecting an envelope detector after the filter amplifier, and injecting the wobbulator signal before the filter.

* "Single Sideband," RSGB BULLETIN, February, 1964, p. 38.

Special Events Stations

To celebrate Wolverley's thousandth anniversary, a carnival in aid of Oxfam will be held on July 18. At Wolverley, near Kidderminster, a station signing GB3WOC will be operating on the h.f. bands, particularly on 15 and 20m. A talk-in station will also be active on 160 and 2m. Contacts, which will be confirmed by QSL, will be welcome.

On August 1, 2 and 3, the Royal Naval Amateur Radio Society will be operating GB3RN from HM Dockyard, Portsmouth, during the Navy Days. All the latest Naval ships and equipment will be on show. There will be talk-in facilities on 160, 4 and 2m.

Until October 25, 1964, **HB9RAS** will be active on 80 to 10m on a.m., c.w. and s.s.b. at the Swiss National Exhibition. Amateurs are welcome to visit the station, which is located in the Leisure and Hobbies Section. Further details are available from Radio Amateurs of Switzerland, Ch. Liaudoz 9, Pully/Lausanne, Switzerland.

Members of the Liverpool and District Amateur Radio Society will be operating **GB2LS** during the annual Liverpool Show from 20.00 GMT on July 16 until 20.00 GMT on July 18. A.m., c.w. and s.s.b. will be used on the h.f. bands, and contacts will be acknowledged with special QSL cards.

During the Gala Day Celebrations of the Marconi Apprentice Association at Chelmsford, Essex, members will be operating G3MWT on 160m, 80m, 2m and possibly 4m. Pre-arranged contacts are particularly required, and requests should be addressed to G3JTW, the club-station address, "Brooklands," New London Road, Chelmsford, Essex. Special QSL cards will be issued for contacts with **GB3MWT.** Cards from other stations should be sent to the Marconi Apprentice Association Radio Club, c/o The Education Office, Marconi House, New Street, Chelmsford, Essex.

The Southampton Group will be operating a station with the call-sign **GB3SOU** during the Southampton Show, which is to be held on Southampton Common on July 10 and 11. The h.f. bands and 2m will be in use, and there will also be talk-in facilities on 160 and 2m. Visitors are welcome, and a full programme of entertainment and refreshments have been arranged.

Start of Service from BBC's New Band III Television Station in Lancashire

Following the Postmaster-General's approval to the use of unallotted channels in Band III to improve the existing 405-line programme services, the BBC brought into service on April 20 a new television station in Lancashire on Channel 12 (vision 209·75 Mc/s, sound 206·25 Mc/s). The transmissions are vertically polarized.

The purpose of this new station is to provide alternative and improved reception of BBC television programmes in West Lancashire where reception of the BBC transmissions on Channel 2 from Holme Moss is at times subject to severe interference from foreign stations during the summer months. The service area is expected to cover the western half of Lancashire south of Lancaster, including the Blackpool, Preston, Southport and Liverpool areas, and also the Wirral Peninsula and parts of the coastal areas of Flintshire.

The new station has been built at Winter Hill, near Bolton, where it shares the site of the existing television station of the Independent Television Authority. The use of this site and the installation of temporary equipment has enabled the service to start much sooner than would otherwise have been possible and before the summer when interference with the Holme Moss transmissions on Channel 2 from foreign stations can again be expected. The permanent BBC station at Winter Hill, which will replace the temporary installation operating on Channel 12, will be brought into service next year.

An Economical Modulator

For use with Transmitters of up to 40 watts d.c. Input

By PAUL HARRIS, G3GFN*

IN *Improving Modulation Efficiency in V.H.F. Transmitters* [1] it is mentioned that while 40 watts d.c. input to the p.a. was a convenient level to run—on the basis that freely available "replacement" mains transformers will supply adequate power for this input—when it comes to deciding how to modulate this, a.m. style, one is apparently faced with having to employ quite potent valves just ambling along.

This particular problem recently arose in connection with a transmitter/receiver for the 70 Mc/s band. The required physical size of this unit barred the use of large audio valves, and in any event, the relatively high standing current of such valves would have entailed employing a larger mains transformer to run the modulator-receiver section than that provisionally allocated for this purpose. In addition, the heat dissipated by such valves would undoubtedly have proved somewhat of an embarrassment when locked up within the confines of the unit.

A review of valve literature showed that Mullard Ltd. quote some special operating conditions for the seemingly puny EL84, under which a pair in push-pull will deliver some 20 watts of audio [2]. Aside from the consideration of power output, the mean dissipation is very much lower than that for class AB1, thus reducing the heat generated by the valves—a worthwhile consideration when equipment is of small dimensions.

High Power from EL84s

The conditions under which push-pull EL84s will produce nearly 20 watts of audio are described as "low loading," presumably derived from the reduced value of anode-to-anode load. Although cathode bias is employed, the value of bias voltage approximates to that for class B conditions, and it is through this that the increase in efficiency is obtained.

Under low loading conditions, the value of anode-to-anode load for a pair of EL84s is reduced from 8K ohms to 6K ohms, and by reason of the increased bias, the quiescent current, which is 72 mA for class AB1, drops to 48 mA.

There are two requirements which must be observed when operating EL84s under low loading conditions if their maximum power output potential is to be realized. First, as with all class B stages, the h.t. supply must be capable of providing fairly large peak currents without suffering any undue voltage variation in the process. A simple method of ensuring this is by having a substantial value of capacity across the h.t. line. Provided that this is large enough in value, it will act as a reservoir for the peak current demands. Second, as the current swing through the valves between quiescent and peak output conditions is quite large, and since the bias for this mode of operation is developed across resistors in the cathode leads of the EL84s, these resistors must be bypassed by high value capacitors to prevent the value of the bias voltage wandering, and consequently changing the working point.

Detailed information on "low loading" operation will be found in *Circuits for Audio Amplifiers* [2].

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Distortion

It is a fact that one never gets something for nothing, and in one minor respect, this is true of EL84s when they are operated under low loading conditions.

While this mode achieves a very large increase in power output, the level of harmonic distortion rises to a value which would be unacceptable to the audio purist. In hi-fi applications this can be overcome by using an ultra-linear configuration for the output stage, coupled with negative feedback. In our case, where we are trying to extract the last drop of power, the consequent reduction in output given by these methods would be unwelcome. In the design to be detailed, other steps are taken to prevent such distortion getting out of hand.

Readability

In modulation the primary requirement is to place as much intelligence on a plain carrier as possible, subject to limiting the amount to a point below that at which over-modulation occurs. In addition, the modulation characteristics must have "punch" so that the transmitted signal can be read under adverse conditions. We are not, in fact, so much concerned with hi-fi, but, rather, with *readability*.

It is now fairly well known that the range 300 c/s-3000 c/s contains all the frequencies needed for optimum voice communication. Frequencies below 300 c/s add nothing to the intelligibility of a transmission, and excursions in this direction are just so much wasted power. True, they may, at close quarters, make transmissions sound "nice" and qualify the operator as a *basso profundo* candidate for Covent Garden—Opera of course—but that's about all. As for frequencies above 3000 c/s, while they may add a little more "bite" to the modulation, under the present crowded conditions on the amateur bands we cannot afford the

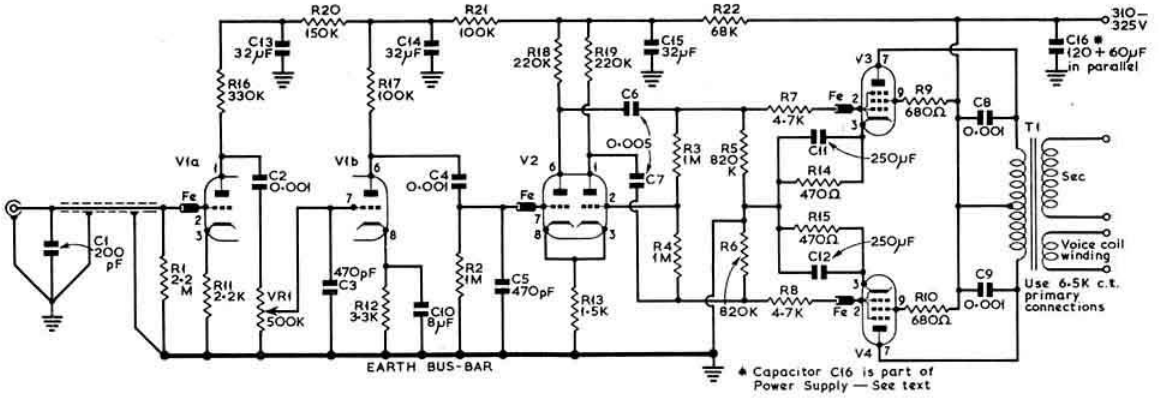


Fig. 1. The circuit diagram of the EL84 push-pull modulator. It should be noted that C16 is part of the power supply.

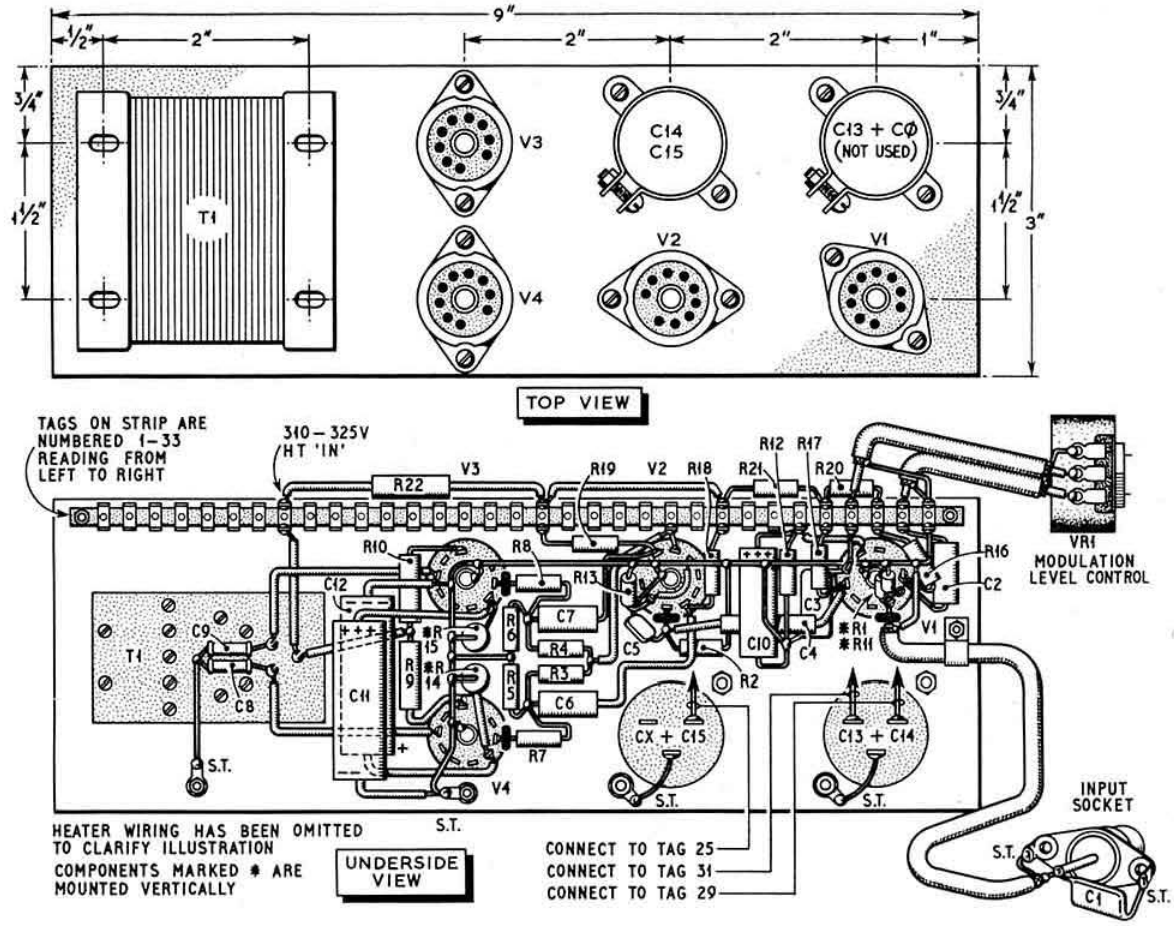


Fig 2. Component layout above and below chassis.

luxury of the increased bandwidth which such transmissions require.

By tailoring the frequency response of the modulator a very worthwhile increase in readability can be achieved, and in this particular case, by paying special attention to the high frequency response of the final modulator stage, the effect of harmonic distortion can be limited to an acceptable level. At the same time, the full output capability of the low loading conditions can be retained.

Limitations

Low loading conditions have one particular limitation. When the input is a sine wave, the output must not be allowed to run at a high level. For normal modulation purposes, where speech waveforms are involved, this limitation is of no consequence.

If sine wave testing is undertaken, it is essential to limit the power to about 2 watts otherwise the output valves will be damaged.

Measuring Power Output

At first sight it may seem difficult to verify the peak output of a stage operating under these conditions. In the writer's case, verification was obtained by running the modulator into a dummy load, measuring the peak voltage across this load on an oscilloscope, and converting this by simple calculation into power.

As a matter of interest the figures obtained—with an h.t. supply of 325 volts—showed a peak output in excess of 22 watts for the circuit given. At approximately 25 watts peak, some flat-topping became evident.

Circuit Analysis

There is no fancy footwork in the circuit which is shown in Fig. 1. Basically, it is a simple audio amplifier with its coupling constants selected to give a smooth roll-off below 500 c/s (3db down at 300 c/s) plus a touch of h.f. attenuation in the pre-amplifier circuits to keep the top end under control. The main high frequency shaping is undertaken in the output stage so that this will also take care of any harmonic distortion components. Precautions are included to prevent stray r.f. causing havoc in the modulator.

V1 (a) operates as a " wide open " voltage amplifier and has a value of grid leak suitable for most crystal microphones. Directly across the co-axial input socket is connected a 200 pF capacitor to bypass any r.f. collected by the microphone lead. At the actual connection to the grid pin of V1 (a) a ferrite bead is slipped over the lead as close to the grid pin as possible, and secured in position with a spot of adhesive. The ferrite bead increases the inductance of the

lead, which then acts as choke, and materially assists in preventing stray r.f. getting into this stage. Wherever ferrite beads are indicated the treatment is the same: as close to the grid pin as possible, and secured with adhesive.

The modulation level control, VR1, is fitted between V1 (a) and V1 (b), the latter section also operating as a voltage amplifier.

The 470 pF capacitor from grid to ground of V1 (b) serves two purposes. First, it is part of the top-end frequency shaping circuits, and as such would be more usually found connected in parallel with the anode load of V1 (a). However, by moving its position and placing it in the grid circuit of V1 (b), it not only modifies the h.f. response in the desired manner, but also functions as a further stray r.f. bypass point.

It will be noted that: (i) the cathode bypass capacitor has been omitted from V1 (a); (ii) the value of the cathode bypass capacitor fitted to V1 (b) is well below that normally associated with audio amplifiers, and (iii) the values of the coupling capacitors between the stages are low. The combined effect of these is to provide the desired low frequency roll-off characteristics.

V2 functions as a modified "see-saw" self-balancing phase splitter. This is a particularly useful circuit, for not only does it provide stage gain roughly equal to the gain of one section of the valve, but more than this, if R3, R4, R5, R6, R18, and R19 are of 5 per cent accuracy, then the *maximum* unbalance in the drive voltages to the following grids will not exceed 2 per cent. This is infinitely better than the Lo-Fo standards of the ever popular concertina phase inverter.

The output valves are operated under the low loading conditions previously outlined, and with the values shown and an h.t. supply of 325 volts, peak power well in excess of 20 watts may be expected. While the EL84s have been found quite tame under these operating parameters, and have shown no tendency to parasitic oscillation, grid and screen stoppers are fitted as a precaution. High values of cathode bypass capacitors are employed for the reasons already elaborated, and it is essential that the values specified are used.

Modulation Transformer

The modulation transformer is a unit by Gardners rated at 25 watts. Primary impedances range between 6·5K ohms, c.t., and 9K ohms, c.t., and those of the secondary from 3K ohms to 10K ohms. Of particular interest to those contemplating the construction of transmitter/receivers is the provision of a voice coil winding for 3 ohm or 15 ohm loudspeakers.

The main high frequency roll-off circuit of this modulator is a combination of the inductance of the primary of the modulation transformer and the capacitors C8 and C9. In view of this, if an alternative transformer is employed, some experimenting with the values of C8 and C9 may be required to limit the extent of the h.f. response.

TABLE 1

Notes on Components for the Economical Modulator

All resistors 10 per cent ½ watt except	
R3, R4, R5, R6, R18, R19 ...	5 per cent ½ watt
R22	10 per cent 1 watt
R14, R15	10 per cent 5 watt wire wound
All capacitors 350V d.c. wkg, paper, except	
C16–part of power supply. ...	450V TV electrolytic
C13 + C14	350V electrolytic, 1 in. diameter
C15 + Cx (unused section) ...	As C13, C14
C11, C12	25V wkg. ½ in. diameter
C1, C3, C5	1 per cent silver mica
C8, C9	10 per cent s.m. 750V wkg.
All resistors and capacitors except C8 and C9 are available in the Radiospares range obtainable through local retailers	
Modulation Transformer	
Gardners 25 watt	Primaries: 6·5K ohms, 8·0K ohms and 9·0K ohms, c.t.
	Secondaries: (a) 3K ohms, 5K ohms, 7K ohms and 10K ohms.
	(b) Voice Coil, 3 ohms and 15 ohms.

Construction

While the inherent electrical stability of this modulator is high through the use of generous decoupling circuits, care must still be taken in its physical layout to avoid stray coupling between input and output circuits. So long as a "straight line" form is used, no particular difficulties should be experienced.

As in all high gain amplifiers, there is a danger of earth loops being formed if a multitude of individual earthing points are used, and these could result in instability or an excessive hum level. It is far better to use an earth bus bar, one end of which starts right at the input socket, and the other end of which terminates at one of the output valve valveholders. Such a bus bar can be routed directly over all the valveholders and their spigots connected to it, along with the earthy ends of all such components as need to be earthed.

Insofar as the modulation level control VR1 is concerned, ensure that the casing of this is grounded. Do not, repeat *not*, connect the earthy end of this control to its case. This must be earthed by connection to the bus bar and in no other way.

Fig. 2 shows show the layout adopted by the writer, but it is certainly not the only arrangement which would prove satisfactory.

Conclusion

This modulator is capable of impressing a highly readable signal on carriers generated by p.a. stages running up to 40 watts d.c. input. Even at 50 watts d.c. input its characteristics are such that there should be no complaints of undermodulation.

For those who have never tried a frequency tailored audio system the extra "punch" will probably be quite a revelation. Having all the modulation power concentrated in the frequency band where it does the most good really helps to get through under difficult conditions. What is more, the chap down the road will bless you for having pulled in your bandwidth skirts. The odds are that he might even follow your example ! !

References

[1] See page 443

[2] *Circuits for Audio Amplifiers*, Mullard Ltd.

Proposed Society for Electronic and Radio Technicians (SERT)

At a recent meeting held in London, the Chairman of the Radio Trades Examination Board addressed RTEB Certificate holders regarding the establishment of a corporate society which would give to the radio and electronic technician similar facilities and recognition to those provided by the engineering institutions for professional engineers.

Membership of the SERT would be open, on a subscription basis, to holders of the RTEB Certificate. A regular technical news bulletin would be published and distributed to members.

Technicians are required in ever increasing numbers, and it is important that they should establish a recognized status for themselves.

TECHNICAL TOPICS By PAT HAWKER, G3VA

Homebrew Equipment . German Designs . Using Tuning Indicators as Meters
Temperature Compensation . Noise Temperatures . Sine-wave Oscillator
Transistor Voltmeters and S-meter . Converters with Ferrite-rod Receivers . NCX3 Modification

RECENTLY *QST* awarded a prize to an article " Resolve to Build Something " (*QST*, March 1964) which advocated that we should all make a firm resolution to build something this year—it did not seem to matter much what—if only because " there is more personal satisfaction gained from building a piece of equipment than there possibly could be buying it " as well as " increasing our technical skill."

Now these are, at first reading, very laudable sentiments. Certainly, we could all do a lot worse than get busy with our soldering irons. But still we must admit to a feeling of mild irritation that our transatlantic friends should have now reached the stage where the whole business of constructing or experimenting with pieces of amateur equipment should be approached as though we were all a set of naughty children who spent our pennies on catapults or that nasty shiny factory-built gear.

It would be better, we thought, to try and think out a little more clearly what makes us build rather than buy, or vice versa, and so discover whether there are any lessons to be learnt from this.

Regrettable as it must seem to many, throughout Amateur Radio history there have been only two really compelling reasons—at least as far as the majority of us are concerned—for building rather than buying. The first is when one cannot buy exactly what one wants (and for many years this covered practically the whole gamut of equipment). The second is when one believes that one can build the item considerably more cheaply than the price it is being sold at, to such an extent that this outweighs the nagging fear that one may never get it to work as well as the factory unit.

To make something much cheaper than it would cost to buy is indeed an extremely strong motive. Mike Cox, in an article on the growth of amateur television in *Electronics Weekly* (May 6, 1964), pointed out that many professional television engineers get real pleasure out of constructing for a few pounds some piece of equipment which would cost their organizations several hundreds to buy.

These then are the two strongest motives. First the wish to make something which differs in some significant way from what is currently available on the market; secondly, the desire to obtain at modest cost facilities which would be much more expensive to buy.

All those other considerations—the wish to learn how the circuits really work, the satisfaction of operating homebrew gear, pride of craftsmanship, ease with which the gear can be later modified, even the wish to " upgrade " Amateur Radio—may play some part in the decision, but, if we are honest, for the bulk of us, it is likely to be a subsidiary one.

Fortunately for the future of the hobby, we still believe that the two main reasons can frequently hold true today, and account for the undoubted revival of interest in home construction in the last few years.

Even the best production line equipment has to be designed to meet the requirements of the crowd rather than the individual and has to wait for demand to catch up with new technical developments. And the rising labour costs in industry—as well as the continued existence of a " surplus " market no longer dependent upon World War II—ensure that over a good range of equipment, the home constructor need lay out only a fraction of the final market value of the gear.

A further shot-in-the-arm for the constructor is that modern transistor equipment lends itself to simple forms of construction, with far less awkward metalwork to worry about. We referred some time ago to Veroboard (*TT* February 1962) in the form of the universal printed circuit board, but have been very impressed during various visits to research and development laboratories to see how much use can be made also of perforated-only boards, which are available from the same company, and which lend themselves well to the putting together of both temporary and permanent circuits.

Perforated boards are now readily available in the various stores, and another firm which has introduced a convenient sized perforated resin-bonded board, 4½ in. by 2½ in. with 200 holes, for the constructor is R. & E. Lamb, Queens Road, Leytonstone, London, E.11. The firm supplies the boards for 2/- each with 9d. packets of 40 brass eyelets. This should really allow the putting together of simple units in advance of what the market offers.

A neat use of perforated board was illustrated in *QTC* (February 1964) showing a seven-transistor electronic keyer by SM5KV put together in this way, and several *QST* designs have featured this promising technique.

An even simpler scheme, mentioned recently in *QST* is to use a piece of wood with tie posts consisting of brass tacks nailed into the board.

German Gear

Germany is a country which has always gone in for a high standard of mechanical design in communications equipment—and this tradition seems to be found in the continued popularity of home construction. Certainly, some of the German Army h.f. radio equipment of the last war featured some ingenious units. We recall in particular some transmitter-receivers we tried out in 1945-46 which were very easy to handle and some of the best calibrated " straight " receivers and v.f.o.s ever seen in military equipment. Even today, the Morse key at G3VA remains a " liberated " item which we still think is one of the best pump-handles yet designed.

Scanning through some recent issues of *Funk-Technik* and *Funkschau* it is clear that this characteristic persists. For instance *Funk-Technik* Nr. 2/3, 1964 contains constructional details of a most advanced h.f. receiver along the lines of the Collins S-line. With fixed crystal-controlled h.f. oscillator, there are eight bands each 200 kc/s wide for 3·5 (2), 7 (1), 14 (2) and 21 Mc/s (3), with 2·95-3·15 Mc/s tunable first i.f. The front end has an EF183 r.f. amplifier with PCF82 triode section as mixer. Permeability tuning is used throughout, and an OA150 diode switch selects upper or lower sidebands. Perhaps an unusual feature is the use of a.c./d.c. technique with a heater-chain and silicon rectifier, a tendency which seems to be gaining ground even in amateur equipment but which can be dangerous unless a non-reversible mains plug and socket is always used (and a check always made to ensure that the mains socket on which it is to be used has been correctly wired).

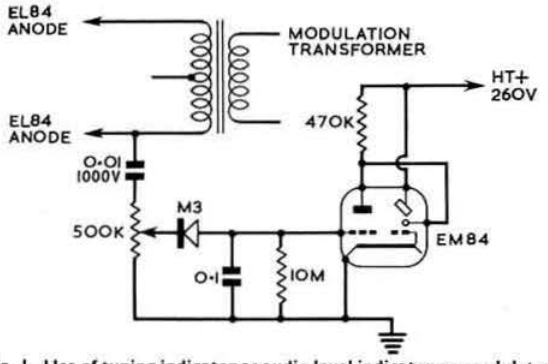


Fig. 1. Use of tuning indicator as audio level indicator on modulator for 10 watt 144 Mc/s rig.

Another design which caught our eye was for a most elaborate 3·5 Mc/s v.f.o./transmitter/modulator using 14 transistors, even though the output power (from an AUY10) is only 0·7 watt. The special high-stability circuit includes a complicated phase-locking arrangement.

Tuning Indicators

Both the German magazines have recently featured articles on compact 144 Mc/s transmitters running about 10 watts. For instance DL1HM describes (*Funk-Technik*) a neat package containing transmitter, modulator, v.h.f. converter and all power supplies, thus making with the addition of an h.f. communications receiver a complete station. A basically similar unit, but transmitter/modulator only is described by DL3SZ in *Funkshau* (No. 6/7, 1964).

An interesting feature of DL3SZ's modulator is the inclusion of a modulation level indicator similar to the type of voltage level indicators widely used in domestic tape recorders to assist the user in correctly setting the gain control. Fig. 1 shows this circuit, which takes off a small audio signal from one side of the modulation transformer, rectifies it with a crystal diode and averages it out by means of a resistance-capacitance time constant network. The system goes under the impressive German name of *Aussteurunganzeige*, and would seem a useful means of keeping an eye on the audio.

Once a tuning eye has been put into a transmitter, it can of course be switched for use for quite a number of other applications. It would enable tuning up to be done without meters (another dodge is to use small bulbs as current indicators). We found this being done in an economical design for a 25-watt transmitter by VU2SE in *SIRAN* (South India Radio Amateurs Newsreel) of December, 1963. There are no meters and an EM84 is switched to provide indication of p.a. grid drive or anode tuning: see Fig. 2. The p.a. comprises a pair of EL84s.

Although both these designs use EM84s it may be worth noting that a high-slope indicator tube which was specifically designed for use as a voltage-level indicator in tape recorders is the EM87 which is fully closed by a 10 volt signal. This indicator is arranged so that excessive voltages cause the luminous areas of the display to overlap giving a brighter section at the centre of the display, readily noticeable to the user. It would seem most suitable for use as a modulation indicator.

Tuning-eye indicators can also be used for such applications as grid dip oscillators, provided that the necessary h.t. is available. As yet, tuning indicators appear to be about the only valve device in common use which has not yet got a solid-state rival.

Temperature Compensation

The use of negative-temperature-coefficient capacitors to compensate for temperature drift in oscillator circuits for receivers and v.f.o.s has become fairly popular in recent years, and the technique is described in the RSGB *Amateur Radio Handbook* and elsewhere. Although it is seldom possible to achieve absolutely exact compensation, partly because drift is usually due to a combination of various capacitive and inductive changes, a considerable improvement can often be obtained, particularly where a unit runs fairly warm.

PA0SE discusses this technique of temperature compensation at some length in *Electron* (March 1964), showing its effect on a 2849-4029 kc/s oscillator (Fig. 3). By providing two 100 pF trimmers C2, C3 it is possible to adjust the degree of compensation provided by C4 which is an 82 pF ceramic capacitor with a negative temperature coefficient of −750 parts per million per degree Centigrade.

Noise Temperature

There appears to be an increasing tendency these days to define receiver sensitivities in terms of noise temperature rather than noise factor. Originally this practice appeared to be confined to radio astronomy and then spread to space communications, but nowadays one finds it increasingly

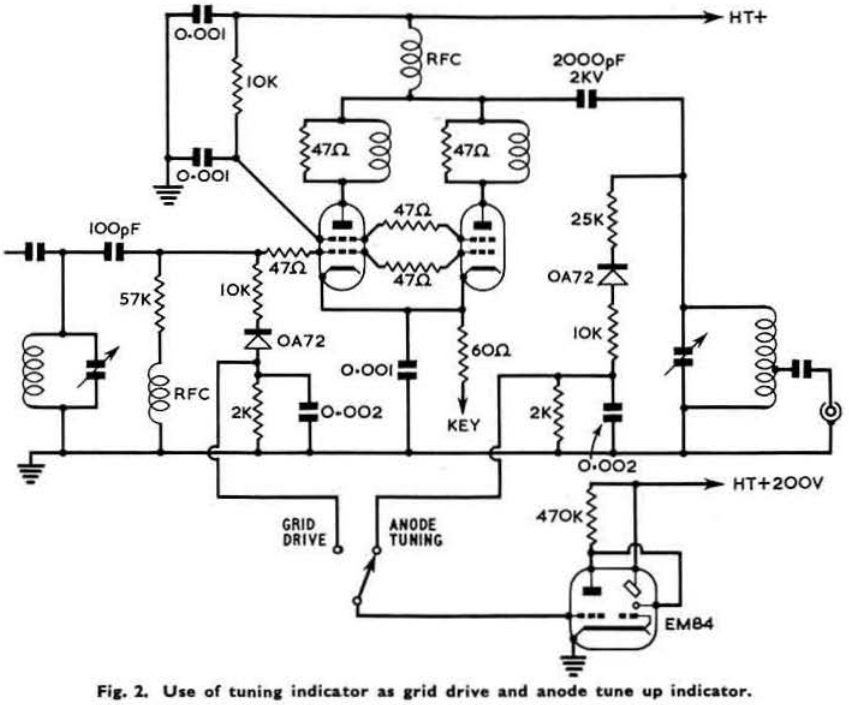


Fig. 2. Use of tuning indicator as grid drive and anode tune up indicator.

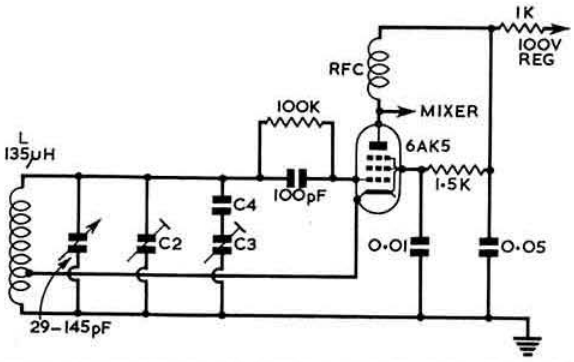


Fig. 3. Temperature compensation for h.f. oscillator. Trimmers C2, C3 100 pF. C4 82 pF —750 ppm temperature coefficient.

used for normal v.h.f. and microwave receivers, and even occasionally for h.f. receivers. The following quick conversion table will satisfy most needs, showing the connection between noise figure (db) and excess noise temperature in degrees Kelvin, in 0·5db steps.

db	°K	db	°K	db	°K	db	°K
1·0	75	3·5	359	6·0	864	8·5	1763
1·5	120	4·0	438	6·5	1005	9·0	2013
2·0	170	4·5	527	7·0	1163	9·5	2295
2·5	226	5·0	627	7·5	1341	10·0	2610
3·0	289	5·5	739	8·0	1763		

Sine-wave Oscillator

Back in April 1961, we gave the circuit of a two-transistor oscillator providing near sine-wave output using a headphone as the inductive element; and later this found application in a published design for a modulated grid-dip oscillator. Oscillators of this type are also useful for such purposes as s.s.b. transmitter testing. A further circuit using only resistors and capacitors appeared recently in *Radio-Electronics* (April 1964), Fig. 4, derived from US patent number 3,070,757. Even with a 6 volt supply, the drain is only about 1 mA, and the frequency can be changed by changing the value of C1. Typical frequencies are 0·1 μF about 2000 c/s; 0·5 μF 1000 c/s; 1 μF 700 c/s; 4 μF 300 c/s. Almost any type of low cost a.f. transistors should be suitable. Paper or non-polarized capacitors, rather than electrolytics, should be used.

Bias Supplies

In *TT*, August 1963, details were given of the use of a paper capacitor for voltage dropping to obtain a negative bias supply from the normal mains transformer. F2TR (*Radio-REF*, March 1964) has taken this a stage further by providing a useful list showing the negative voltages obtained with various values of capacitance: see Fig. 5. The idea has also spread to *QST* (May 1964, *Hints and Kinks*).

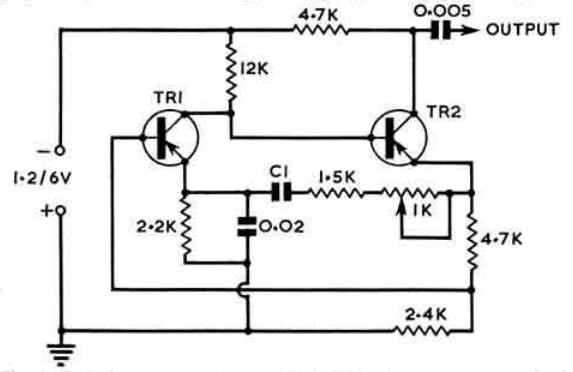


Fig. 4. R-C sine-wave oscillator. TR1, TR2, almost any type of a.f. transistors. For value of C1 see text.

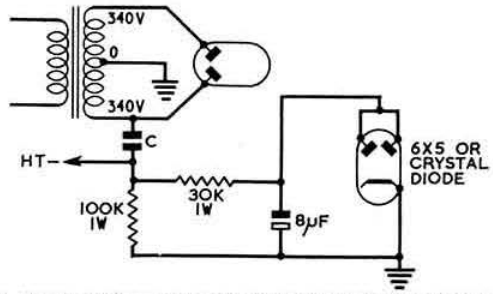


Fig. 5. F2TR's version of the capacitor voltage dropper bias supply. Value of C for various voltage outputs: 0·5 —340, 0·25 —330, 0·1 —240, 0·05 —160, 0·04 —140, 0·01 —37, 0·006 —23, 0·002 —10·5, 0·001 —7·6, 0·00025 —3·2.

Transistor Voltmeters

Although, as mentioned earlier, there is no semiconductor tuning indicator, transistor voltmeters can be used for many purposes for which such an indicator might come in handy, even though since transistors are essentially current-controlled devices, they are not always as suitable as valves for use in high-impedance voltmeters.

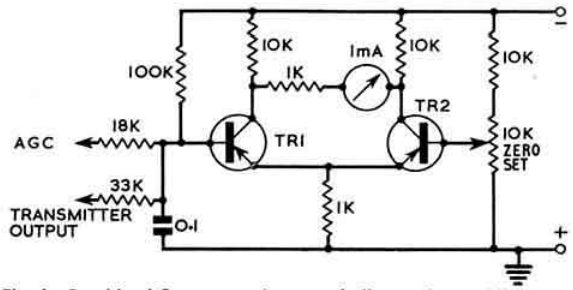


Fig. 6. Combined S-meter and output indicator for mobile transmitter-receiver. TR1, TR2, OC71.

Fig. 6 shows a combined S-meter/power output indicator, using a popular form of transistor voltmeter arrangement, from a mobile 144 Mc/s transmitter-receiver described by PA0QH in the Dutch magazine *Radio-Electronica* (receiver section, October 1963).

A somewhat similar circuit forms the basis of a general purpose sensitive h.f. indicator for checking oscillators in

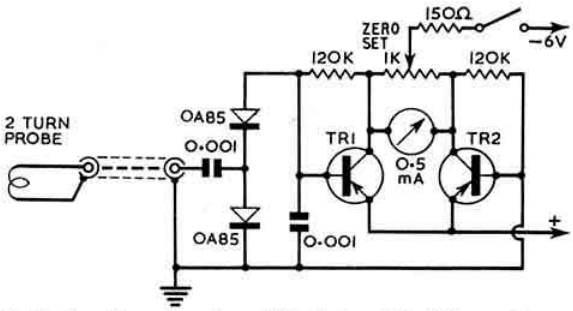


Fig. 7. Transistor voltmeter as h.f. indicator. TR1, TR2 any a.f. types.

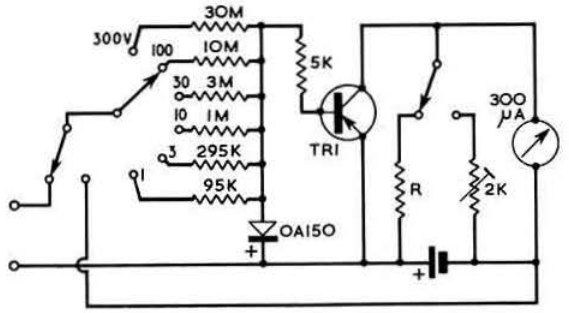


Fig. 8. Transistor voltmeter with six voltage ranges and input impedance of about 100 K ohms/V. TR1, OC70, OC71.

converters, transistor crystal oscillators, etc. The circuit is shown in Fig. 7 and is by PA0BM from *Electron* (March 1964).

A general purpose portable transistor voltmeter (Fig. 8) having an internal resistance of the order of 100 K ohms per volt appears in *URE Revista de Radio* (February 1964). The value of R is obtained from R = 3/0·003—Ri, where Ri is the internal resistance of the microammeter. An OC71 could be substituted for the OC70.

Converters with Transistor Receivers

Recently, while we were listening (on 'phones) to some 14 Mc/s signals, with a small transistor broadcast receiver standing near the amateur-bands set, we were surprised to hear the 14 Mc/s stations coming through well on the speaker of the transistor set, with the same degree of selectivity as on the main receiver.

This puzzled us for the moment until we realized what was happening. The main receiver uses a regenerative second detector on 465 kc/s and this was radiating just sufficient signal, modulated by the incoming signals, on the second harmonic of 930 kc/s to be picked up on the ferrite-rod aerial of the transistor set which was only a few inches from the detector valve, and which by chance was tuned to about 930 kc/s.

This does not seem to have any particular application in itself but it reminded us of a scheme which was described some time ago in *QST* to allow an h.f. converter to be used with a small broadcast receiver having no external aerial/earth sockets. The output of the converter instead of going to a normal type i.f. transformer went to a coil wound on a ferrite rod; when this rod was lined up with the receiver rod there was sufficient coupling to transfer the signals from the converter to the receiver.

Nowadays, with so many small transistor receivers around, many of which have high overall amplification, this scheme appears to offer a useful means of listening on amateur bands. A very simple type of crystal-controlled transistor converter which might be adapted to this purpose, or could be used with one of the sets which have external sockets, is shown in Fig. 9 and comes from *DL-QTC* (March 1963). R1 should be chosen for optimum results between 100K ohms and 1 Megohm.

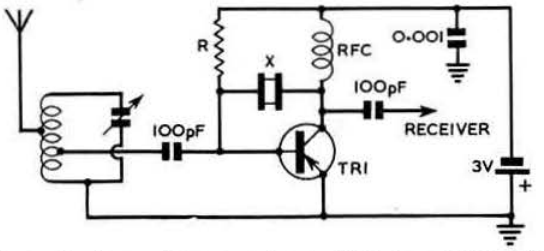


Fig. 9. Simple transistor crystal-controlled h.f. converter. TR1, AF105, 2N247, etc.

A real problem, however, with a fixed tuned converter in this application is that the internal aerial will pick up broadcast signals when tuning. It would probably be better to use a tunable converter oscillator and pick a quiet spot as the i.f.

NCX3 Modification

It is not often that we include, in this column, modifications for a specific item of commercial equipment, but G3WW has sent along details of a 5·2 Mc/s trap to prevent i.f. breakthrough on the National NCX3 transceiver. For some time past, LHQ in Norway, operating on 5202·5 kc/s has been pounding through and giving trouble by breaking into the 5·2 Mc/s i.f. stages. G3WW made up a simple parallel tuned trap in accordance with details provided by National (Fig. 10) and has found it 100 per cent effective in curing the trouble. The trap has little or no attenuation on transmitted power or on signals in the amateur bands but provides about 60db attenuation on 5·2 Mc/s signals.

The padder capacitor, C2, may need to be varied above or below the 950 pF suggested by some 10-25 pF to make the trap tune to 5·2 Mc/s with the 50 pF pre-set tuning capacitor at half mesh, to allow tuning to the exact frequency of any interfering station. The value of 950 pF (1 kV disc ceramic), suggest National, can be made up of a combination of three capacitors.

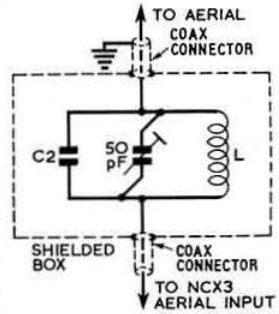


Fig. 10. 5·2 Mc/s trap for NCX3. L, seven turns of 16 s.w.g. copper wire (1·5 μH) wound over 1 in. form and spaced one wire diameter (form can then be removed).

Here and There

The RA17-type Deltahet converter designed by VK2AZN (*TT*, December 1963) attracted quite a lot of interest among members, and we know that a number obtained full details from VK-land. Among those who are interested in this unit are: G3ORF, G3JSB, G3PAG, GM3PIB and Harry Barnes (Norwich).

W2JMZ (*QST*, January 1964) has collated information from prominent DX-chasers throughout the world; this shows that they tend to rate the quad as the top DX aerial, although height is considered as important as type. For 7 Mc/s vertical ground planes are first choice.

That inveterate leg-puller G2BSA reports that since winding some audio tape around his coils (*TT*, April 1964) everybody reports hearing a VP8 previously recorded on the tape. Could 'BSA be trying to kid us that he does not use even enough power to cause complete h.f. erasure? Now if he had said that the effect was in his receiver . . . . .

With a tuning rate of about 2·5 kc/s per revolution to our tuning knob, we note with interest that the SS-1R receiver (reviewed *QST*, May 1964) has a built-in tuning motor. Incidentally the review stresses the importance with this no-r.f. stage receiver (using 7360 balanced mixers) of accurately matching the aerial to the receiver (50 ohms).

An extremely simple form of 4 : 1 balun designed for u.h.f. TV aerials was described at the IEE Convention recently. It consists of a half-wave length of insulated wire wrapped around a metal lug in a polythene container. It is connected between the feeder and aerial element in the same way as the equivalent co-axial balun.

IMPROVING MODULATION EFFICIENCY IN V.H.F. TRANSMITTERS

By PAUL HARRIS, G3GFN*

ONE of the problems which sometimes confronts a v.h.f. operator when checking a new transmitter manifests itself as a decided lack of modulation, even though, to all intents and purposes and according to l.f. practice, the audio system is quite capable of supplying adequate power to fully modulate the p.a. Unwritten laws being what they are, it seems to be decreed that he who has only just enough modulation for the intended d.c. input shall experience this phenomenon to the full. Experience has indicated that the effect occurs mainly when p.a. valves are operated at, or very near to, their upper frequency limit, and almost inevitably occurs when a p.a. valve is run, under reduced input conditions, on frequencies beyond the normally classified upper limit.

Grid Current

While no completely satisfactory explanation seems to have been put forward in the accepted textbooks to account for this peculiarity, there is strong reason to believe that it is linked with grid drive. Where valves are operated at or beyond their maximum frequency ratings, grid drive has to

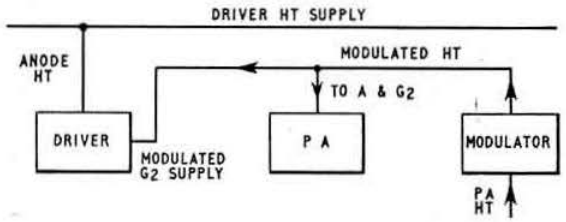


Fig. 1. Schematic diagram of modulation system.

be most carefully adjusted to secure maximum output and efficiency, and it is usually worthwhile plotting grid drive against power output in order to secure the optimum value for the particular conditions existing in the p.a. It is interesting to note that even changing valves of the same type usually entails slight readjustment of grid current to secure maximum output, and if the h.t. is altered, sometimes substantial changes are needed.

From the foregoing it seems reasonable to assume that, under the conditions which we are considering, when the p.a. voltage rises with modulation peaks, the grid current conditions become far from optimum, and the power output does not rise in step with the modulation. This would account for the effect noted.

How then is this to be overcome? On the face of it, it appears that the grid drive also requires to be adjusted at the modulation rate so as to keep it in step with the h.t. applied to the p.a. This is in fact what has been found is required.

In 1950 when the writer constructed his first 144 Mc/s transmitter using a 2E24 in the p.a., this particular little gremlin threw its spanner into the works very effectively. No amount of persuasion would induce the p.a. to accept even a decent level of modulation, except, strangely enough, in a downward direction. For 10 per cent of upward modulation, 90 per cent downward modulation occurred. To borrow from modern phraseology, the writer literally " went round the twist."

* 94 Aldwick Road, Bognor Regis, Sussex.

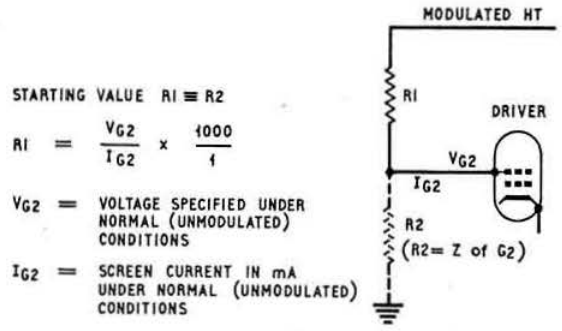


Fig. 2. Method of calculating resistor values.

The Cure

Eventually it was found that by applying a proportion of the modulated voltage to the screen grid of the p.a. driver stage, matters changed completely. The theoretically correct amount of audio produced a fully and symmetrically modulated carrier. Since then, all transmitters produced for the v.h.f. bands have used this arrangement, and none of them has produced this disheartening effect. That this particular little gremlin is still causing trouble has been gleaned from observations passed by some v.h.f. operators.

Since the days of the stumbling experiments the writer has noted with considerable interest that certain items of " surplus " v.h.f. gear—the B44 transmitter-receiver for example—use a more or less identical circuit arrangement, and moreover, Mullard Ltd. in the application report on the QQV03-20A and QQV06-40A valves suggest that this method may be " helpful." The basic arrangement is shown in Fig. 1.

Recently the writer constructed a fairly potent transmitter for the 70 Mc/s band employing a QV06-20 in the p.a. driven by a 5763 functioning as a tripler/driver, the p.a. operating as a straight amplifier. It was estimated that the d.c. input to the p.a. would be of the order of 40 watts, and therefore the modulator would have to be capable of delivering about 20 watts peak. A power of 20 watts of audio is pretty awkward to generate *efficiently*, and while it is true that EL34's would idle along at this level, the object was to produce a compact unit. Bearing in mind the fairly high standing current of a pair of EL34's and the demands that this would make on the power supplies, they did not find much favour in this case. A study of manufacturers' literature indicated that the much smaller EL84's used under *low loading* conditions would supply the peak power required. (See *Circuits for Audio Amplifiers*, published by Mullard Ltd.)

The design and layout of the transmitter made provision for the screen grid of the driver 5763 to be fed either from a straight h.t. line, or the modulated h.t. supply to the p.a. Although the modulator was checked (it was verified that it was delivering peak power in excess of 20 watts) the depth of modulation was limited to 55 per cent with a d.c. input to the p.a. of 40 watts and the 5763 screen grid fed from a straight h.t. rail. On the other hand, running the screen grid of the 5763 from the modulated supply, and hence indirectly modulating the grid drive to the p.a. produced a fully modulated carrier without difficulty.

When using this arrangement, care must be taken to ensure that the p.a. grid current is not modulated too enthusiastically. Only just sufficient should be used so as to give a

fully modulated carrier with the correct ratio between audio power and d.c. input to the p.a. In addition, the *mean* d.c. voltage applied to the screen of the driver should not exceed the rated value. While it can be logically argued that on modulation peaks the screen voltage of the driver may become excessive, in practice this does not seem to have any detrimental effect.

Driver Screen Resistor

A small number of experiments with the arrangement in the 70 Mc/s transmitter, and also in another using a 6BW6 driver, indicated that when the value of the series resistor from the modulated supply was approximately equal to the d.c. impedance of the screen grid of the driver, then conditions appeared to be optimum. Nevertheless, in another case, substantially less resistance than the calculated value produced the best results. It would seem therefore that any calculated value should be treated as a starting value only, and experiments conducted with lower values until the optimum is found. What is certain is that the highest practical value giving the correct relationship between audio power and d.c. input should be finally fitted.

Those who are interested in improving the efficiency of their modulation in v.h.f. transmitters may care to try this idea. In any event it is an arrangement which is well worth bearing in mind in any projected v.h.f. transmitter where modulation requirements are difficult to satisfy or the modulation power available only just adequate.

A Coaxial Plug Adaptor

By R. J. HUGHES, TD, DLC, G3GVV*

CERTAIN items of surplus equipment, currently available, suffer the disadvantage of being provided with Pye-type coaxial sockets. The ex-RAF coaxial relay, Type 78, is a typical example; inspection of this relay reveals that the substitution of modern miniature coaxial sockets would not be an easy task. This article describes a method of overcoming this difficulty by retaining the existing Pye-type sockets, and making an adaptor which consists of a Pye-type plug, mated with a miniature coaxial socket.

* Farleigh, 65 Harlands Road, Haywards Heath, Sussex

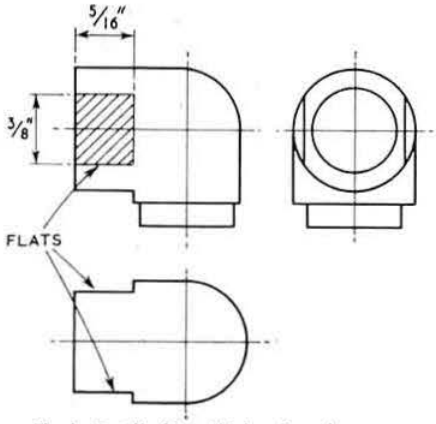


Fig. 1. Detail of flats filed on Pye plug.

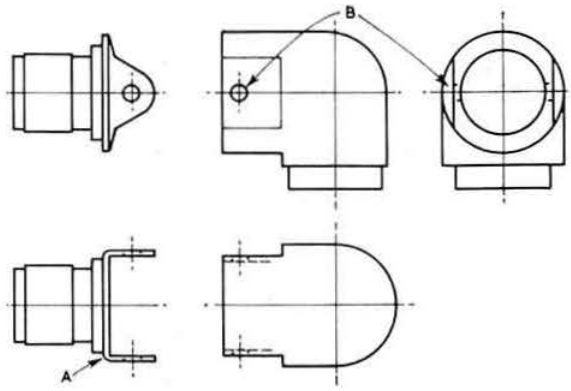


Fig. 2. Method of mounting miniature coaxial socket on Pye plug.

Modifications to the Pye Plug and Miniature Coaxial Socket

(i) File two flats, on opposite sides of the Pye plug (see Fig. 1). Care must be taken to ensure that these two flats are parallel to each other.

(ii) Bend at right angles, each fixing plate of the miniature coaxial socket, to form a snug fit over the flats (*A* in Fig. 2).

(iii) Using the fixing holes in the miniature coaxial socket as a template, centre punch the Pye plug.

(iv) Drill and tap (6BA) two holes, one in each flat of the Pye plug (*B* in Fig. 2).

(v) Solder a short length (about $\frac{3}{8}$ in.) of wire to the central spigot of the miniature coaxial socket. Insert the other end of the wire into the central receptacle of the Pye plug; this will be accomplished more easily if tinned copper wire (20 or 22 s.w.g.) is used, rather than flexible stranded wire.

(iv) The Pye plug and miniature coaxial socket are finally bolted together, using two round head or cheese head bolts, 6BA, $\frac{1}{4}$ in. long.

It may be found that, when operation (ii) is attempted, the holes would come too close to the end of the Pye plug. This difficulty may be overcome by slotting the fixing holes in the miniature coaxial socket, using a rat-tail file.

Results

The writer has made up several of these adaptors, primarily for use with a coaxial relay Type 78. They provide a simple and neat unit; their insertion loss, when used in a 144 Mc/s installation, appears to be negligible.

Claims for RSGB Certificates

Members are reminded that claims for RSGB Certificates should be sent direct to Headquarters. Claims are acknowledged on arrival and passed to the Honorary Certificates Manager for attention.

RSGB International Radio Communications Exhibition, October 28-31

In view of the number of enquiries received for stand space at this year's show it has been decided to open the gallery at the Seymour Hall to exhibitors. Firms who intend to take part are recommended to contact the organizer, Mr P. A. Thorogood, 35 Gibbs Green, Edgware, Middlesex.

QUA Associates

conducted by "JIX"

ALTHOUGH we started this series in May by discussing a simple receiver, mainly for beginners, that can be built up stage by stage, the *QUA Associates* pages in future BULLETINS will describe your interests and contain technical gen which is going to be of greatest interest to the majority who read these notes. It is valuable to read your letters, to hear of projects carried out, and of any outstanding problems you have. Others may be experiencing the same difficulty, be it theory or in practice. But nothing much can be done if you don't communicate your ideas!

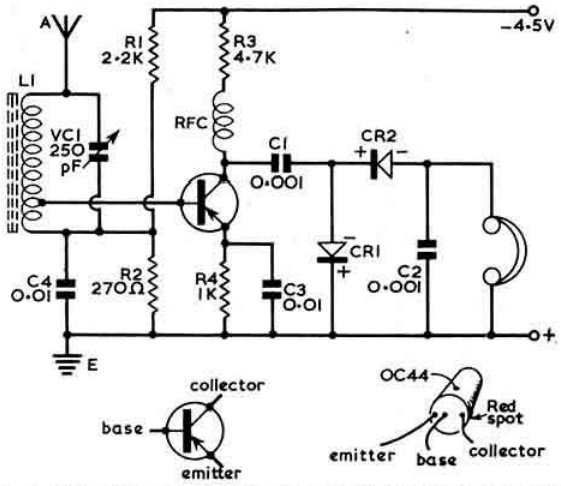


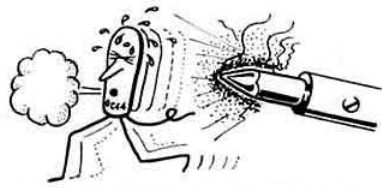
Fig. 1. This is the second instalment of the circuit published in QUA Associates in May. The addition of a transistor considerably improves the sensitivity of a crystal set, and also provides a more comfortable listening level when receiving local stations.

Information for Beginners

Comments about beginners and the lack of information for them appeared in the May issue of *The Short Wave Magazine*. This has come up before, but not everyone would agree that it is such a problem, or that " Its solution is as far off as ever." Boys talking to me say that they don't need " spoonfeeding," and get the best fun out of experimenting and working together. There is a vast amount of books and " know-how " just waiting at public libraries. Clubs have experienced members to help any beginner. Other periodicals have a large number of articles for beginners, and we might mention *Hobbies Weekly* which has introduced many a boy to his first simple radio construction. Perhaps you will agree that the friendship and co-operation is as developed as ever, and that Amateur Radio is increasing, so there is no need for pessimism about youth who will succeed in their own way, like the early pioneers who rose to the challenge without any published information.

Receiver: An R.F. Amplifier

I hope some of you have had success with the crystal set design described in May. We are now ready to add an amplifier to make the circuit more sensitive. Amplification of signals can be carried out using valves or transistors, but



Remember, transistors do not like heat—they suffer from thermal runaway.

amplifiers require power from a battery or the mains and unlike the simple crystal set, they work by converting some of this to signal power, so a stronger result is obtained.

The circuit, Fig. 1, suggested for your next experiment involves a transistor r.f. amplifier. This means that signals are amplified before the detector. The same ferrite rod coil can be used; in fact the tap was designed for " matching " into the base of the transistor. A suitable layout is shown in Fig. 2.

The detector now follows the r.f. stage and is fed from the collector of the transistor. It is at the collector that the amplified signal appears. Take care not to overheat the transistor when soldering it into the circuit, and watch the positive and negative sides of the battery, so that you always connect it the correct way round.

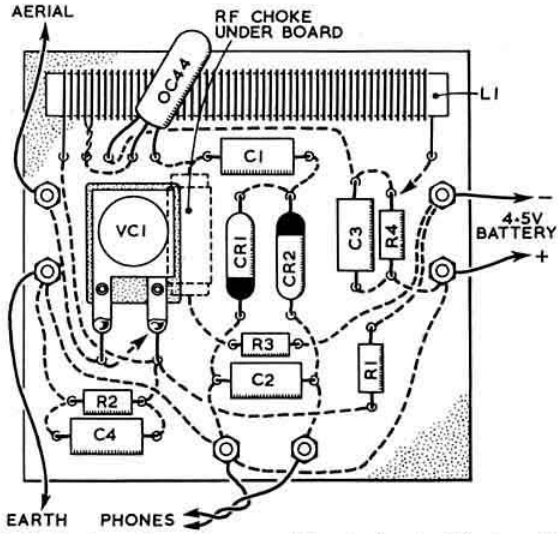


Fig. 2. As shown here, the more elaborate circuit of Fig. 1 can be fitted on to the same board as the original crystal receiver with little difficulty.

* Correspondence for " JIX " should be sent to RSGB Headquarters.

Soldered Joints

Very often, especially with beginners, trouble occurs because soldered joints are weak in a circuit that has been built. It is all too easy to obtain a " dry " joint. This may look all right, but in fact an oxide layer is formed between the parts joined and a high electrical resistance results, which is likely to upset the operation of the set. The type of joint mentioned usually falls apart anyway with a bit of a pull.

The cause of this type of trouble is dirt or grease on the parts to be joined, or too little heat, or both.

The number one golden rule is to see that the surfaces to be soldered are clean. Make sure that all the enamel is scraped off the ends if you are using enamelled wire, or that dull looking leads are scraped bright. Solder tags are often dulled by an oxide film so they should be scraped too. To make sure, the separate parts can be " tinned " first. This means that they are given a coating of solder, then brought together. When the soldering iron is applied, the solder runs and a good joint is formed.

If the iron is not hot enough, then the solder will be pasty and a poor joint is likely. It may seem obvious but the main cause of too little heat is trying to solder a large job with an iron which is too small. Physics types will know that the capacity for heat of a small copper bit will not be enough for large masses of metal, such as soldering direct to a chassis (especially copper). The old gas heated irons are best for chassis soldering. Another cause of insufficient heat is the dabbing on and off the joint that some beginners seem to do. The iron must be firmly applied and kept there to conduct heat to the work. It might be an advantage to wriggle it against the job; experience gives the feel for this kind of thing.

Finally there is the need to understand the fluxing action. Flux used to be daubed on to the work first, but now it is usually inside the solder wire (cored solder). As its name says, flux helps the solder to flow and to " wet " the metals being joined. It is important to run the solder straight on to the job with the iron in place. If solder is placed on to the iron first, the flux will have boiled away by the time it is applied to the job and a poor result is likely. Try melting solder without flux, you should notice that it is rather dull and thick. Apply a little flux (or fluxed solder) and it immediately runs better and brightens up. We hope your soldering will be as successful as ever, and no dry joints!

Activities this Month

Gordon Rolland, **A3766,** at school in Addington, writes to say that he is pleased to see *QUA Associates* in the BULLETIN. Gordon is interested in the setting up of efficient receiving stations, especially aerials. There may be some of you who would like to correspond with him about these matters.

Another letter, this time from Roger Lapthorn, **A3554,** (Kingsbridge, Devon) contains an impressive list of stations heard on a crystal set. Radio Moscow, Rome, and many other European broadcasters on medium waves, as well as G2DYM and G3SHT on 20m. A3554 recommends crystal sets as a relaxation from really big stuff, and also that joining a club is a big help in Amateur Radio: we heartily agree.

Clive Bennis, of South Woodford, is making mathematical models to illustrate waveforms. It is hoped that some of these will be shown at the RSGB Radio Communications Exhibition next October. Clive has only the Morse test left before getting his " ticket."

A3805 (Eric, Northwood) pointed out that I did not mention that a fairly good outdoor aerial is needed for crystal sets, because the only power that is available is that collected by the aerial. You can try experiments with different wires; long, short, high, running North and South. A good earth connection also improves reception.

Stephen Shaw, **A4124,** of Stockport, has built the crystal set described in the May BULLETIN (with modifications, of course!) and reports some interesting results, mainly continental broadcasters. Stephen also stated that he noticed signals being superimposed on other carrier waves by the crystal set. This has been reported before and appears to be the result of " cross modulation " by the crystal detector, due to the rectifying action.

That is all for this month. BCNU de JIX.

Ragchew for Associate Members

A meeting of " A " members to enable you to air your views will be held at Wanstead House, The Green, Wanstead, London, E.11, on Friday, July 10, commencing at 7.30 p.m. If you have any items you would like discussed, please write to " Jix," 82 Granville Road, London, E.17. We hope to see you there.

GB2WS

The exhibition station which was operated during the Shakespeare Quatercentenary Celebrations at Stratford-upon-Avon proved a great success and credit is due to all who helped to make the venture possible, including the manufacturers who kindly loaned equipment and aerials.

The receiving side consisted of a Racal RA17K, a GEC BRT400, and a Heathkit RA1. Transmitters were a Heathkit DX100U, a Labgear LG300 and a Mosley Commando II, the latter for s.s.b. working.

Operation was mainly on 80m, but 40m and 20m were also used. Over 500 contacts were made in 42 call areas.

The exhibition station was organized by the Stratford-upon-Avon and District Radio Club.

Radio Research 1963

In recent years the Radio Research Station of the DSIR has become increasingly involved in international scientific ventures. Its interest in geomagnetism and the ionized and un-ionized parts of the earth's atmosphere has led to its playing a part in the UK contribution to the International Quiet Sun Years (IQSY) enterprise. For the same reasons the Station is collaborating with the USA, Canada and the European Space Research Organization on their various space research activities.

Radio Research, 1963, which comprises the report of the Radio Research Board and the report of the Station's Director, has recently been published.* It outlines the past year's work of the Radio Research Station and particularly its international activities.

To complement observations made during the International Geophysical Year, 1957-58, when sunspot activity was at its maximum, the Station is repeating some of these observations during the IQSY, 1964-66. Vertical soundings of the ionosphere are being made at Slough, Singapore and the Falkland Islands. Investigations are also being carried out at the British Antarctic Survey's base at Halley Bay.

An experiment will be mounted by the Station in the third satellite of the joint UK/USA satellite programme, due to be launched in 1967. The experiment is intended to measure the radio noise originating from lightning flashes.

The Station, in conjunction with some Scandinavian laboratories, will collaborate on the major experiment in one of the first two satellites to be launched under the ESRO programme. This experiment will measure the intensities of electrons and protons of different energies at high latitudes.

Through a collaborative arrangement with the Canadian Defence Research Board, the Station has been privileged to receive telemetry data direct from the CDRB's topside sounding satellite *Alouette*. The data collected have been of immense use to the Station in its own researches.

* *Radio Research 1963*, published for DSIR by HMSO. Price 3s. net, by post 3s. 6d.

AMATEUR (SOUND) LICENCE A†

The text of the new Amateur (Sound) Licence A now being issued in place of the former Amateur (Sound) Licence is as follows. The terms of the Amateur (Sound) Licence B† are similar but do not authorise the use of frequencies below 420 Mc/s or the use of Morse.

Date of issue..... Fee on issue.....
Renewable.....in each Year. Fee on renewal.....
Call-sign.....

1. (1) Licence.....
of .....
(hereinafter called " the Licensee ") is hereby licensed, subject to the terms, provisions and limitations herein contained:

(a) to establish in the United Kingdom an amateur sending and receiving station for wireless telegraphy (hereinafter called " the Station ") at:
  (i) ..... (hereinafter called " the main address "): or
  (ii) any premises (hereinafter called " the temporary premises ") or any location (hereinafter called " the temporary location ") for separate periods none of which shall exceed four consecutive weeks; or
  (iii) any premises (hereinafter called " the alternative premises ") provided that at least 7 days before the Station is established at the alternative premises notice in writing is given to the General Post Office Telephone Manager (E/Radio) for the area in which the alternative premises are situate of the postal address of the alternative premises. The said Telephone Manager shall also be notified in writing when the Station is no longer established at the alternative premises;

(b) to use the Station for the purpose of sending to, and receiving from, other licensed amateur stations as part of the self-training of the Licensee in communication by wireless telegraphy:
  (i) Messages in plain language which are remarks about matters of a personal nature in which the Licensee, or the person with whom he is in communication, has been directly concerned;
  (ii) Signals (not being in secret code or cypher) which form part of, or relate to, the transmission of such messages;

(c) to use the Station, as part of the self-training of the Licensee in communication by wireless telegraphy, during disaster relief operations conducted by the British Red Cross Society, the St. John Ambulance Brigade or any police force in the United Kingdom, or during any exercise relating to such operations, for the purpose of sending to other licensed amateur stations such messages as the Licensee may be requested by the said Society, Brigade or such police force to send, and of receiving from any other licensed amateur station such messages as the person licensed to use such other licensed amateur station may be requested by the said Society, Brigade or such police force to send;

(d) to use the Station for the purpose of receiving transmissions in the Standard Frequency Service.

(2) **Limitations**

The foregoing Licence to establish and use the Station is subject to the following limitations:

(a) The Station shall not be established or used on the sea or within any estuary, dock, or harbour, or in any moving vehicle, vessel or aircraft.

(b) The Station shall be used only with emissions which are of the classes specified in the Schedule hereto and are within the frequency bands specified in the Schedule hereto in relation to those respective classes of emission, and with a power not exceeding that specified in the Schedule hereto in relation to the class of emission and frequency band in use at the time.

(c) The Station shall be operated only (i) by the Licensee personally, or (ii) in the presence of and under the direct supervision of the Licensee, by any other person who holds a wireless telegraphy licence issued by the Postmaster General to use another amateur station or who holds an Amateur Radio Certificate issued by the Postmaster General.

(d) Messages shall not be broadcast to amateur stations in general, but shall be sent only to (i) amateur stations with which communication is established separately and singly, or (ii) groups of particular amateur stations provided that communication is first established separately and singly with each station in any such group.

(e) When the Station is used for the purpose of sending messages by the type of transmission known as Radio Teleprinter (RTTY) it shall be used only with International Telegraph Code No. 2 (5-Unit Start-Stop) and with speeds of transmission of 45·5 or 50 bauds.

(f) No message which is grossly offensive or of an indecent or obscene character shall be sent.

2. International Requirement

The Licensee shall observe and comply with the relevant provisions of the Telecommunication Convention.

3. Frequency Control and Measurement

(1) A satisfactory method of frequency stabilization shall be employed in the sending apparatus comprised in the Station.

(2) Equipment for frequency measurement shall be provided capable of verifying that the sending apparatus comprised in the Station is operating with emissions within the authorized frequency bands.

4. Non-Interference

(1) The apparatus comprised in the Station shall be so designed, constructed, maintained and used that the use of the Station does not cause any undue interference with any wireless telegraphy.

(2) When telegraphy (as distinct from telephony) is being used, arrangements shall be made to ensure that the risk of interference due to key clicks being caused to other wireless telegraphy is eliminated. At all times, every precaution shall be taken to avoid over-modulation, and to keep the radiated energy within the narrowest possible frequency bands having regard to the class of emission in use. In particular, the radiation of harmonics and other spurious emissions shall be suppressed to such a level that they cause no undue interference with any wireless telegraphy. To ensure that the requirements of this subclause are met, tests shall be made from time to time and details of those tests shall be recorded in the Log as required in clause 6 hereof.

† Reproduced by permission of H.M. Postmaster General.

(3) The use of " spark " sending apparatus is specifically forbidden.

5. Operators and access to Apparatus

The Licensee shall not permit or suffer any unauthorized person to operate the Station or to have access to the apparatus comprised therein. The Licensee shall ensure that persons operating the Station shall observe the terms, provisions and limitations of this Licence at all times.

6. Log

(1) An indelible record shall be kept in one book (not loose-leaf) (in this Licence called " the Log ") showing the following:

(a) Date.
(b) Time of commencement of every call made from the Station (including the tests referred to in clause 4(2) hereof).
(c) Call-signs of the stations from which messages addressed to the Station are received or to which messages are sent, times of establishing and ending communication with each such station, and the frequency (not frequency band) or frequencies (not frequency bands) and class or classes of emission in each case.
(d) Time of closing down the Station.
(e) The address of the temporary premises or the alternative premises or particulars of the temporary location when the Station is established other than as provided in clause 1(1)(a)(i) hereof.

All times shall be stated in GMT. No gaps shall be left between entries and all entries shall be made at the time of sending and receiving.

(2) If the Station is at any time operated by a person other than the Licensee (see clause 1(2)(c)(ii) hereof) the Licensee shall ensure that the Log is signed by that person with his full name, and that the call-sign of the station which he is licensed to use, or (if there is no such station), the number of his Amateur Radio Certificate, is shown in the Log.

7. Receiver

The Station shall be equipped for the reception of messages sent on the frequency or frequencies, and by means of the class or classes of emission, which are in current use at the Station for the purpose of sending.

8. Recorded messages

(1) Messages addressed to the Station from any licensed amateur station with which the Licensee is in communication may be recorded and retransmitted in accordance with this Licence, provided that the retransmission is intended for reception by the originating station only, and that the call-sign of that station is not included in the retransmission.

(2) Modulation is prohibited by means of recordings of any kind other than special recordings of sinusoidal tone or tones within the audio frequency spectrum which may be either constant or steadily changing in frequency.

(3) Gramophone or tape recordings of the type intended for entertainment purposes may not be transmitted for any purpose.

9. Call-sign and notification of location

(1) Whenever the Station is used the call-sign mentioned on the first page of this Licence shall be transmitted: Provided that when the Station is used—

(a) at an address other than the main address the Licensee shall, in order to indicate the country or place of use, vary the prefix letter to the call-sign by using the prefix letter(s) appropriate to that country or place, being G for England, GM for Scotland, GW for Wales, GI for Northern Ireland, GC for the Channel Islands and GD for the Isle of Man;
(b) at the temporary premises the suffix " /A " shall be added to the call-sign;
(c) at the temporary location the suffix " /P " shall be added to the call-sign.

(2) The call-sign, which may be sent either by Morse telegraphy at a speed not greater than 12 words per minute or by telephony, shall be sent for identification purposes at the beginning and at the end of each period of sending, and whenever the frequency is changed. When the period of use exceeds 15 minutes the call-sign shall be repeated (in the same manner) at the commencement of each succeeding period of 15 minutes.

(3) When telephony is used, the letters of the call-sign may be confirmed by the pronouncement of well-known words of which the initial letters are the same as those in the call-sign; but words used in this manner shall not be of a facetious or objectionable character.

(4) When the Station is used at the temporary premises or the temporary location, particulars of this temporary location or of the address of the temporary premises shall be sent at the beginning and end of the establishment of communication with each separate amateur station, or at intervals of 15 minutes, whichever is the more frequent.

10. Inspection

The Station, this Licence and the Log shall be available for inspection at all reasonable times by duly authorized officers of the Post Office.

11. Station to close down

The Station shall be closed down at any time on the demand of an officer of the Post Office.

12. Period of Licence, Renewal, Revocation and Variation

This Licence shall continue in force for one year from the date of issue, and thereafter so long as the Licensee pays to the Postmaster General in advance in each year on or before the anniversary of the date of issue the renewal fee prescribed by or under the regulations for the time being in force under section 2(1) of the Wireless Telegraphy Act, 1949: Provided that the Postmaster General may at any time after the date of issue (i) revoke this Licence or vary the terms, provisions or limitations thereof by a notice in writing served on the Licensee, or by a general notice published in the London, Edinburgh and Belfast Gazettes, or in a newspaper published in London, a newspaper published in Edinburgh and a newspaper published in Belfast addressed to all holders of Amateur (Sound) Licences A, (ii) revoke this Licence by a general notice published by being broadcast by the British Broadcasting Corporation addressed to all holders of Amateur (Sound) Licences A. Any notice given under this clause may take effect either forthwith or on such subsequent date as may be specified in the notice.

13. This Licence is not transferable.

14. Return of Licence

This Licence shall be returned to the Postmaster General when it has expired or been revoked.

15. Previous Licences Revoked

Any licence, however described, which the Postmaster General has previously granted to the Licensee in respect of the Station is hereby revoked.

16. Interpretation

(1) In this Licence:
(a) The expressions—
(i) " messages " and " signals " shall not include visual images sent by television, facsimile transmission, or other means;

(ii) " remarks about matters of a personal nature " shall not include messages about business affairs;
(iii) " Standard Frequency Service " shall have the same meaning as in the Radio Regulations and Additional Radio Regulations in force under the International Telecommunication Convention signed at Geneva on the 21st day of December, 1959, where it is defined as " A radiocommunication service for scientific, technical and other purposes, providing the transmission of specified frequencies of stated high precision, intended for general reception ";
(iv) " the Telecommunication Convention " shall mean the International Telecommunication Convention signed at Geneva on the 21st day of December, 1959, and the Radio Regulations and Additional Radio Regulations in force thereunder and includes any Convention and Regulations which may from time to time be in force in substitution for or in amendment of the said Convention or the said Regulations;
(v) " the United Kingdom " shall mean the United Kingdom of Great Britain and Northern Ireland, the Isle of Man and the Channel Islands.

(b) References to the operation of the Station shall include references to the speaking into the microphone comprised in the Station;
(c) Except where the context otherwise requires other words and references shall have the same meaning as they have in the Wireless Telegraphy Act, 1949 or in the Regulations made under Part I thereof.

(2) Section 19(5) of the Wireless Telegraphy Act, 1949 shall apply for the purposes of this Licence as it applies for the purposes of the Act.

(3) Nothing in this Licence shall be deemed to authorize the use of the Station for business, advertisement or propaganda purposes or (except as provided by clause 1(1)(c) hereof) for the sending or receiving of news or messages of or on behalf of, or for the benefit or information of any social, political, religious or commercial organization, or anyone other than the Licensee or the person with whom he is in communication.

Schedule

Footnote No.	Frequency bands (in Mc/s) (See A below)	Classes of emission (See B below)	Maximum d.c. input power (See C below)
1 and 5	1·8–2	A1, A2, A3, A3A, A3H, A3J, F1, F2 and F3	10 watts
2	3·5–3·8		150 watts
	7–7·10 14–14·35 21–21·45 28–29·7		
1 and 3	70·1–70·7	A1, A2, A3, A3A, A3H, A3J, F1, F2 and F3	50 watts
1, 4 and 6	144–145	A1, A2, A3, A3A, A3H, A3J, F1, F2 and F3	150 watts
6	145–146		
1 1 1 1 1 1	420–450 1215–1325 2300–2450 3400–3475 5650–5850 10,000–10,500		
	21,000–22,000		
1 1 1	2350–2400 5700–5800 10,050–10,450	P1D, P2D, P2E, P3D and P3E	25 watts mean power and 2·5 kilowatts peak power
	21,150–21,850		

A. Except as provided in Footnote 6 below artificial satellites may *not* be used by stations in the amateur service.

Footnotes

1. This band is allocated to stations in the amateur service on a secondary basis on condition that they shall not cause interference to other services.
2. This band is shared by other services.
3. This band is available to amateurs *until further notice* provided that (i) only the frequency 70·375 Mc/s ±25 kc/s shall be used for the purposes mentioned in Clause 1(1)(c) of this Licence; (ii) frequencies between 70·1-70·3 Mc/s inclusive and 70·5-70·7 Mc/s inclusive shall not be used on the North-West side of the Line Firth of Lorne to the Moray Firth; and (iii) use by the Licensee of *any* frequency in the band shall cease immediately on the demand of a Government official.
4. The following spot aeronautical frequencies must be avoided *whenever* this band is used: 144·0, 144·09, 144·18, 144·27, 144·36, 144·45, 144·54, 144·63, 144·72, 144·81 and 144·9 Mc/s.
5. The type of transmission known as Radio Teleprinter (RTTY) may not be used in this band.
6. On and after 1st January, 1965, in the band 144-146 Mc/s artificial satellites may be used by stations in the amateur service.

B. The symbols used to designate the classes of emission have the meanings assigned to them in the Telecommunication Convention. They are:

Amplitude Modulation

A1. Telegraphy by on-off keying, without the use of a modulating audio frequency.
A2. Telegraphy by on-off keying of an amplitude-modulating audio frequency or frequencies, or by on-off keying of the modulated emission.
A3. Telephony, double sideband.
A3A. Telephony, single sideband, reduced carrier.
A3H. Telephony, single sideband, full carrier.
A3J. Telephony, single sideband, suppressed carrier.

Frequency (or Phase) Modulation

F1. Telegraphy by frequency shift keying without the use of a modulating audio frequency, one of the two frequencies being emitted at any instant.
F2. Telegraphy by on-off keying of a frequency modulating audio frequency or on-off keying of a frequency modulated emission.
F3. Telephony.

Pulse Modulation

P1D. Telegraphy by on-off keying of a pulsed carrier without the use of a modulating audio frequency.

P2D. Telegraphy by on-off keying of a modulating audio frequency or frequencies or by on-off keying of a modulated pulsed carrier—the audio frequency or frequencies modulating the amplitude of the pulses.

P2E. Telegraphy by on-off keying of a modulating audio frequency or frequencies or by on-off keying of a modulated pulsed carrier—the audio frequency or frequencies modulating the width (or duration) of pulses.

P3D. Telephony, amplitude modulated pulses.

P3E. Telephony, width (or duration) modulated pulses.

C. D.c. input power is the total direct current power input to (i) the anode circuit of the valve(s) or (ii) any other device energizing the aerial.

Notes

(a) The Postmaster General should be notified promptly of any change in the correspondence address of the Licensee. Except as provided in (b) below correspondence should be sent to the Postmaster General, Radio Services Department, Radio Branch, General Post Office, London, E.C.1.

(b) Remittances and correspondence about payments to the Postmaster General required under this Licence should be sent to the Accountant General's Department, General Post Office, Chetwynd House, West Bars, Chesterfield, Derbyshire. It is unnecessary to send the Licence when making remittances.

(c) Clause 4(1) of the Licence requires that the apparatus comprised in the Station shall be so designed, constructed, maintained and used that the use of the Station does not cause any undue interference with any wireless telegraphy. In order to prevent interference due to close coupling of aerials, the aerial to be used for the Station should be sited as far as possible from any existing television or other receiving aerials in the vicinity. This is particuarly important if it is proposed to instal an indoor transmitting aerial, e.g. in the loft, where interference may be conducted through the electricity supply wiring. In some circumstances it might not be possible to use an indoor aerial.

(d) If power for the working of the Station is taken from a public electricity supply, no direct connection should be made between the supply mains and the aerial.

(e) If the Station is situated within half a mile of the boundary of any aerodrome, the height of the aerial or any mast supporting it must not exceed 50 feet above the ground level. An aerial which crosses above or is liable to fall or to be blown on to any overhead power wire (including electric lighting and tramway wires) or power apparatus must be guarded to the reasonable satisfaction of the owner of the power wire or power apparatus concerned.

(f) Demands for closing down (see clause 11) can be expected to be received, inter alia, in connection with national emergencies or when interference is being caused to a Government wireless station or other important services. An oral demand by an officer of the Post Office to close down the station will be confirmed in writing.

(g) Under Section 1 of the Wireless Telegraphy Act, 1949, it is an offence to use any station or apparatus for wireless telegraphy except under and in accordance with a licence granted by the Postmaster General. Breach of this provision may result in this Licence being revoked and the offender being prosecuted.

(h) If any message, the receipt of which is not authorized by this Licence, is received by means of the Station, neither the Licensee nor any person operating the Station should make known the contents of any such message, its origin or destination, its existence or the fact of its receipt to any person except a duly authorized officer of Her Majesty's Government or a competent legal tribunal, and should not retain any copy or make any use of any such message, or allow it to be reproduced in writing, copied or made use of. It is an offence under Section 5 of the Wireless Telegraphy Act, 1949, deliberately to receive messages the receipt of which is unauthorized or (except in the special circumstances mentioned in that section of the Act) to disclose any information as to the contents, sender or addressee of any such message.

(j) It is an offence under Section 5 of the Wireless Telegraphy Act, 1949, to send by wireless telegraphy certain misleading messages.

(k) This Licence does not authorize the Licensee to do any act which is an infringement of any copyright which may exist in the matter sent or received.

(l) This Licence does not absolve the Licensee from obtaining any necessary consent before entering on private property with any apparatus.

Amateur (Sound) Licence A

Typical examples of the frequency tolerance required when working (a) near the centre and (b) near the band-edge* of the frequency bands allocated to the amateur service.

Frequency Band (Mc/s)	Frequency tolerance when working near the centre of the band (%)	Frequency tolerance when working near the band-edge* (%)
1·8–2·0	5·0	0·5
3·5–3·8	4·0	0·26
7·0–7·10	0·7	0·14
14·0–14·35	1·2	0·07
21·0–21·45	1·0	0·047
28·0–29·7	3·0	0·034
70·1–70·7	0·42	0·14
144–145	0·34	0·07
145–146	0·34	0·07
420–450	3·4	0·022
1215–1325	4·3	0.075
2300–2450	3·2	0·04
3400–3475	1·1	0·029
5650–5850	1·7	0·017
10,000–10,500	2·4	0·009
21,000–22,000	2·3	0·0045

* In the bands up to 29·7 Mc/s band-edge has been taken as 10 kc/s; for the bands between 70·1–450 Mc/s band-edge has been taken as 100 kc/s; and for the bands above 450 Mc/s band-edge has been taken as 1 Mc/s for the purpose of these examples. (Note: when determining the proximity of an emission to the edge of a frequency band the bandspread due to the modulation, on the appropriate side of the carrier frequency, needs to be added to the frequency tolerance of the carrier.)

Note: The examples quoted in respect of the frequency bands 420–450 Mc/s and above are appropriate to the Amateur (Sound) Licence B.

(m) For the reception of broadcast programmes a separate broadcast receiving licence is necessary.

(n) The Postmaster General regards himself as free to publish the Licensee's name and address at his discretion unless within one month of the date of issue of this Licence the Licensee specifically asks that this should not be done.

(o) The expression "wireless telegraphy" used in this Licence has the meaning assigned to it in the Wireless Telegraphy Act, 1949, and includes, inter alia, radiotelephony.

(p) With reference to clause 9(3) of the Licence it is recommended that for uniformity the phonetic alphabet contained in Appendix 16 of the Radio Regulations, Geneva 1959, reproduced below, should be used when the letters of the call-sign are transmitted phonetically:

A Alfa	J Juliett	S Sierra
B Bravo	K Kilo	T Tango
C Charlie	L Lima	U Uniform
D Delta	M Mike	V Victor
E Echo	N November	W Whiskey
F Foxtrot	O Oscar	X X-Ray
G Golf	P Papa	Y Yankee
H Hotel	Q Quebec	Z Zulu
I India	R Romeo	

(q) With reference to clause 16(2) of the Licence section 19(5) of the Wireless Telegraphy Act, 1949, reads as follows: "In considering for any of the purposes of this Act, whether, in any particular case, any interference with any wireless telegraphy caused or likely to be caused by the use of any apparatus, is or is not undue interference, regard shall be had to all the known circumstances of the case and the interference shall not be regarded as undue interference if so to regard it would unreasonably cause hardship to the person using or desiring to use the apparatus."

Notes on changes to the Amateur (Sound) Licence A compared with the earlier Licence

Licence Clause	Comments
1(1)(a)(ii)	As the licence provides in clause 9(1)(b) and (c) for the use of both the suffixes /A and /P, the expressions "temporary premises" and "temporary locations" are shown separately.
1(1)(a)(iii)	Seven days notification should be given in writing about the intention to operate, or to cease operating, at an alternative address.
1(1)(d) and 16(1)(a)(iii)	These are new subclauses.
1(2)(d)	In view of enquiries from amateurs about the practice to follow in "netting," this subclause has been reworded to help amateurs.
1(2)(e)	This clause authorizes the use of RTTY transmissions by all amateurs. Footnote 5 to the Schedule to the licence prohibits RTTY transmissions in the 1·8–2 Mc/s band.
1(2)(f)	It has unfortunately been found necessary to put this new clause in the licence because of complaints received from time to time about the use of objectionable and/or obscene language in transmissions from stations operating in the amateur service.
4(2)	The last sentence has been reworded because it has not been clear hitherto that test transmissions should be recorded in the log.
6	The log keeping requirements in this clause have been amplified. The attention of licensees is therefore drawn to all the provisions of this clause.
8(2) and (3)	These are new subclauses.
9	This clause has been revised to allow for the variation of call-sign prefix letters, to regularize the use of the suffix /P for temporary location working and to require the transmission of call-signs at 15 minute intervals when a transmission exceeds that period.
16(1)(b)	Despite the terms of the licence in respect of the types of messages which may be transmitted and the persons other than the licensee who are authorized to operate the station, some amateurs have represented on occasions that those terms do not prohibit persons visiting the station from speaking into the microphone. There is no change in the revised licence as regards permissible types of messages and operators and this new subclause 16(1)(b) has therefore been included in the licence to avoid further misunderstanding.
SCHEDULE 70·2–70·4 Mc/s	This band has been extended to 70·1–70·7 Mc/s. Its use must be strictly in accordance with the conditions of footnotes 1 and 3 to the Schedule.
Explanatory Note A and Footnote 6	The Schedule shows that on and after 1st January, 1965, in the band 144–146 Mc/s only, artificial satellites may be used by stations in the amateur service. The spot frequencies in the 144–146 Mc/s band listed in footnote 4 must be avoided in *any* use of that band.
Explanatory Note B (formerly A)	This note now includes the meanings of the various classes of emission assigned to them in the International Telecommunication Convention.
	The additional classes of emission A3H and A3J are now authorized in the appropriate frequency bands.
NOTES	Some of the former notes have been amended and some new notes have been included. The notes to the licence are intended for guidance and licensees are advised to familiarize themselves with all the notes.

Crystal Activity Tester

By A. I. H. WADE, G3NRW*

WHILE experimenting with the filter of an s.s.b. exciter it became obvious that some crystals of the same type and same nominal frequency exhibited quite different characteristics, due mainly to variations in activity between specimens.

Reduction in activity may be caused by one or more of the following:

(i) Permanent damage to the crystal structure or even fracture as a result of excessive current.
(ii) Surface contamination by dirt, grease or moisture.
(iii) Incorrect methods of grinding in attempts to increase the frequency.
(iv) Rough handling.

The need was thus felt for a simple test instrument capable of giving an indication of crystal activity, and this article describes the tester subsequently constructed.

Requirements of the Tester

(i) The instrument should be portable, preferably with self-contained power supply, so that on-the-spot checks can be made when purchasing crystals.
(ii) There are several types of crystal available with frequencies from around 100 kc/s to over 30 Mc/s. For simplicity and convenience, it would be useful for the tester to function over this range without the need for switching or tuning adjustments.
(iii) The oscillator should be capable of sure-fire operation, but excessive crystal current must be avoided to ensure that the most delicate crystals are not damaged.

Circuit

The tester operates on the principle that, within limits, the output voltage of a crystal oscillator is a function of the activity of the crystal. Accordingly, the instrument consists of a crystal oscillator Q1 (Fig. 1) the output of which, after rectification, is amplified by the d.c. amplifier Q2. A measure of the activity is thus indicated by the meter M1 in the collector circuit of Q2.

The oscillator is a transistorized version of the well-known Pierce circuit. This has no tuned load, so that the frequency limits are determined primarily by the parameters of the transistor used. In this case an OC170 was chosen, but there is no reason why higher frequency types cannot be used (such as the 2N1742 or MAT series), provided that suitable modifications are made to the bias circuit.

Forward bias is applied to the base by means of R1 and R2; this ensures that oscillation will occur with all but the most inactive crystals. R1 and R2, together with the emitter resistor R4, also contribute towards the stability of the stage.

The voltage developed across the collector load R3 is rectified by the diode CR1, and the resulting current flowing through R5 is amplified by Q2. Almost any type of audio transistor may be used here.

The meter has an f.s.d. of 2 mA, but its calibration is purely arbitrary as the tester only provides a comparison between the activity of crystals. A more sensitive movement could be used, but then it would be necessary to increase the values of R5 and R6.

Construction

The tester is built in a 4¾ in. × 3¾ in. × 2 in. Eddystone diecast box, with all the major components mounted on the lid. The layout is not critical, except that r.f. connections should be kept as short as possible.

Any reasonable number of types of crystal holder may be used, all of them being connected in parallel between the collector and base of the OC170. It is suggested that one of the holders be a B7G-type valveholder, so that the oscillator circuit may be wired directly on to its pins (Fig. 2). Most of the B7G-based crystals available have either pins 1 and 5 or pins 3 and 7 connected to the crystal; these are the active pins on the valveholder, and the remainder are used as tie points. The transistor is supported by its wires, which should be sleeved as a precaution against accidental short-circuit.

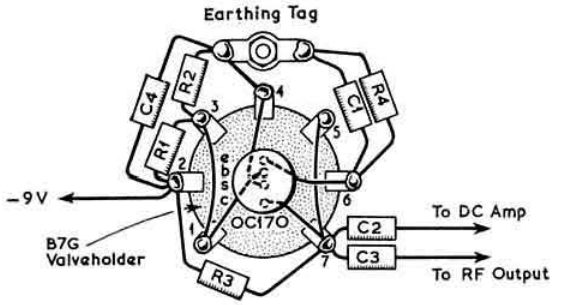


Fig. 2. Layout of the oscillator stage.

The d.c. amplifier is constructed on a small piece of tag-

(continued on page 470)

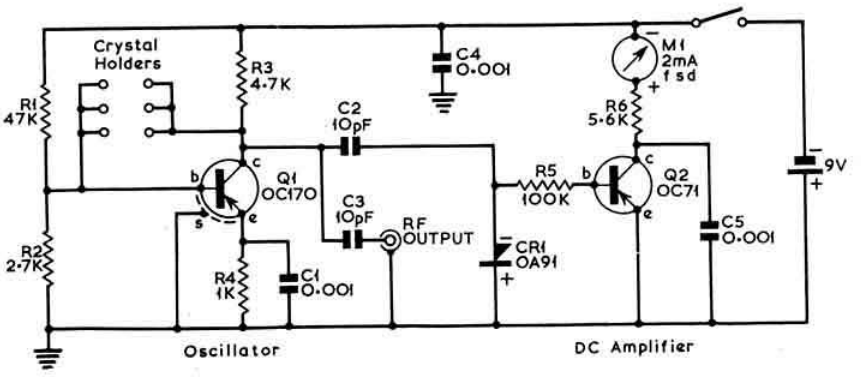


Fig. 1. Circuit of the tester. C1, C4, C5, 0.001 μF disc ceramic; C2, C3, 10pF silver mica.

* Rutherford Hall, Loughborough, Leics.

THE MONTH ON THE AIR

A CHRONICLE OF EVENTS ON THE HF AMATEUR BANDS

By R. F. STEVENS, G2BVN *

US Reciprocal Operating Bill passed

THE Reciprocal Operating Bill has now passed both Houses of the US Legislature and subsequently received Presidential assent. Unfortunately at the time of writing the exact terms of the Bill are not known but they will be published as soon as they become available. However, it is quite clear that the Bill authorizes the FCC (the US licensing authority) to give permission to foreign nationals to operate *provided that* a reciprocal arrangement is in force. In other words, there is no automatic granting of permission to operate to all visitors, but a process of selection by reciprocity is enforced. It will be noted that the phrase *permission to operate* rather than " licence " is used, and this, of course, is the basis on which W4BPD was able to make many of his memorable trips (incidentally aren't the bands quiet without Gus?). Obviously the ideal state of affairs would be the existence of a common amateur licence with similar qualifications throughout all countries, but this ideal is unlikely to be reached in the foreseeable future. There are, of course, problems involved where one licensing authority insists upon reasonable technical and operating qualifications, and another authority will grant licences upon application and without examination. National Societies will now bring pressure to bear upon their administrations to provide reciprocal facilities on the pattern of the USA, and it is believed that the removal of restrictions in this way cannot do other than benefit both amateur radio and international relations.

News from Overseas

G5KW will be arriving in **Saudi Arabia** at the beginning of July for a stay of several years. He is equipped with KW s.s.b. equipment and a triband beam for the h.f. bands, and also has 50 Mc/s gear which it is hoped can be used during the next sunspot cycle. G5KW hopes to be active from neighbouring Arabian countries from time to time. HZ1HZ is the Deputy Minister of Communications in Saudi Arabia, and has been instrumental in obtaining permission for visitors to operate whilst in the Kingdom. A small number of G5KW/JY and /YI QSLs are available to meet any requests that have not yet been dealt with, and applications should go to G2BVN.

From Eric Trebilcock via G2MI it is learnt that **VR4CV** has no longer any interest in amateur radio and has passed his log book and QSLs to Eric who may be reached at 340 Gillies Street, Thornbury, N.17, Victoria, Australia. Furthermore, it is learnt that **VK9WP**, Bill Luke, is now on his way to **Nauru Is.** for a tour of duty as a coastal radio operator, which will probably last for two years. He hopes to be active on phone and c.w.

VS1LP was active during the *CQ* S.S.B. Contest and registered 227,040 points from 532 contacts and 160 prefixes, and it is believed that the final score of VS1LX was in the region of 201,000 points. VS1LP found propagation to Europe and Western USA very good, but poor to Oceania, Africa and S. America. During the USSR DX Contest conditions to parts other than Europe were again poor and only three QSOs were made with Eastern USA. VS1LP reports QSOs with the UK on 7 Mc/s at 19.15, and was asked by JA3AA to QSY to 1880 kc/s, but no contact resulted. The European and USA stations are no longer heard in Singapore on 1·8 Mc/s, and marker station DHJ on 1830 kc/s is now not audible. It is, however, hoped to resume activity on this band during October or November, when s.s.b. may be available.

JT1CA will be going QRT at Ulan Bator on June 28 and will be back in Moscow on July 2, where he will resume operation as UA3CA. Vlad has filled a gap in many country lists during his stay in Mongolia and has done an excellent job during a period when conditions have been far from good. New stations now on the air on c.w. include JT1AH and JT1KAE, and QSLs for these should go to Box 639, Ulan Bator.

ZB1CR is now QRT from Malta and will be returning to the UK in mid July after a visit to the USA and Canada. QSLs should go to his home call G3NKQ.

SM7ACB, QSL manager for **OX3JV**, reports that the logs for the period April 14 to 23, 1964, have been lost following an aircraft accident, and that there will be some delay in dealing with QSL requests covering this period.

FO8AA is the call of the radio club at Papeete, Tahiti, which is now active on the h.f. bands. The aerials available comprise a quad and a rotary ZL Special, and the station is on the air on most mornings between 06.00 and 08.00 usually operating around 14,036 kc/s. QSLs should go to BP 374, Papeete, Tahiti, and the replies are reported to be swift.

H.E. Sheik Ahmed Zaidan, Deputy Minister of Communications, HZ1HZ, who has recently had amateur licensing in Saudi Arabia restored. Left, HZ2AMS; right, G5KW/ex-HZ1KE.
(Photo by G5KW)

* Please send all items to RSGB Headquarters to arrive not later than July 17 for the August issue and August 14 for the September issue.

DXpeditions

Hammarlund report on their **DXpedition of the Month** activities. **VP8HF**, all QSLs have been acknowledged and also all s.w.l. reports; **HZ2AMS/8Z4,** mailing of cards is now under way; **YV8AJ,** mailing of cards for this recent three day operating period is under way, and it is hoped to repeat the operation in the near future; **VP7NY**, QSLs are being despatched on a continuous basis. **11RB** will DXpedite to several spots in S. Europe during August including Sardinia and Pantellaria (the latter does not count as a separate country for DXCC, but the prefix will probably be IP).

Using the calls **K8LBQ/3, K8PLJ/3** and **K8GJM/3,** there will be continuous operation during the period August 14 to August 17 under the title **Project Delaware** to provide contacts for the state of Delaware and the county of Sussex. All bands between 3·5 and 28 Mc/s will be used as conditions permit, and QSLs may go the the W8 Bureau or to K8LBQ, 24001 Hazelmere Road, Cleveland, Ohio 44122, USA. Please enclose an s.a.s.e. or IRC for a direct reply.

The radio club of the 92nd Signal Regiment will be operating from two rare counties, **Angus** and **Kincardine** between July 12 and 24 using c.w. on 1·8 Mc/s. In addition to the club call **GM3SIG,** the calls **GM3JNO, GM3LOV** and **GM3PPS** will be used.

It is reported that HB9ZT will make a trip to Liechtenstein for ten days during August when his call will be **HB0ZT.**

VQ8BFC shifted his anchorage and during June operated from Egmont Is. of the Chagos Archipeligo, and according to reports from the USA was extensively worked by East Coast stations during the middle of the month. It seems unlikely that the trip to Rodriguez Is. will now be made, and the latest news is that Harvey is scheduled to return to the Seychelles on June 22. QSLs to G8KS, and a reply envelope helps a great deal.

It is reported that XE1AE has negotiated for a licence to operate from **Socorro Is.** and that a DXpedition will be made under the auspices of the Hammarlund organization. The call may well be **XE1AE/XF4.**

San Andres Is. was scheduled to receive s.s.b. activity under the call **HK0QA** lasting for at least a month from the middle of June. At the time of writing this station had not been reported.

HZ2AMS, Angus Murray-Stone, may be expected to show up from either or both of the Neutral Zones during the next month or so, probably with very little warning. His Riyadh call will be suffixed with either 8Z4 or 8Z5.

DXCC News

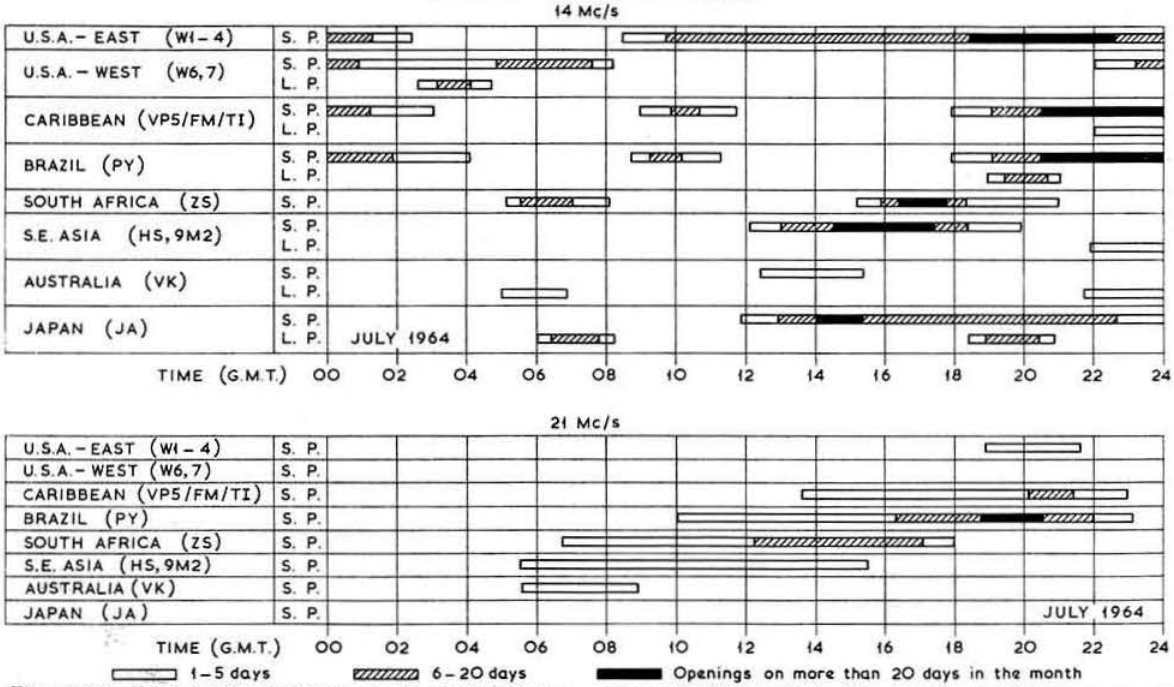
The ARRL have accorded separate country status to the **Iraqi/Saudi Arabian Neutral Zone** and cards may be submitted for credit w.e.f. October 1, 1964.

It is reported that separate country status will be granted for **Annobon Is.,** if and when the permission to operate is seen by W1WPO.

IQSY

DM3IGY operates on 28·000 Mc/s from the Geophysical Observatory at Collm for Sporadic *E* propagation studies.

PROPAGATION PREDICTIONS



The pattern of propagation during the month of July will be generally similar to that prevailing during June, and the comments made for last month again apply. The tables show that there is little consistent DX predicted before 14.00 GMT and that the paths to the West, North West and South West will be open on 14 Mc/s at least until midnight. In addition to the areas shown on the tables, openings to the Pacific may be expected between 06.30 and 10.00, but these will be infrequent. Users of the propagation predictions will certainly already have noticed that on many occasions DX stations have not been heard at the times forecast for them, and this usually occurs when the predicted times do not coincide with the peak activity periods of the amateurs in the area concerned. The conditions are therefore only optimum when these times, do in fact, coincide, and this is especially true for areas with relatively few amateurs.

The provisional sunspot number for May 1964 was 9·4, with the period of greatest activity lying between May 15 and 26. The predicted figures for September, October and November are 8, 7 and 6 respectively. The trough of the present sunspot cycle will probably occur during the winter 1964/65, but even with this point reached there will be no apparent improvement in propagation conditions for a number of months.

OH2XK operating OH2AH/0 and OH5TM waiting his turn during the January, 1964 Hammarlund DXpedition of the Month at the Aaland Islands. OH2BG can be seen in the background operating the other station, OH2YV/0.

(Photo by OH2YV)

The operating schedule is 00.00-01.00; 06.00-07.00; 12.00-13.00 and 18.00-19.00 GMT.

5B4WR is the call of a beacon transmitter operating on 29·008 Mc/s from Limassol for transequatorial propagation studies between Cyprus and S. Africa. The operating times are 15.00-19.30 on weekdays and 07.00-19.30 on Saturdays and Sundays. The identification is transmitted for ten seconds in every minute by frequency shift keying.

DL0AR continues to operate on 29·000 Mc/s, as previously mentioned, and the new Lerwick beacon, **GB3LER,** on 29·005 Mc/s should now be fully operational. The purpose of these two beacon stations is to aid the programme of research into auroral propagation now being undertaken as part of the Society's contribution to the national effort during IQSY.

The **IQSY net** meets daily, except Sunday, on 3783 kc/s for the interchange of information on solar and magnetic activity, the control station being GM3LTP at Lerwick.

Contests

To commemorate the visit of the President of the Portuguese Republic to Mozambique, the **LREM** have arranged a contest to take place between 00.00 on August 1 and 24.00 on August 2, 1964. This is an all mode contest in which the rest of the world will endeavour to contact as many CR7 stations as possible. Only one contact with the same station is allowed on each band, and contestants' logs must be sent not later than 30 days after the event to Liga dos Radios-Emissores de Mocambique, PO Box 812, Lourenco Marques. The numbers to be exchanged consist of the signal report plus the QSO serial number, i.e., a five digit number on phone and a six digit number on c.w.

The c.w. section of the **CQ WW DX Contest** attracted over 1200 entries from 110 different countries, and amongst the leading stations were:

All-Band Single Operator		*Multi-Operator Single Transmitter*	
5A1TW	871,750 points	VK5NO	945,248 points
W3GRF	712,640 points	KG6AAY	730,598 points
9Q5AB	663,310 points	W6RW	526,960 points
KP4AOO	601,084 points	K4LIQ	482,630 points
W4HYD	550,536 points	LZ1KSZ	468,540 points

The leading multi-operator multi-transmitter station was **CX2CO** with 1,456,380 points, and five other stations scored over a million points. Amongst the Continental leaders were **VP8GQ** with 356,760 points on 14 Mc/s and **ST2AR** with 140,610 points, also on this band, whilst the Contest Editor of CQ, **W1WY,** took time off from checking logs to register 56,776 points on 21 Mc/s.

Leading **UK** stations were:

G3FXB	All Band	425,216 points
G3HDA	,,	190,848 points
G2DC	,,	155,008 points
G3PFB	,,	89,920 points
G3PVS	,,	43,890 points
G3HCT	21 Mc/s	70,035 points
G3NQD	,,	9,040 points
G3POI	14 Mc/s	48,438 points
G3SEF	,,	15,333 points
G3HCL	7 Mc/s	29,323 points
G3EYN	,,	21,888 points
G3FKM	,,	16,206 points
G3PIT	3·5 Mc/s	6,771 points
G3RBP	1·8 Mc/s	1,275 points

The following high scores were claimed for the **1964 ARRL DX Contests:**

Single Operator C.W.		*Single Operator Phone*	
W3GRF	734,502 points	K2HLB	430,992 points
W4KFC	718,584 points	YV5BIG	381,150 points
W8GFX	658,665 points	YV5AGD	366,252 points
W4DHZ/4	628,056 points	W4BVV	347,454 points

A reminder that the c.w. and phone sections of the **Tenth WAE DX Contest** will take place between 00.00 and 24.00 on August 8/9 and August 15/16 respectively. Logs must be mailed not later than September 30 to Dr. H.-G. Todt, DL7EN, Chlodwigstr. 5, 1 Berlin 25, Germany.

A breakdown of the US stations worked by **GB3RAF** during the recent **S.S.B. Contest** gives the following numbers for each call area: **W1** 63; **W2** 126; **W3** 34; **W4** 71; **W5** 7; **W6** 13; **W7** 7; **W8** 41; **W9** 26 and **W0** 13. Other countries with numbers worked include: **DJ/DL** 52; **USSR** 46; **VE** 52 and **VK** 16.

Awards

The **Johannesburg Festival Award** is available to all amateurs who contact the required number of Johannesburg stations during the festival period between July and October,

On the way to OH/0 on board M/S *Skandia* in the "Finnish ice-cream."

(Photo by OH2YV)

1964. Stations outside Zone 38 must QSO five Johannesburg stations and any mode, or combination of modes, is allowed with a minimum report of RS33 or RST338. A certified list of the QSOs should be sent with the application to the Awards Manager, PO Box 7227, Johannesburg, Rep. of S. Africa. There is no charge for this award, which is also available to s.w.ls.

The **Award Hunters' Club International Inc.** had its beginnings in 1957 and is attracting an increasing amount of interest at the present time. The HQ is at Isokaari 4-B-30, Lauttasaari, Finland, where John Velamo, **OH2YV,** manages the affairs of the club. AHC International publish a leaflet giving details of the organization and rules and requirements for membership, and of which G2BVN has a limited supply. Any interested operator is invited to send an s.a.s.e. for a copy of the leaflet.

To commemorate the fortieth anniversary of Radio EAJ-1 Radio Barcelona, the oldest Spanish broadcasting station, on November 14, 1964, the Spanish National Society, URE, announce the **2nd Diploma Radio Barcelona.** This may be claimed by UK stations who can produce proof of QSOs with 20 EA3 stations located in the four Catalan regions: Barcelona, Tarragona, Lerida and Gerona. QSOs may be on phone or c.w., and only one QSO per station is acceptable. The qualifying period is between June 1 and November 30, 1964, and applications will be accepted until December 31, 1964. These should consist of a signed list showing details of the QSOs together with the applicants QSLs in confirmation thereof. It is asked that a QSL addressed to EAJ-1 should also be enclosed, so that the cards of operators who apply for this award may be exhibited. Short wave listeners may apply for the award and applications should be sent to Delegacion de URE (Diploma DRB), Apartado Postal 541, Barcelona, Spain.

In the latest Honor Roll for the attractive **USA-CA** Award it is noted that **G4CP**, Ron. Perks, is No. 357.

In connection with the WPX Certificate issued by *CQ Magazine*, credit will be given for the new Jamaican prefix **6Y5** only if credit has *not* already been claimed for 6YA.

Referring to the qualifications for the **Olympia Award** given in *MOTA* last month, it should be noted that the cards submitted for the three classes should include at least two, one and one respectively from the Tyrol, i.e., OE7.

Around the Bands

Again very few activity reports have been received this month, due partly no doubt to the many other distractions which attend the advent of what we good-naturedly call summer in this country, and partly to the fall-off in propagation conditions that occur at this season.

Close up on VP8HF! S.s.b. mike can be seen on left of desk and el-keyer paddle on the right of desk. Two sacks in background contain rock specimens for geologist.
(Photo via G3RFH)

No one will admit to working or hearing any worthwhile DX on either **1·8** or **3·5 Mc/s,** while the **7 Mc/s** banner is in the solitary but capable hands of **BRS20317** who, as usual, tabulates his captures by continents as follows:

Africa: Conditions have been excellent during the evening with many signals peaking S7 or S8. 5H3HD (20.30), 9Q5AB (21.00), FB8XX (22.30), OR4VN (23.00), 5Z4IV (19.30), ZE3JO (21.00), EL2AD (22.50), VQ2GJ (17.45), ZS6OS (18.30), ZS1BK (21.00). If only FB8WW would come up on 7 or 21 Mc/s perhaps he would be easier to work from Northern Europe than he appears to have been on 14 Mc/s these past few months.

Asia: Although generally the star 7 Mc/s DX source in winter, at this time of year things are very different, and despite diligent searching all that has been audible have been a few UL7, UI8, UH8 and a couple of UA0 stations. However, if Gus was still wandering around the more distant Asian countries no doubt he would be S8 or S9 for hours on end every night. It is amazing how conditions can change, or appear to change for the better when one such as Gus connects an r.f. generator to a radiator!

Oceania: VK5NO and VK3AXK have been heard with the former touching S8 (around 21.00), but it must be remembered that at this time of year absorption is nearing its peak and the length of the shortest paths from Oceania results in most signals reducing to nil before they are half-way to Europe.

North America: Stations heard are confined to the areas adjacent to the eastern seaboard, and even then signals strengths are pretty low.

Central America: 22.00 to shortly after midnight appears to be about the most fruitful time and KV4CI, VP6AT, VP6CJ, HI8NPI, VP2MV and a few KP4s were logged.

South America: Apart from the odd PY and LU around 21.30, nothing of interest has been observed. Ah well, in six months' time when we return home through sub-zero temperatures the band should be in much better shape!

The **14 Mc/s** band, unlike 7 Mc/s *has* been good to the Pacific and **G8JM** has been using one-sided modulation and the short path to good effect working such juicy items as FO8BJ, KB6EPN, W0PM/KM6, W7VAX/KS6, ZL1ABZ (Kermadec Island) all during the breakfast hours. Other noteworthy items worked include AP2MI, CR9AH, FG7XV, FG7XT/FS7, HM5BF, HR2SY, HZ2AMS, KC4USV, KR6CF, OA4PD, OD5LX, OY8KR, PZ1BW, TL8SW, VK9XI (Christmas Island), VS5MH, VQ8BFC (Chagos Island), VS9MB, VS9MG (one of the aliases of wandering VS1LX), VU2NR, XW8AV, ZD6PBD, and 9N1MM.

G3POI pounds the brass, and proves that interesting things happen below 14,100 kc/s as well as above. Such things as CR9AH (16.40), PJ3AH (22.10), 5H3JI (18.50), VP2KJ (20.05), KL7BZO (21.40), FG7XC (20.30), DU1FM (15.30), VS6EY (15.45), 7Z1AA (18.20), CO6AH (21.45) and PZ1BH (21.35).

A3699 records sideband signals from VS5MH (15.25), FG7XT/FS7 (15.30), ZD6PBD (17.00), CR6GF (17.00), 9L1JR (18.20), K8EQH/MM which is the flagship of the US Navy 6th Fleet (18.27), OY8KR (19.10) and FG7XV (19.25).

A4089 uses a modified BC342 with a converter and during the period May 24 to June 3 logged the following s.s.b. stations: EP2BY (20.10), 4U1SU (18.10), 5Z4JY (18.25), OA3JF (16.17), 9G1EK (18.40) and 4U1ITU (19.10).

A2498 also concentrated on sideband stations and reports hearing AP2MI (16.30), CP5EC (23.30), EL2AH (20.25), EP2DJ (20.00), ET3JF (17.40), FO8BJ (08.45), HC5EJ (23.25), HL9KH (13.45), HL9KR (14.00), HR2SY (21.10), HR3HH (23.00), KA5MC (16.30), KB2EPN (09.10), W1YNP/KG4 and W9JJM/KG4 (23.00), W0PI/KM6 (08.00), KR6GF (13.30), LA9PI/P, Jan Mayen Island

JT1KAA in Ulan Bator.

(20.45), PJ2CE, St. Maarten (23.30), PZ1CE (23.50), TI2USA (23.50), TL8SW (17.40), TU2AU (18.30), VP8GQ (20.10), VQ1GDW (17.40), VQ8BFC (17.25), VS9MB (12.00), YV8AJ Hammarlund Expedition (22.40), WA2USA New York World's Fair (15.10), 3A2CP (18.00), 4U1ITU (17.40), 4W1B (19.10), 4W1D (20.40), 5H3JR (17.05), 6O6BW (18.25), 7X3CT (17.20), 7Z1AA (06.40), 7Z3AA (16.50), 9L1HX (20.45) and 9L1JR (18.10), FG7XT (02.35), HC8FN (01.20), OA4KY (01.30) and OA5AO (03.00), all of which goes to show that despite lack of sunspots 20m is still full of DX for those who really know how to winkle it out.

The **21 Mc/s** band at present performs best in late afternoon and early evening, but signals from Oceania and the Far East are noticeable by their absence. However, for DX hunters requiring new countries in Africa and Central America it has been far from unproductive. On c.w. **G3POI** worked 4W1B (19.52), 9Q5TH (19.10), EA6AM (17.10), 7X2DU (16.30), VU2GM (09.10), 5H3JI (18.15), 9L1TL (19.10), FB8XX (11.25), EP2DM (14.20), OA4KF (19.00), CR7IZ (15.00) and PJ3AH.

A3850 provides ample evidence that **21 Mc/s,** unlike 14 Mc/s, still provides a happy hunting ground for the users of longer established forms of modulation (to wit, amplitude modulation) and reports VP2SM (20.15), KZ5BT (20.20), HP1AP (20.25), VP2KR (21.20), VP2AQ (21.20), ZP5DL (21.25), HK3ET (21.35), HC5EN (21.55), TI2EAG (22.20).

QTH Corner

AP2MAP	to Hammarlund DXpedition QTH.
DU0DM	via DU1OR.
FO8BJ	L. Cochet, BP 867, Papeete, Tahiti (correction).
HA Bureau	Postbox 214, Budapest 5, Hungary.
KJ6CC	Douglas Aircraft Radio Club, Box 130, APO 105, Postmaster, San Francisco, Calif., USA.
MP4QBF	to G3IZU (home QTH).
OA4KY	Box 2965, Lima Peru.
TG9GZ	Box 25-A, Guatemala City, Guatemala.
TJ8AC	BP 26, Garoua, Cameroun. .
VP7NA	H. North, Box 5041, Nassau, Bahamas.
VP7NG	Box 5755, Nassau, Bahamas.
VS9MH	to G3NIR (home call).
ZB1CR	to G3NKQ (home call).
4W1D	via HB9AAW.
5A1TG	Box 1651, APO 231, New York, NY, USA.
6Y5UC	c/o Physics Dept., Univ. of W. Indies, Kingston, Jamaica.
7Z1AA	via HB9AET.
7Z3AA	via MP4BDM.
9L1JC	J. Clark, HQ., RSLMF, Freetown, Sierra Leone.
9L1JR	J. Richardson, Box 53, Freetown.
9L1KW	K. Waerzer, FCSG, Freetown.

* * *

RSGB QSL Bureau: G2MI, Bromley, Kent.

Additionally mention must be made of the sporadic-*E* short skip propagation which affects this band, but to a lesser extent than 14 Mc/s at this season of the year.

G3RMF uses 50 watts to a multi-band dipole, and using A3 he talked to 5B4AK (13.20), ZS1AB (16.10), CE2BJ (21.10), YV5EWP (19.45), PZ1CP (21.00), EA9EN (20.40), TG9US (14.00), VP2KR (22.10), FG7XL (21.20), 9U5DL (14.12), 9X5LR (19.25), 9Q5FD (20.05), HK3ET (20.50), CE3TS (21.10), ZP5EB (19.55), and FG7XP (21.45).

The main news of **28 Mc/s** concerns the almost daily openings to all over Europe via sporadic-*E*. At weekends in particular the band has often been really crowded with stations, and **G3SEM** lists most of the prefixes which have been audible in the UK such as F, DJ, UP2, I1, OE5, UR2, EA, SP, CT1, and SM. If DX means long distance that list might not appear very interesting, but if by DX you mean the unusual then the interest increases, while if you are only a few points short of WAE, then it is positively mouth-watering! **BRS25600** includes most of the above prefixes and adds UA6, UB5, UA2 and OH, while earlier in the month, when the short skip was almost non-existent, he logged some long distance DX such as ZS1AB, 9G1EC, 9G1DM, 5X5JK, 9Q5AB, 4X4DK, 5B4AK, 5Z4AA, PY7AN, 5H3JI and 5H3JJ. Finally, and of particular interest, comes a report from **G3OEJ** who in one single day either heard or worked 9Q5AB, 5X5JK, 4X4DK, 9G1DM, 9G1EC, PY8MA, 5Z4AA, 5B4AK, 5A4TI, 5H3JI and 6W8AE. Old ten metres is far from dead, it is just collecting its strength ready for the next sunspot cycle which, thank goodness, is now only just around the corner.

DX Briefs

W9SFR has the logs for the operation of **KC6PE** between October 28, 1959 and June 5, 1960, the operator being a silent key.

BY1PK has been heard working stations outside the E. Europe area, and it is reported that he will make an appearance on s.s.b.

The Bjorn Staib Arctic expedition, which was allocated the call LA2C, has returned to Norway owing to unfavourable weather conditions.

OH0NH is regularly active on Top Band using the rig of OH2YV. Best times to look are between 22.00 and 24.00 on Tuesdays and Fridays near 1830 to 1835 kc/s.

Three new prefixes are now in use by Saudi Arabian stations, which are: **7Z1** (West), **7Z2** (East) and **7Z3** (Riyadh).

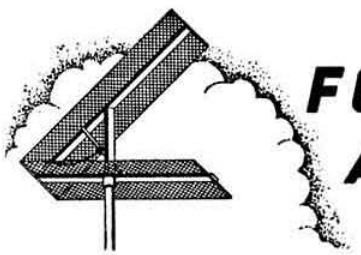
MP4BEX is the call of G3EIW who will be returning to the UK in July and who has been active on 14 Mc/s c.w. Before his return MP4BEX hoped to be active on 3·5 Mc/s using high power and a rhombic. All QSLs should go via the RSGB QSL Bureau.

According to the *LIDXA*, **LU2XL/9K3**, who is active on 14 Mc/s s.s.b., does not QSL via W5DOZ as previously reported. His QTH is said to be Box 8112, Salmaui, Kuwait.

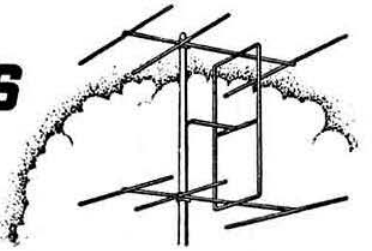
The **Pacific** area has been worked from Europe on a number of mornings during the last month, but conditions cannot be said to be stable. Amongst the stations reported are: **KG6SB** (Marianas), 14,260 kc/s; **KC6PE** (E. Carolines), 14,010 kc/s; **KB6EPN** (Canton Is.), 14,280; **KH6EDY** (Kure Is.), 14,300; **KX6CF** (Marshall Is.), 14,320 kc/s; **KS6BA** (Am. Samoa), 14,260 kc/s; **VR4CM** (Solomons), 14,300 kc/s; **VR5AD** (Tonga), 14,030 kc/s and **WB6BZS/KJ6** (Johnston Is.), 14,250 kc/s.

A copy of *DL-QTC* for **June, 1957** is being sought by G2BVN who would appreciate the loan of this issue for a short period.

Many thanks to all correspondents and acknowledgement is made to the West Gulf DX Club *Bulletin* (W5IGJ), the LIDXA *Bulletin* (W2MES), *DX'press* (PAOFX) and the *DX'er* (W6HVN). Please send all items to RSGB Headquarters to arrive not later than **July 17** for the **August** issue and **August 14** for the **September** issue.



FOUR METRES AND DOWN



Inter-Continental U.H.F. DX by Moonbounce

By F. G. LAMBETH, G2AIW *

AT 20.20 GMT on June 13, 1964, G3LTF at Galleywood, Essex, and KP4BPZ in Puerto Rico, made contact on 430 Mc/s by bouncing their signals off the moon. Signal reports were RST459 both ways. A further contact took place one hour later.

KP4BPZ was fortunate in having the 1000 ft. radio-telescope dish aerial at Arecibo, Puerto Rico at his disposal. G3LTF's equipment included a 15 ft. dish aerial and an AF139 transistor pre-amplifier for reception. Power input to the p.a. was 150 watts.

G3CCH (Scunthorpe) was the first to hear KP4BPZ's signals, but unfortunately could not raise him.

On June 14, KP4BPZ was heard again, this time on 2m moonbounce by G3CCH, G3ENY, and G2HCG. G3CCH reported that the signal from Puerto Rico was down to S2 between 20.30 and 21.00 GMT, and there was no response to G3CCH's own transmissions. G3ENY (Bridgnorth, Shropshire) heard occasional Morse characters from 20.00 GMT onwards and recorded " QRZ de KP4BPZ " at 20.29 GMT. A 16 element stack array and an A2521 pre-amplifier were used for receiving signals on 144·001 Mc/s; unfortunately no return transmissions could be made at the time.

A report from ARRL states that KP4BPZ worked W1BU, W9GAB, HB9RG, W9HGE and G3LTF on 432 Mc/s c.w. and W1FZJ on a.m. On 144 Mc/s, W1BU, K2LMG, G2HCG, WB6GZJ, DJ3EN, W3TIK/3, W3TMZ/3, W3LUL/3, DJ8PL, W4HJZ, DL3YBA, W4FJP(?) and W0IC.

OH-W 2m Moonbounce

Further news of the OH-W 2m moonbounce contact first reported in the May issue of the BULLETIN has been passed on to us by G2HCJ.

OH1NL, with a power input of 800 watts, contacted and received W6DNG who was running a kilowatt, between 15.00 and 16.00 GMT on April 11, 1964. OH1NL gave S2, and received a report of S3.

A 12 dipole aerial with a net reflector having a gain of 21db was used by OH1NL. This was horizontally polarized, and could be tilted between 7° and 39° above the horizon. The 800 watt, 144·137 Mc/s transmitter was home-constructed and has the following line-up: 6AK5, three 5763s, 6146, push-pull 826s and push-pull grounded-grid TB2-5/40Gs. The receiver uses two 6CW4s in the first r.f. stages, followed by a grounded-grid EL86, an E88CC, and an E180F. The first oscillator is variable, and feeds a twin diode mixer. After the first single-tuned i.f. stage, a pulse amplifier separates noise pulses to gate a succeeding transistor stage. The signal finally passes through three band-pass switched filter stages.

W6DNG used eight stacked seven element Yagis. The transmitter operated on 144·002 Mc/s, with 1 kW to a pair of grounded-grid 4X250Bs in push-pull. The receiver used a 6CW4 Nuvistor crystal converter, preceded by a 416B pre-amplifier.

G-EA 2m Troposcatter Contact

On June 11 at 22.24 GMT, **G2JF** (Wye, Kent) worked EA1AB at Santander on the north coast of Spain. Contact was made on 2m via troposcatter with elements of extended tropo, which included four medium level pings in one over. The best report was RST559. Contact was also made with F9NL near the Spanish border (QRA Locator AD72).

GC2TR (Jersey) also worked EA1AB on June 11, just prior to G2JF's QSO. GC2TR recorded RST579 from EA1AB, and slow fading was present which spoilt phone communication.

Four Metres

The recent extension of the four metre band should do much to increase its popularity, but before this can happen to any extent there will be much building and modification of suitable equipment. In the April issue of the RSGB BULLETIN an excellent Nuvistor converter designed specifically for this band was described in detail. However, most 2m converters should perform well at lower frequencies, and one which has been modified in this way is the RSGB 144 Mc/s Converter described on pages 132 to 134 of the RSGB *Amateur Radio Handbook*.

G2WS (Coventry) has found that the 2m converter referred to becomes a very simple, reliable and efficient unit on 4m, and that the oscillator in particular is extremely stable. The following information should be sufficient to enable anyone to modify the converter with little difficulty.

To lessen the risk of TV interference, the tunable oscillator should be altered to tune to 70 Mc/s + the i.f. of approximately 10 Mc/s, and so is set to cover 80 to 81 Mc/s. This requires only a single stage instead of the oscillator and doubler in the 144 Mc/s version, and therefore the 12AT7 can be replaced by a 6C4.

L1 is increased to 8 turns, ½ in. diam.; L2 to 20 turns, tapped three turns from the end connected to C3, ½ in. diam.; L3 is increased to nine turns, and all the r.f. chokes can be formed from roughly twice the length of wire. The i.f. stages described in the *Handbook* need no alteration.

Little 4m activity has been reported this month, but **G3OUF** (Ealing) reports that May 17 produced another QSO with G3OHH (Macclesfield), who is consistent every Sunday morning. G3PLX (Liverpool) was also contacted and reported pings on G3OUF's signal. On May 18 G3IUD (Wilmslow) was worked RST579 both ways. May 24

* 21 Bridge Way, Whitton, Twickenham, Middlesex. Please send all reports for the August issue to arrive by **July 10**, and for the September issue by **August 7**.

brought G5ZT (Plymouth) with 569 signals and deep fading, though occasional short duration pings brought the signal up to S8. G3EHY (Banwell) was worked S9 both ways.

G3HLW (Waterlooville, Hants.) reports that there are many stations within a 20 miles radius of Portsmouth that are known to be active, all on the common frequency of 70·26 Mc/s. They include: G2DYH, G3CNO, G3ADZ, G3AWY, G3GFN, G3GVM, G3HLW, G3HYG, G3IDL, G3JLO, G3IMA, G3LYH, G3ORR, G3MAD, G3PUR, G3SGA.

The frequency of 70·26 Mc/s is mainly used by mobile stations and saves much time otherwise spent tuning. G3HLW and many other believe it would be a step forward if all 4m mobile operators use this frequency.

Planning of the 4m. band is discussed by G6NB on page 462.

Mobile Polarization on Four Metres

After consideration of the factors influencing the polarization of 4m mobile stations, the Society's V.H.F. and Mobile Committees have agreed to recommend all mobile users of that band to adopt vertical polarization. The chief factor influencing their decision was the very difficult problem of a suitable horizontally polarized aerial which could be used on a car without exciting comment or endangering safety. Against this problem, the obvious solution is a quarter-wave vertical whip, preferably mounted centrally on the roof, police style, but alternatively, and probably just as effectively, on a new wing mount.

A great deal of evidence has been received from various members relating their experiences using cross polarization, "mobile-to-fixed," on 2 and 4m. A number of these letters have been published in the BULLETIN, and a survey of all the evidence leads to no definite conclusion regarding the necessity for vertical polarization at the fixed end of the contact. In order to try to resolve the point, the V.H.F. Committee is commissioning a series of experiments under controlled conditions. Meanwhile, some fixed stations may consider it interesting to erect a simple ground plane for this band, and, when in contact with mobiles, make comparisons with a horizontal beam. Due allowance should be made for the fact that the ground plane will be approximately 3db down on a half-wave dipole in free space. The V.H.F. Committee would be interested to receive detailed reports of any such experiments, which should be sent to Society Headquarters.

Meteor Scatter QSO on 144 Mc/s

On May 3, G3LTF, in Galleywood, Essex, worked UA1DZ in Leningrad via meteor scatter. Reports exchanged were S23 from G3LTF and S49 from UA1DZ. The QSO was completed at 07.40 GMT. The distance is 1,280 miles and this is believed to be a new European record for 144 Mc/s. Peak signals from UA1DZ were S8 and were also heard by G5YV in Leeds.

V.H.F. DXpeditions

G3BA and **G4LU** will be in **Wales** from Sunday, July 26 to Sunday, August 2. The tour has been arranged so that these places will be visited on the following dates: Radnor,

These photographs were taken during the Scottish V.H.F. Convention held at Glasgow on April 18. Top left: Fraser Shepherd, GM3EGW, proposing a toast to " The RSGB " at the dinner in the evening. Top right: G. M. C. Stone, G3FZL, President of the RSGB, presenting GM6XW with the Jock Kyle Memorial Trophy Award. Bottom left: Len Hardie, GM2FHH, (left), is seen talking to GM3EGW, both well-known 2m DX operators. Bottom right: G3FZL talking to GM3KYI and GM4HR of Dundee.

(Photos by G3HRH)

July 26; Monmouth, July 27; Glamorgan, July 28; Carmarthen, July 29; Pembroke, July 30; Cardigan, July 31, and Merioneth on August 1. Operating time will be from 19.00 BST to midnight and 08.00 to 09.00 the following morning. Only 2m will be worked. Anyone wishing to arrange skeds should write to either G4LU or G3BA giving an approximate frequency. All contacts will be QSLd.

G5LJ and **G3DUV** anticipate operating 2m mobile in **Northern Ireland** and **Eire** during the period July 23 to August 7.

The **GB2GC** group will now be operating from **Alderney** (Channel Islands) from September 5 to September 7 inclusive, and will enter for V.H.F. NFD. Operation will be on 4m and 2m, and if there is enough demand for skeds, equipment for 70cm may be taken. Operation on 70cm will be for skeds only. Frequencies will conform to the band plans, and on 4m will be 70·50 Mc/s. Skeds are offered for September 7 and requests should be addressed to GB2GC, c/o G3OUF, 80 Argyle Road, Ealing, London, W.13 (please note that th s is not as shown in the Call Book).

The Radio Club of 92nd Signal Regiment, Army Emergency Reserve, will be operating from Cairn o'Mount, **Kincardine,** on Sunday, July 19, 1964. The call-sign **GM3SIG** will be used, and the Band Plan frequencies of 145·8 to 146 Mc/s will be adhered to. Schedules can be arranged by writing to G3LOV, 8 Lipsham Close, Banstead, Surrey. The operating time will be 11.00 to 17.00 GMT. In addition to the activity on Sunday, July 19, it is hoped to be on the air at irregular intervals between July 12 and 24 from both Kincardine and Angus. The calls **GM3SIG** and **GM3LOV** will be used for this latter activity. Schedules can be arranged by writing to G3LOV.

G3NGK (now at Gillingham, Kent) hopes to be mobile and portable in the **Redruth** area of Cornwall during the first week of July on 70·23 Mc/s. QSOs and listener reports would be appreciated.

DX Achievements—Band Ladders

It has been suggested that " band ladders " should be restarted, with mention of stations *worked* and *heard* over, for instance, distances of 200 miles. Comments are invited, and the feature will be reinstated should there be sufficient interest.

The equipment which was used by W6DNG on April 11 to achieve a 2m moonbounce contact with OH1NL.

The V.H.F. Manager's Trophy, presented to the Society by R. C. Hills, G3HRH. The trophy is to be awarded to the leading entrant in the annual RSGB 70 Mc/s Contest, the rules for which were published in the June issue of the Bulletin.

Two Metre News and Views

G2JF (Wye) comments that the month of May was probably the best for most people since the extended tropospheric opening in January. New contacts were made with: G3LRL, GW3OXD/P, G3EHL, G3KFQ, G3OYX, G3NXK, GW8NP, GW2BJL, G3RHP, G3SXK, G2YU, G3PPA, G5BJ, G3LYG, G3GMJ, GW3CDH/P, G3AGX, G3OVL, G3MML, G3NEO, G3SHS, G3GYC and G3TEX.

F5BK was worked to produce the 2014th station on 2m since activity commenced in August, 1953. Schedules in the range 350 miles plus are still sought for troposcatter investigation. Second hand information heard on the band on June 3 indicated that sporadic *E* propagation was possible around 11 a.m., and G6UT was heard to say that he had heard OE and DL/DJ.

G3JGJ (Pepperdon) worked GC2FZC on May 10 at RST599 at 09.00 GMT. On May 11 GB3CTC (Camborne) was the loudest for the year at RST589, and G6XD was worked. The beacon, however, was inaudible at 07.19 GMT on May 12. On May 15 it was RST 5-6/0-9 at 15.25 GMT, and G5LK was heard calling at 579 and gave the same report. On May 16 F3YY came back to a CQ with reports of RS59 each way. GC2FZC was also worked at RS59+ both ways. On May 29 he was heard again at 59+, and then GC2TR (Jersey) was worked at RS57 (he gave 559).

Vernon Mellor, **G5MR** will shortly be better known to Gs from his new QTH which is 460 ft. a.s.l. **G3EMU** (Canterbury) has been maintaining his lunch-time contact with PA0EA (Amsterdam): the schedule has been running for a considerable time and the range is approximately 200 miles.

First 144 Mc/s Portable Contest 1964

The following are claimed scores for the First 144 Mc/s Portable Contest held on May 2-3, 1964. They are unchecked and are not official results.

G3GWB/P	16,389	G2HIF/P	9,366
GW3RUF/P	15,264	G3LHA/P	9,163
G3KMT/P	12,397	G3NJF/P	9,111
GW3MAR/P	10,691	G3KCB/P	8,901
GW3OXD/P	10,005	GW5PI/P	8,278

Miscellaneous Items

F3ZK will be operating on 2m during the French V.H.F. Portable Contest on July 4 and 5, which coincides with the Second 144 Mc/s Portable Contest. The station will be active for 24 hours from Guise Castle, in Aisne, France.

A new station active in Blackburn is **G3SHJ**, who may be taking his equipment to the Isle of Man on July 18 for a fortnight. Activity will mainly be confined to the daytime.

70cm

G3KEF (Coventry) operated during the First 420 Mc/s Contest on May 30-31 from Beacon Hill, Leics. (eight miles north-west of Coventry), and was accompanied by G3LHA. Twenty-two QSOs were made with four countries (G, F, PA and ON). The E-DX opening came as a complete surprise, in view of the weather. On the Sunday, operation was at a site two miles north-west of Coventry, from where seven contacts were made. Conditions and activity were, as always on the Sunday after a contest, poor. It is interesting to note that 90 per cent of the points claimed were made on the Saturday night, and G3KEF believes that it is time the duration of contests is drastically shortened. The operating period 18.00/24.00 GMT is suggested, which would still provide a chance of catching evening openings. This column welcomes other operators' observations on this rather controversial subject.

Conditions in Lancashire were very poor for the First 420 Mc/s Contest, for only one station was contacted by **G3EKP**. The usual sked with G3LJO/T continues every Wednesday and Saturday, while G3LJO/T also often contacts GW3JGA/T, now that video signals between them have improved.

G3NNG informs us that the Harwell Group's participation in the First 420 Mc/s Contest was marred on the Saturday by a terrific thunderstorm accompanied by hail.

G3JGJ (Pepperdon, 10 miles south-west of Exeter) has a QQV06/40 tripler-final going well.

G3LTF (Galleywood) also reports on the 420 Mc/s contest. Despite a low barometer, conditions were excellent on the Saturday evening into PA and as far north as Nottingham, but G activity seemed low outside the south-east. G3LTF and G3LQR thought there was some skip present; when conditions were at their peak they were not doing so well as stations further inland. QSOs were had with ON4HN, ON4LP, ON4LN, ON4ZK, PA0EZ/A, PA0VLP, PA0AKD, PA0COB, PA0LU, PA0KT, PA0JMS, PA0AKA, PA0TBE, PA0OS, F8VN, F8OB, F8AA, F9NJ, F9LD, with F9RT (Rheims) and PA0DBQ who were lost. Also worked was GW3ATM/P at 59+ as best G-DX.

G3EMU has reactivated his 70cm equipment and can often be heard working G3KMP (Hastings). Unfortunately G3EMU is not well placed for v.h.f./u.h.f. except from the direction of PA.

FLASH-BACK TO THE KINGSLEY

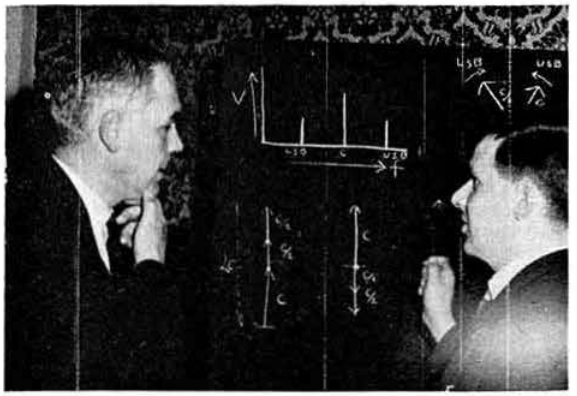
"Uncle Mike" writes:

Unlike many of Amateur Radio's social events, the Tenth International V.H.F. Convention has had a lasting impact: it was not by any means a " here to-day and gone tomorrow " affair.

For one thing it created a healthy dissatisfaction in many visitors simply by looking at the marvellously made entries in the Home Constructors' Exhibition at the Kingsley Hotel that afternoon.

For another, it must have prompted many members to look more seriously at the possibilities of moon-bounce at u.h.f. (a rarefied atmosphere, this, in more senses than one), and single sideband, perhaps a more practical thing for most people at the present stage of the art, and made to sound simple indeed by G3BA and G3MED in the technical symposium.

The Convention had a lasting effect, too, as a talking point over the air for many weeks afterwards, the main theme of people's comment being " how friendly it all was "—but then that is v.h.f. all over. President Geoff Stone, G3FZL, did in fact refer to this special feeling of one-ness which pervades the v.h.f. fraternity, and we can be sure that, knowing Geoff, he will endeavour enthusiastically to spread it more widely in other areas of amateur activity.



To those who can't resolve s.s.b. it was quite revealing to hear the *real* voices of G3BA (left) and G3MED in their dissertation on single-band at v.h.f.

Many groups and clubs made up parties to attend the V.H.F. Convention. That hot-bed of v.h.f. enthusiasm, the Welwyn Garden City Group, was represented, amongst others, by (left to right) G2BLA, G3OZH and G3KWH.

Geoff made these remarks during his after-dinner speech in response to the toast of " The Radio Society of Great Britain " proposed by Harry Wilson, EI2W, a most welcome —and by no means infrequent—visitor to Society v.h.f. affairs.

Other toasts at the dinner at the Kingsley that evening were to " The London U.H.F. Group," proposed by Bert Allen, G2UJ, and replied to by Norman Caws, G3BVG, in his capacity as Treasurer of the London U.H.F. Group. The Group work in intimate co-operation with the RSGB V.H.F. Committee during the preparatory months prior to the Convention itself.

The third toast was to " Visitors and Guests," by Tony Griffiths, G3MED, racily replied to by Austin Forsyth, G6FO, who made some welcome comments about the importance of unity in the amateur movement.

Exploration of the 70 Mc/s Band

By D. N. BILTCLIFFE, G6NB *

THE widening by 400 kc/s of the 4m allocation to 70·1 to 70·7 Mc/s is certainly good news and it makes this hitherto somewhat neglected band a worthwhile proposition.

Many older readers will remember the thrill of sporadic-*E* which we experienced on the old 5m band during the mid-30's and late 40's, also of the excellent work done by G5MR, G5KW and others, in working stations in North Africa during the early days of the 4m band. Unfortunately G, GD, GI, GC, GW, GM, and EI are now the only countries allowed to operate in this frequency range. Nevertheless it is an excellent GDX band which will give much pleasure and QSO's with all parts of the British Isles. It is also a good opening for a superb mobile band giving even better coverage than the much used 160m band and, of course, with less noise.

Planning the Band

Before we all make a rush to start operating let us stop and give some thought to a band plan. It is obvious some sort of plan is necessary, but it must be reasonably elastic in operation to satisfy all concerned. It is suggested the majority of stations active will be in the London area and the Southern part of the country, so these stations could congregate around the centre of the band, say 70·3 to 70·5 Mc/s whilst our Northern friends including GI and GM would operate between 70·5 and 70·7 Mc/s† leaving stations in the South West, EI and GW to operate between 70·1 and 70·3 Mc/s. This plan would at least allow the DX operator to search the part of the band where stations in the desired direction would be operating, at the same time it would give freedom for s.s.b., portable, mobile and fixed stations to make contact and then operate on a single channel, possibly on the edge of each zone. These suggestions have, incidentally been agreed with the *Short Wave Magazine*.

Polarization of Aerials

At this stage it might be worthwhile to consider the polarization of the aerial system. Thought should be given to see if a change to vertical polarization might be an advantage and if it would be a help to the mobile operator, although it may be argued that a vertical whip may give anything but vertical polarization when operating mobile. It would be interesting to have readers' comments on this matter. (*See Four Metres and Down*, page 459.)

Equipment

The equipment for this band may be quite simple and with the number of v.h.f. transistors now available at a reasonable price, thought should be given to transistorized crystal controlled receivers of which a number of good designs have appeared from time to time in various technical journals. For the transmitter it might be as well to consider a really stable v.f.o. outfit but if one does not feel up to the amount of work involved, it should be possible to buy one of the many surplus crystal controlled transmitters on the surplus market which cover 70 Mc/s and use switched crystals to cover frequencies near the zone edges and also the normal operating frequency.

In conclusion may it be suggested to the many operators who use the overcrowded h.f. bands for local rag chewing to consider moving to the 4m band. They will not be disappointed with the results.

* The Red House, Brill, Aylesbury, Bucks.

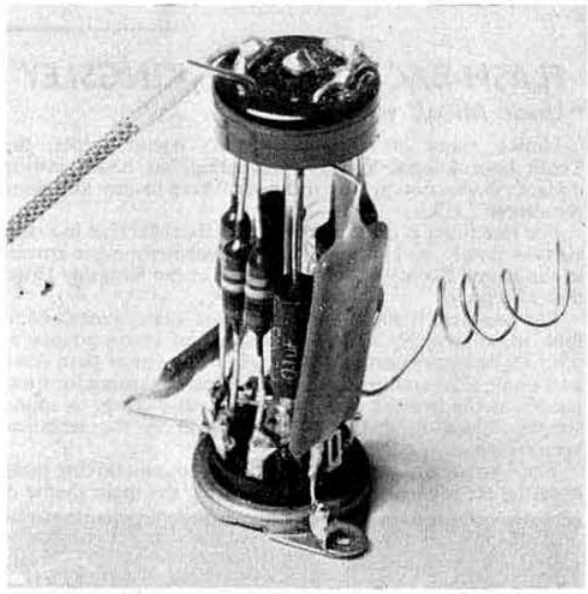
† Subject to the conditions of the Amateur (Sound) Licence A.

Valveholder Sub-Assemblies

By G. Rooney, G3MKH *

The photograph in the review of the KW77 communications receiver on p. 38 of the July, 1963 BULLETIN may have introduced some readers to the idea of pre-assembling small components around a valveholder, using a vertical wire to provide an earth bus-bar. The usefulness of the system will soon be realized if one studies a few circuits employing B7G and B9A valves and notes how many pins on each valve base are connected to earth, either directly or via a resistor or capacitor. For example, in the circuit on page 31 of the same BULLETIN, the product detector V8 has seven pins so connected. This is a rather extreme case and, at the other end of the scale, some circuits will be found where the use of a central earth wire would be pointless. The usefulness of the scheme can be increased, and made independent of the number of earth points required, if a disc of insulating material is fitted at the lower end of the earth wire to provide anchorage for components which do not require to be earthed. The drilled plastic protectors fitted over the pins of new valves are very suitable for use as this insulating disc. After drilling a central hole in a disc it can be slipped over the earth wire and held in position with a blob of solder each side.

The example shown in the photograph is the carrier

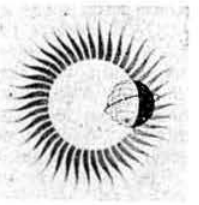


oscillator/cathode follower circuitry of the G2DAF Mk. 1 transmitter, V3 in the circuit published in the October, 1959, issue of the BULLETIN. The assembly embodies four resistors, two moulded capacitors, three silver-mica capacitors and there are four tails for external connections. On this valveholder two heater pins are earthed directly and one anode by-pass capacitor makes use of the central earth wire as a tie-point. The provision of the insulating disc enables nine components to be accommodated in one neat assembly.

Sub-assemblies such as these can be made and checked literally in armchair comfort and enable the bulk of a circuit to be wired without poking into awkward corners of a chassis. The final result is of a higher standard of neatness than the writer has ever achieved in previous constructional efforts.

* 270 Spital Road, Bromborough, Wirral, Cheshire

IQSY NEWS



FOR the past several months detailed reports of the reception of signals on 2m, which have taken place under abnormal propagation conditions, have been received by the RSGB from some of the skilled observers taking part in the RSGB IQSY (International Years of the Quiet Sun) Programme. There are now 41 amateurs actively engaged in research into the various fields concerned with the propagation of radio signals, apart from members of the RSGB Scientific Studies Committee who are organizing the programme.

The overall programme for IARU Region I is being co-ordinated jointly by DARC and RSGB, the former organization having a well established auroral reporting network under the control of Edgar Brockman, DJ1SB. A number of overseas amateurs are also participating directly in the RSGB programme. One observer is Olof Karlson, SM6PU, who has been reporting on auroral propagation since 1959. Another observer is Tom Short, ZE1AN, of Bulawayo, Southern Rhodesia, who is reporting regularly on the trans-equatorial reception of signals from the beacon station 5B4WR. He also reports on the reception of DL0AR, these reports being passed on to DARC for information. A recent enquiry of considerable interest came from SM3AVQ, President of the Gavle Shortwave Amateurs Club; a contribution to our programme from his area would be particularly valuable. Another area from which assistance is required is Iceland as it would be valuable to compare trans-auroral zone propagation with auroral back scatter. A number of reports of 144 Mc/s auroral propagation during last Autumn have been received although there have been none this year. The sun at present is very quiet so that auroral propagation is unlikely to occur frequently. That is why it is even more important for observers to be alert, as a sudden magnetic storm could occur and would provide very interesting information. Warnings of impending solar activity are sent to all observers by G2FKZ.

GB3LER, Lerwick

A great deal of work in connection with the Society's programme is being done by Ray Flavell, GM3LTP, who is establishing two experimental transmitters at the Observatory, Lerwick, one operating on 10m and the other on 2m. These transmitters will be operating 24 hours a day and operation should commence shortly. A permanent receiving station, also operating 24 hours a day is being set up by Jim Lyon, GM3GUJ, at the Technical College, Thurso, Caithness, and a number of amateurs in this area are also assisting in the programme. A regular IQSY net has been established on 3783 kc/s s.s.b. daily at 18.15 GMT, and on Sundays at 09.30 GMT. This activity links groups in various areas, which are organized by: London, G2BVN; Belfast, GI3KYP; Dunfermline, GM3EGW, GM3FYB and GM3IQL; Thurso, GM3GUJ and Lerwick. The basic purpose of this net is to maintain contact between observers and to pass information on details of solar and magnetic activity from Lerwick. Another group is active in the Bridgnorth area under Geoff. Roberts, G3ENY, and in addition there are a number of amateurs in various parts of the country such as G3RZG, Weymouth; G2AOX, Hendon; G3MWZ, Lincoln; G3BTC, Welling; G3OAD, Dudley; GM3GUI, Friockheim; G2CIW, Birmingham; G3CFO, Bromley; G4LX, Newcastle-on-Tyne; GM2DRD, Forfar; and SWL Ray Williams of Grantham. Additional observers are still required, especially to report on signals in the 28 Mc/s band and anyone interested is invited to write to the Scientific Studies Committee at RSGB Headquarters.

The details of the equipment at Lerwick are as follows: the h.f. transmitter has been specially constructed by K.W. Electronics Ltd., and is crystal controlled and delivers about 50 watts output on 29·005 Mc/s. The aerial is a three element Yagi of specially rugged construction supplied by SVS Masts. The Society is indebted to Rowley Shears, G8KW and Frank Bennister, G3COX, respectively for their valuable co-operation. The v.h.f. transmitter is a Pye PTC704 with slight modifications, delivering 15 watts output via an aerial change-over relay to either a J-Beam 6-over-6 slot fed Yagi beamed NNE, or to a similar aerial beamed SSE. Both transmitters are keyed simultaneously by a Government Surplus Keying Device type 1, similar to the one used at the GB3VHF beacon at Wrotham. The v.h.f. aerials are arranged so that the signals are beamed NNE for two minutes and SSE for one minute with the call sign being sent once every minute. The equipment is set up in a hut on a site remote from the observatory having a very good outlook both to the north and south.

Known Beacon Stations

Frequency (Mc/s)	Call-sign	Location of Transmitter	Watts	Aerial	Direction	Operating Period
28·000	DM3IGY	Collm, Sachsen, Germany				00.00-01.00, 06.00-07.00, 12.00-13.00, 18.00-19.00 GMT
29·000	DL0AR	Hiddesen, Teutoburger Wald, Germany	170	Minibeam	N	Cont.
29·008	5B4WR	Limassol, Cyprus	25	Vertical	Omni.	15.00-19.30 GMT (wk), 07.30-19.30 GMT (Sat., Sun.)
29·005	GB3LER*	Lerwick, Shetland	50	3 ele.	NNW	Cont.
50·046	ZE1AZC	Salisbury, Southern Rhodesia	40	Groundplane	Omni.	Cont.
144·100	GB3CTC	Redruth, Cornwall	50	6-over-6	NW	Cont.
144·150	OE7IB/P	Patscherkofel, Innsbruck, Austria	5	Vertical	Omni.	Cont.
144·500	GB3VHF	Wrotham, Kent	50	5 ele.	N	Cont.
144·929	OH3VHF	Ylojarvi, nr. Tampere, Finland	80	6: 4-over-4	Switched	04.00-23.00 GMT
145·000	SM4UKV	20km west of Orebro, Sweden	90	X-dipole	Omni.	06.00-24.00 GMT
145·150	LA1VHF	Mount Yausta, 125km west of Oslo, Norway	25		Omni.	
145·900	DL0SG	Straubing, Niederbayern, Germany	12		Omni.	
145·987	OZ7IGY	Copenhagen, Denmark		2: Halo		11.00-23.00 GMT
145·995	GB3LER*	Lerwick, Shetland	25	2: 6-over-6	NNE, SSE	Cont.
431·500	GB3GEC	Hammersmith, London	400	4: 8-over-8		Cont.
432·008	DL0SZ	Munich, Germany	35	15 ele.	N	
432·018	OZ7IGY	Denmark				11.00-23.00 GMT
433·000	DL1XV	Predigtstuhl, Oberbayern, Germany	10	11 ele.	NW	

* *To be operational shortly.*

Single Sideband

By G. R. B. THORNLEY, G2DAF *

THE experienced constructor who has built up his " know how " over a period of many years, is often inclined to forget that what he considers to be well known straightforward constructional practice may often be completely unknown to the younger operator who has decided to build a relatively complex piece of amateur equipment, such as an all band s.s.b. transmitter or receiver.

This fact has been brought home to the writer by the number of letters received from BULLETIN readers asking " elementary " questions such as, " Which way round should I wire the double triode valve in the audio amplifier?" —" Should heater wires be run separately or as a twisted pair?"—" Should all wiring be in screened cable?"—" Do you recommend using a steel chassis?"—" What method do you adopt for winding coils on Aladdin or Neosid formers with screening cans, as used in your Mk. 2 transmitter?"—" I understand that commercial receivers such as the AR88 and CR100 always use wave-change switch banks with shorting plates, but I notice in your receiver circuit that you do not show these. Will it be all right to use standard switches without shorting plates or is this an omission in the circuit diagram?"

At the time the original G2DAF Communication Receiver was being developed in 1958 and 1959, it was difficult to obtain miniature i.f. transformers and signal frequency coils, and mechanical filters were non-existent. The receiver was therefore constructed using six FT241 crystals and three physically large i.f. transformer cans in the filter, and surplus i.f. cans and large coil formers in the band-switched stages. This required a chassis size of 17 in. × 17 in.: as large as an AR88 receiver.

The tendency today is to make equipment lighter and smaller. Small components such as the Electroniques signal frequency coils and the Electroniques and Maxi-Q miniature i.f. transformers and mechanical filters which require much less space than their crystal and transformer counterparts are now readily obtainable. Using these components it is no longer necessary to rigidly adhere to the original chassis dimensions. In fact, the receiver can be constructed within an overall chassis size of 16 in. × 12 in. with a 17 in. × 9 in. front panel. Again, from letters received it is apparent that many potential constructors would in fact like to reduce the overall size, but hesitate to do so because they are uncertain of the methods used by " experts " to obtain a satisfactory chassis layout.

In addition to this, many amateurs listen on the 80m band and have heard the writer discussing an experimental front-end for the G2DAF Mk. 2 receiver that does not have the customary r.f. stage. It is also fairly common knowledge that a new amateur bands communication receiver is being marketed in the United States which it is claimed has a greatly improved cross-modulation performance, also without an r.f. stage. Furthermore, an article has appeared in *QST* extolling the virtues of the 7360 beam deflection valve as a low-noise mixer and stating that this valve has a noise factor so low that it enables a receiver to be built without an r.f. stage, but that has a signal-to-noise ratio not inferior to other high quality receivers.

This has caused some amateurs to add two and two and make five. It has become obvious to the writer that it is commonly supposed that the new front end in the G2DAF Mk.2 receiver uses 7360 valves and that G2DAF has removed the r.f. valve and thrown it in the dust-bin. One recent letter starts as follows. " I am planning to build the G2DAF receiver described in the booklet *Communication Receivers*, but before doing so would like your advice in connection with the cascode amplifier V1. I understand that your Mk.2 receiver does not have an r.f. stage, and I would like to incorporate this modification in my own receiver. Will you please tell me how the aerial coils and the oscillator input should be coupled into the 7360 mixer valve?"

The writer is naturally anxious to avoid answering individual questions of the types that have been quoted, and also feels that one or two issues of *Single Sideband* run as a " Question and Answer " feature will serve a useful purpose and also be of some general interest. Before commencing the query department, G2DAF would like to make it quite clear that the opinions expressed are personal ones, for other experienced constructors might well have quite different views.

Questions and Answers

Q. Which way round should a double-triode valve be connected?

A. Double triode valves used as cascaded audio stages, a carrier oscillator-cathode follower, or as a Butler oscillator may be connected any way round. That is, the first stage of a B9A base valve may comprise pins 1, 2 and 3, or pins 6, 7 and 8: it is immaterial which half of the valve is used first. The exception to this general rule is a cascode valve such as the ECC84 in which the internal screen is connected to one of the cathodes and to pins 7 and 8. In order to ensure that the internal screening is effective this cathode must always be earthed to r.f., which means that the signal input side of the circuit should always be wired to pins 6, 7, 8 and 9. Valves of the 12AU7, 12AT7 and 12AX7 class were developed for audio amplifier applications and although the two electrode structures have similar characteristics they are not balanced capacitively and are not internally screened from each other. Where r.f. balance is thought to be necessary and internal screening is desirable the newer double triode valves developed for r.f. use are preferable: these are the ECC85 and ECC88.

Q. Should heater wiring be run separately or as a twisted pair?

A. The pins of modern B7G and B9A valveholders will not accept wire greater in diameter than 22 s.w.g. It is therefore convenient to wire the apparatus throughout using 22 s.w.g. tinned copper wire insulated either with 1·5mm sleeving (obtainable in 3 ft. lengths), or alternately p.v.c. insulated 0·028 in. (22 s.w.g.) solid core wire wound on reels in 36 ft. lengths and distributed by Radiospares. A particularly useful advantage of the latter wire is that it is obtainable in 11 different colours. Colour coded wiring is always an advantage, for it prevents mistakes and makes fault finding or subsequent modification much easier. The Radiospares p.v.c. wire is always used by G2DAF, with the following colour coding: yellow, heaters; white, cathodes; grey, a.g.c. and negative bias; red, h.t.+; pink, 150 V regulated; black, h.t. negative or earth; blue, grids. All wiring carrying r.f. is run point to point via the shortest possible path. Wiring carrying d.c. or 6·3 volt heater supplies is run close in along the top chassis fold and is then taken at right angles directly to the appropriate valveholder or tag strip. The two heater wires are kept flat and close together, close against the chassis underside. Cross screens are prepared by cutting out a ⅜ in. × ⅜ in. square with a pair of tin snips right against the corner of the screen so that there is clearance for the cable harness, and in order that the screen can be removed if necessary without unlacing the wiring. If the chassis is composed of separate box sections, these are prepared by drilling ⅜ in. diameter holes in adjacent corners and the cable harness is run through these holes. Resistors

* 5 Janice Drive, Fulwood, Preston, Lancs.

in the h.t. leads feeding anodes and screens are taken vertically upwards from the valveholder to a tag strip mounted immediately above the valveholder on the chassis side apron, Mounting (tag) strips can be obtained from Radiospares (via local radio dealers) in lengths containing 28 tags; these can be cut to any required length.

Q. Should all wiring be in a screened cable?

A. No! Wiring should not be in screened cable unless this is indicated on the circuit diagram. In general, the only part of the circuit requiring screened cable is the audio line from the microphone socket, the leads to the volume control and the audio noise silencer control if this is fitted. A *Q* multiplier or notch filter may be fitted at one side of the panel in order to get a balanced panel lay-out, and will require to be connected to an i.f. strip probably 7 in. or 8 in. away. In this case a screened cable to carry the r.f. will be required, but this will not be normal screened wire. Coaxial cable will be used, and the designer will have made allowance for the additional shunt cable capacity across the i.f. transformers.

Q. Do you recommend using a steel chassis?

A. The most suitable material for the amateur is aluminium or aluminium alloy of 18 or 16 gauge. This is an excellent conductor, is clean and easily worked and is light in weight. Sheet aluminium for panels may be bought in any thickness up to $\frac{1}{4}$ in., and ready made box chassis sections, machine pressed in 18 s.w.g. can be obtained at low cost from BULLETIN advertisers.

Q. Is it necessary to use band-change switches with shorting plates?

A. The AR88 and CR100 receivers are general coverage, with a very wide frequency range of from 500 kc/s (or less) up to 30 Mc/s. The self-resonant frequency of unused signal frequency coils would almost certainly lie within the range of the receiver on the higher frequency bands, and these coils would behave as trap circuits and absorb energy at the signal frequency and also at the heterodyne oscillator frequency. This is avoided by short-circuiting all unused coils by a wiper plate on the switch bank. In an amateur band receiver the tunable coverage is restricted to six narrow bands within the range 1·5 to 30 Mc/s. It is most unlikely that an unused coil would become self-resonant in a wanted higher frequency band and switch banks without shorting plates are generally considered to be perfectly satisfactory. This has the added advantage of allowing three or four switch contacts to be wired together so that one coil can be used to cover a number of sections of the 10m band, or alternatively one coil can be used to cover two bands, i.e., 10 and 15 metres.

* * *

Next month a modified i.f. circuit using the Kokusai mechanical filter will be described, and also a revised lay-out for a 16 in. × 12 in. × $2\frac{1}{2}$ in. G2DAF receiver chassis using standard box sections. In addition, further notes on constructional techniques and winding coils on Aladdin and Neosid coil formers will be included.

Closing date for the August issue
July 10

Closing date for the September issue
August 7

Copy received after these dates may be held over to the following issue if still topical

The President visits Brussels and Paris

THE President was pleased to represent the Society at two important overseas functions during May. The first of these was the Annual General Meeting of the Union Belge des Amateurs-Emetteurs (UBA) held on Sunday, May 10 at the SABENA air terminus, a very fine new building in the centre of Brussels. The proceedings commenced in the morning with a general ragchew followed by a lunch and business meeting during which Karl Schultheiss, DL1QK, President of DARC, Wyn Dalmijn, PA0DD, President of VERON, Pierre Herbert, F8BO, Vice-President of REF, Jacques Simonnet, F9DW, Treasurer of IARU Region I and Geoff Stone, G3FZL, addressed the gathering. A subject of great interest to all was the question of reciprocal licensing and our President told of the persistent efforts made by the RSGB to obtain this facility from our GPO. To date reciprocal licensing facilities are granted by Belgium, France, Netherlands, and West Germany to mention our closest neighbours. The RSGB was urged to pursue the matter as vigorously as before, for the benefit of both visitors to Britain and to Britons travelling on the Continent. (At present the countries mentioned, other than France, will give licenses to foreign nationals even though reciprocal facilities may not be forthcoming.) The whole proceedings were ably conducted by the President of UBA, Rene Vanmuysen, ON4VY, who announced with obvious regret that on doctor's orders he would have to relinquish the office of President. A new President was appointed during the meeting, namely ON4AK, whilst Rene Vanmuysen was retained as adviser. A party of about 40 Belgian amateurs and their wives hope to visit London on August 7, 8 and 9 and the Society is planning to welcome them and hold a special function in their honour on the evening of the 7th.

The second visit was made to the Annual Congress of the REF which was held on Saturday and Sunday, May 23 and 24. On the Saturday afternoon a visit was made to the Paris studios of Radio Luxembourg. The proceedings continued on the Sunday morning with a special Mass at 8 a.m. followed by the Annual General Meeting at 9 a.m. At the conclusion of the meeting the whole assembly and their ladies moved to the Cercle Républicaine in the Avenue de l'Opéra for a typically French luncheon which lasted into the late afternoon. Towards the end of the luncheon the foreign guests addressed the assembly in turn including Rene Vanmuysen, ON4VY, representing UBA, Ted Robinson, F8RU, Secretary of the International Amateur Radio Club (IARC) Geneva (4U1ITU), a representative from Switzerland and Geoff Stone, G3FZL. In this case the whole proceedings were ably conducted by the dynamic President of the REF, Robert Brochut, F9VR. Again the interest in reciprocal licensing was obvious and it is a great pity that we are not able to give a lead to European countries in this respect. The Secretary of the IARC was interested to hear of the plans being made by the RSGB to help to promote amateur radio in the new countries of Africa as the IARC are also making similar plans. In fact the theme of the IARC Convention to be held in Geneva on September 5 and 6 is " Ham Tech Aid."

At both events the President donated an RSGB flag and copies of the *Handbook* and *Call Book*. In all, the President was very favourably impressed with the enthusiasm, ham spirit and the obvious success of these events which make the Annual General Meeting of the RSGB seem dull in comparison, although the same atmosphere is experienced in this country at mobile rallies and conventions, such as the International V.H.F. Convention, and similar events.

Society News

Education and Training Committee

The terms of reference of the recently formed Education and Training Committee are as follows:

(1) To advise the Council on all aspects of education and training in Amateur Radio.
(2) To promote the knowledge and practice of Amateur Radio amongst interested persons of all ages.
(3) To negotiate with organized bodies engaged in educational work.
(4) To co-ordinate Amateur Radio educational activities already established.

The Committee is concerned with such activities at both home and abroad and has already held two successful meetings.

RSGB Merseyside Lecture 1964

Members who attended the Stockport ORM in October, 1963, will recall with pleasure the lecture and demonstration given by Mr. Bob Auger of Pye Records Ltd. With this in mind Mr. Auger was approached again with a request that he should present the 1964 Merseyside Lecture. An attendance of approximately 160 in the Lecture Theatre of Radiant House, Bold Street, Liverpool indicates the reputation established by the first talk.

The equipment demonstrated consisted of a commercial twin track tape recorder, mixing and equalizing units and two speakers in small cases which produced superlative quality. Demonstrations of music, both popular, modern and classical, were heard with interest and Mr. Auger described in detail the method of recording the sounds created by modern groups—information which is, of course, very topical on Merseyside.

Mr. L. N. Goldsbrough, Zone A Representative on the Council, proposed the vote of thanks and the audience were tumultuous in their appreciation. We are indeed grateful to Mr. Auger for providing members on Merseyside with a most interesting and exciting evening. B. O. B.

Aeronautical Mobile Rally

Members with pilot's licences or who are interested in aviation are invited to communicate with F. K. Parker, G3FUR, 64 Tinwell Road, Stamford, Lincs.

Morse Instruction Classes

It is hoped to conduct Morse Instruction Classes at Oldbury College of Further Education, Wolverhampton New Road, Causeway Green, Oldbury, Worcestershire. Those interested should contact either the Principal, W. J. Potter, or the Organizer, W. L. Woodcraft, Education Offices, Highfields, West Bromwich, Staffs.

Will you be changing your address soon?

A new addressing system for wrappers for the RSGB BULLETIN and subscription reminders is to be installed at Headquarters and will come into operation during the next few weeks.

Members who expect to change their addresses in the near future are asked to notify Headquarters as far in advance as possible. Similarly, any member whose address on the wrapper for this issue of the BULLETIN requires any modifications is requested to inform Headquarters immediately, returning the wrapper with the notification if possible.

REGION 12 REGIONAL MEETING
Seaview Hotel, John O'Groats
Saturday, August 28, 1964

Members living outside Region 12 will be most welcome. Further information may be obtained from the Regional Representative, G. B. Woffinden, GM3COV, 9 Hakon Road, Thurso, Caithness, or from A. J. Oliphant, GM3SFH, 17 Rockwell Crescent, Thurso. *The Council will be represented by the President, Mr G. M. C. Stone, G3FZL, and the General Manager, Mr John A. Rouse, G2AHL.*

IQSY Newsletter

GM3LTP is writing a monthly newsletter which is distributed from the RSGB in London to all observers, and gives details of activity, information of IQSY geoalerts, sunspots, magnetic and other useful data. Sample copies are available to those who would like more information before deciding to join the group of observers.

Vacancy on RSGB Bulletin

There will shortly be a vacancy on the editorial staff of the RSGB BULLETIN and associated publications.

A good command of English, the ability to write quickly and lucidly on a wide variety of subjects, and enthusiasm are essential. A knowledge of Amateur Radio, preferably as a licensed amateur, would be an advantage.

Applications for this interesting post on the Society's Headquarters staff should be addressed to the General Manager, Radio Society of Great Britain, 28 Little Russell Street, London, W.C.1.

Wireless Institute of Australia

The permanent postal address of the Federal Council of the Wireless Institute of Australia is Box 2611W, Melbourne C.1, Victoria, Australia.

Olympic Games, Japan, 1964

The Japan Amateur Radio League, PO Box 377, Tokyo, Japan, would like to know the names, call-signs and addresses of any amateurs who will be visiting Japan for the Olympic games this Autumn.

Uncle's Southend Party

This annual event, organized by G6NU, will take place on July 19, 1964, at 12 noon and again at 3.15 p.m. Amateurs and their families are welcome to attend, and should meet at the top entrance of Southend Pier.

Stolen Equipment

At 2.45 a.m. on June 16, 1964, a transmitter belonging to G2MI was stolen from his Vauxhall Velox. The panel, which has been specially shaped to fit into the dashboard, is marked " G2MI Mobile " in the top left hand corner, and has a 0-50 mA meter in the top right corner. All valves are mounted horizontally, the line-up being 12SK7—12A6—6CH6—2E26. Calibration is for the 1·8 Mc/s and 3·5 Mc/s bands. Would anyone who has any information please inform G2MI or the police.

Mobile Column

In last month's *Mobile Column* the call-sign G3SOB/T appeared in error. The correct call-sign is G3SDB/T.

Obituaries

Miss E. M. Bottomley, G3OHB

It is with deep sorrow that we record the death on April 23, 1964, of Enid Bottomley, G3OHB, of St. Theresa's Cheshire Home, Penzance.

Obtaining a licence was no easy task for Enid, for she had to overcome not only the handicap of a non-technical education but the disability from which she suffered often made study impossible. Nevertheless when she took the GPO Morse Test it was more than just securing a pass at 12 w.p.m.—Enid was able to copy 28 w.p.m. When she received her licence in August, 1960, she became the first YL operator in Cornwall.

In 1961, G3OHB and Graham Thomas, G3OGT, another patient at St. Theresa's, received the Mullard Award, 1960, for their fortitude and courage.

We shall all miss this charming and courageous young lady. To her father and to G3OGT we offer our sincere condolences.

J. N. W.

Jim Alexander, G2BP

The sudden and unexpected death of Jim Alexander, G2BP, leaves amateurs in the Medway Towns very sad. Jim was very seldom heard on phone, but was a master of the straight key and could send for many hours without tiring.

Having served in the RAF as a radio operator during the war, he saw many years overseas. On re-obtaining his licence in 1946 he soon obtained a wall full of sheepskins.

We have lost a quiet, sincere, and friendly gentleman. To his widow, we extend our heartfelt sympathy at this time.

D. G. Q.

NZART Annual Convention

The Thirty-eighth Annual Convention of NZART, held in Christchurch, New Zealand, from May 30 to June 1, 1964, was attended by nearly 350 amateurs and friends from all parts of the country. The business meeting was opened by the Deputy Mayor of Christchurch on the Saturday morning and ended in the afternoon with the election of ZL3ND as the new President of NZART.

The remainder of the Convention was taken up with social activities, a mobile rally, meetings of the Amateur Radio Emergency Corps (AREC), Old Timers' Club, and the Women's Amateur Radio Organization (WARO). Visits to places of interest included the Deep Freeze Communications Centre. An exhibition spanning the period 1914 to 1964 was of particular interest. A full programme was provided for the ladies.

The youngest amateur attending was 15 and the oldest 75, convincing proof that age is no bar to the enjoyment of amateur radio.

Silent Keys

We record with sorrow the passing of the following amateurs:

T. Murnane, G3BXY, of Newbury, Berks.
L. G. Boomer, G2YJ, of Croydon, Surrey.
H. G. White, BRS5027, of East Acton, London.
B. Stuart, G3LS, of West Hartlepool.

Area Representatives

The following are additions to the list of Area Representatives published in the May issue:

REGION 1
BLACKPOOL
H. G. NEWLAND, G5ND, 161 Penrose Avenue, Marton, Blackpool, Lancs.
REGION 5
LUTON
D. G. PINNOCK, G3HVA, 265 Chesford Road, Luton, Beds.
REGION 17
READING
N. I. BOWER, G5HZ, Little Priory, Peppard, Henley-on-Thames, Oxon.

Affiliated Society Representatives

The following are additions to the list of affiliated Society Representatives published in the December 1963 issue of the BULLETIN:

CIVIL SERVICE RADIO SOCIETY
H. Reeve, G3HXZ, 284a Barking Road, London, E.6.
DURHAM CITY AMATEUR RADIO SOCIETY
R. G. Cary, G3DYY, Site 40 Alderdene Burn Estate, Newbiggin Lane, Lanchester, Co. Durham.

Affiliated Societies

The following societies and clubs are now affiliated to RSGB:

AMATEUR RADIO SOCIETY OF BARBADOS
c/o C. N. P. Weatherhead, Vermont, Dover, Christ Church, Barbados, W.I.
DOUNREAY AND CAITHNESS AMATEUR RADIO SOCIETY
c/o A. J. Oliphant, 17 Rockwell Crescent, Caithness, Scotland.
GARENDON SCHOOL RADIO SOCIETY
c/o J. A. Ferrigan, Headmaster, Garendon School, Thorpe Hill, Loughborough, Leics.
LUTON AND DISTRICT AMATEUR RADIO SOCIETY
c/o D. G. Pinnock, 265 Chesford Road, Luton, Beds.
RADIO AND ELECTRONICS SOCIETY
c/o The Hon. Secretary, Students Union, University Road, Leicester.
255 SIGNAL SQUADRON AMATEUR RADIO CLUB
c/o 404 Sig. J. W. McCulloch, Field Troop, 255 Signal Squadron, BFPO 63.

Glasgow Area Representative

Mr. C. Lindsay, GM3KTZ, has resigned from the office of Area Representative for Glasgow. Nominations for his successor, supported by the signatures of five Corporate members, should be sent to the General Manager to arrive not later than July 15, 1964.

GB2RS SCHEDULE

RSGB News Bulletins are transmitted on Sundays in accordance with the following schedule:

Frequency	Time	Location of Station
3600 kc/s	9.30 a.m.	South East England
	10 a.m.	Severn Area
	10.15 a.m.	Belfast
	10.30 a.m.	North Midlands
	11 a.m.	North West England
	11.30 a.m.	South West Scotland
	12 noon	North East Scotland
145·30 Mc/s	10.30 a.m.	Beaming north west from Sutton Coldfield
	10.45 a.m.	Beaming south west from Sutton Coldfield
145·50 Mc/s	11.00 a.m.	Beaming north from Leeds
	11.15 a.m.	Beaming east from Leeds
145·8 Mc/s	11.30 a.m.	Beaming west from Belfast
	11.45 a.m.	Beaming north east from Belfast
145·10 Mc/s	12 noon	Beaming north from London area
	12.15 p.m.	Beaming west from London area

News items for inclusion in the bulletins should reach Headquarters not later than first post on the Thursday preceding transmission. Reports from Affiliated Societies and from non-affiliated societies in process of formation will be welcome.

Society Affairs

A digest of the business discussed at the April, 1964, meeting of the Council

THE April meeting of the Council was held on April 13, 1964, and was attended by Messrs. G. M. C. Stone (President), N. Caws, J. C. Foster, L. N. Goldsbrough, J. C. Graham, R. C. Hills, E. G. Ingram, R. H. James, A. O. Milne, L. E. Newnham, F. K. Parker, A. D. Patterson, R. F. Stevens, J. W. Swinnerton, E. W. Yeomanson (Members of the Council), John A. Rouse (General Manager and Secretary), and P. C. M. Smee (Minuting Secretary).

Apologies for absence were submitted on behalf of Messrs. H. A. Bartlett and L. Varney.

European Satellite Ad Hoc Committee

The President reported that Dr Karl Lickfeld, Chairman of the IARU Region I Permanent V.H.F. Committee, had informed him that a meeting of the Ad Hoc Committee to discuss plans for a European Amateur Radio satellite would be held towards the end of 1964. Dr Lickfeld had said he looked forward to seeing the Society's V.H.F. Manager, Mr R. C. Hills, at the meeting.

National Field Day

The Council discussed at length complaints regarding the scoring system to be used in NFD 1964 from members in Scotland, Wales and Northern Ireland. On behalf of the Contests Committee, Mr Graham reported on consideration of a number of helpful suggestions put forward by Mr Patterson in a letter to the Chairman of the Committee. (Mr Patterson's letter was published in the May issue of the RSGB BULLETIN.)

A proposal that the rules used for NFD 1963 should be substituted for the published rules for NFD 1964 was defeated.

(Messrs. Ingram, James and Patterson voted for the proposal; seven votes were cast against it).

V.H.F. Translator Station

It was noted that a formal acknowledgment had been received in reply to the Society's letter to the GPO of March 20, 1964, regarding a 145 Mc/s translator station.

Membership

The Council approved 113 applicants for membership (86 Corporate and 27 Associate). In addition, 10 applicants for transfer from Associate to Corporate grade were approved. The subscriptions of two members were waived on the grounds that they suffer from blindness.

The Council granted affiliation to Echelford Amateur Radio Society, GEC (Coventry) Apprentices Association Amateur Radio Society, Mullard Sports and Social Club (Mitcham) Amateur Radio Society, RAF Abingdon Amateur Radio Club, and RAF Newton Amateur Radio Club.

Addressing Machines

It was reported that, after detailed consideration of the various systems available, the Finance and Staff Committee had come to the conclusion that the proposals put forward by Elliott Business Machines Ltd. were best suited to the Society's purpose. The proposed new system would co-ordinate the wrapper addressing and membership subscription records. In addition, the new machinery would provide a number of additional facilities.

The Council approved the purchase and installation of the Elliott system.

Commercial Support for Amateur Radio

The Council considered the implications for the Amateur Radio movement of the formation in the USA of the International Society of Radio Amateurs (ISORA) and the Society for the Propagation of Amateur Radio Communication Services (SPARCS). The ISORA, although apparently commercially backed, appeared to be very little known. SPARCS seemed to be more important and had the support of a number of prominent people in the USA.

It was felt that while the Society should keep abreast of the activities of these groups, it should not associate too closely with commercially-sponsored organizations. The real defence of Amateur Radio lay in awakening support for Amateur Radio in developing countries.

Contribution to Region I Division IARU

It was agreed to pay the Society's contribution of £242 to the IARU Region I Division for the year ending December 31, 1964.

Honorary Official Historian

The Council resolved to appoint Mr John Clarricoats, O.B.E., G6CL, the Society's Honorary Official Historian.

Northern Ireland V.H.F. Beacon Station

Mr Patterson reported that the Electricity Board for Northern Ireland had agreed to allow the setting up of an RSGB Beacon Station at the site of its own radio station.

French National Convention

It was reported that the President had been invited to attend the French Society's National Convention in Paris.

New and Emergent Nations

Mr Stevens submitted information in tabular form regarding Amateur Radio in some of the newly-independent countries in Africa. The Council authorized expenditure in connection with the promotion of Amateur Radio in African countries forming part of Region I IARU.

Region 10 Regional Lecture

The Council noted with approval a proposal by the Region 10 Representative Mr C. H. Parsons, to arrange a Regional Lecture in Cardiff in September 1964.

Reports of Committees

The Mobile Committee at its meeting on March 13 discussed arrangements for the Mobile Rally at Texas Instruments Ltd., and gave advance consideration to the Wethersfield and Woburn Abbey rallies. The problem of polarization of 4m aerials was also considered.

On April 11, the Finance and Staff Committee dealt with matters relating to the proposed new Articles of Association, office equipment including a new addressing machine, Headquarters staff, and the advertising of RSGB publications.

The Contests Committee met for its normal monthly meeting on March 19, 1964, to deal with correspondence from members, the rules for a number of forthcoming contests and arrangements for checking the entries received for various events. Preliminary consideration was also given to a proposed new v.h.f. contest for listeners.

On March 20, the Exhibition Committee discussed plans for the 1964 RSGB Radio Communications Exhibition to be held at the Seymour Hall, London, on October 28-31.

The first meeting of the newly-formed Education and Training Committee was held on March 21. Among the topics discussed were articles and features in the RSGB BULLETIN for Associate members, the co-ordination of information on RAE courses throughout the country, school radio clubs, and a questionnaire to be sent to independent radio clubs.

The Scientific Studies Committee met on March 23 and discussed the current tropospheric propagation programme, arrangements for the IQSY, the 29 and 144 Mc/s experimental station GB3LER at Lerwick, the distribution of solar activity and auroral warnings and a suggestion from a member for moonbounce and satellite trail reflection experiments in the 28 Mc/s band.

* * *

The Council was in session from 6 p.m. to 10.40 p.m.

BERU 1964

The Results of the Twenty-seventh Contest

A non-entrant last year, fifteenth in 1962, and now success is the story for M. Dransfield, 5N2JKO, in the High Power Section of the BERU Contest held on February 15-16,1964. His dedicated approach to the contest merits the reward of first place with a 260 points margin over D. S. Roden, ZB1BX. The latter improved on his 1963 position by one place by beating W. E. Russell, G5WP, by a modest 30 points. G5WP cannot be accused of being inconsistent as his positions during the last three years are second, third, second and now third again.

Contacts made by 5N2JKO totalled 428, of which 58 carried bonuses, while ZB1BX achieved 363 (61 with bonuses) and G5WP made 224 (100 with bonuses). These figures were, of course, prior to any checking.

Conditions

The general opinion was that conditions were fair to poor the world over during the event. There were reports of VE not hearing ZL, and VK not working G, though it would seem that practically everybody could have made dozens of contacts with UA, UB, etc. The unfortunate clash with a WSEM contest was not planned to create a tidal wave of QRM; the fact is that no information has ever been forthcoming from PO Box 88 regarding contests dates. It is a case of choosing a weekend and hoping for the best.

Despite conditions, QRM and all the other hazards of the contest it would seem to have been enjoyable, with the G stations being awarded their usual bouquet of congratulations from around the world for their fine operating manners and technique. This does not mean, however, that the rest of the BERU Contest entrants are to be castigated: far from it.

Low Power Section

The winner of the Low Power Section is C. R. Burchell, ZB1CR, with a score of 2327 which makes him an easy winner over D. Keisewetter, VK2APK, who scored 1690 points. Third place goes to V. H. Thorne, 5H3HD, who is nearly 300 points further away. ZB1CR made 285 contacts

HIGH POWER SECTION

Posn.	Call-sign	Points	Posn.	Call-sign	Points	Posn.	Call-sign	Points	Posn.	Call-sign	Points
1*	5N2JKO	3,250	24	G2QT	1,570	46	G3VW	1,063	69	VK4LT	630
2*	ZB1BX	2,990	25	ZL4GA	1,543	47	VK2RA	1,060		VS1LU	630
3*	G5WP	2,960	26	VS1LP	1,515	48	G3APN	1,055	71	G3MWZ	620
4*	5B4IP	2,922	27	VE2WA	1,472	49	VE3BMB	1,045	72	G3GZS	618
5*	G3FXB	2,758	28	VE3AU	1,455	50	G3PSY	1,037	73	G2GM	610
6*	VS9AAA	2,655		VK3AXK	1,455	51	G3JKY	990	74	VE2YA	575
7	G4CP	2,597		5H3HZ	1,455	52	VK2PV	980	75	G2AJB	510
8*	VQ2WR	2,544	31	G3AAE	1,420	53	G3GGS	975	76	VE1KG	463
9*	VE7KX	2,530		G3GFG	1,420	54	G3FPK	910	77	VE5PM	450
10	5B4KG	2,416	33	VO1DX	1,410	55	G2FYZ	900	78	GI3OLJ	435
11*	VE2NV	2,358	34	VE4MF	1,345	56	VE1EK	865	79	G8QZ	420
12	G5RI	2,313	35	G8KS	1,307	57	G2BLA	860	80	ZL1HY	413
†	VE3KE	2,305	36	ZK1AR	1,290	58	G3MPB	840	81	G3ICH	390
13*	VE1TG	2,295	37	G3KSH	1,263		VK3XB	840	82	VK4SD	335
14	G2DC	2,095	38	G5HZ	1,243	60	ZE3JO	832	83	G8KU	330
15*	VS1LX	2,085	39	6YAXG	1,240	61	VK5CV	795	84	VE3EBU	315
16*	ZD3A	2,035	40	VU2GG	1,225	62	VE2BV	790	85	G3LPC	303
17*	ZL4BO	1,955	41	VE2AYY	1,205	63	5Z4KPB	772	86	G3JVJ	295
18	VE1JX	1,945	42	G3KHA	1,175	64	VE2ATU	760	87	VO1BD	275
19	5B4GF	1,908	43	G5JU	1,146	65	G2DPD	740	88	5Z4HE	235
20	G6CJ	1,753	‡	G2DU	1,142	66	ZL1GX	680	89	VK5KO	210
21	G3GEW	1,745	44	ZL3VI	1,135	67	G3LMD	665	90	G3WP	200
22*	MP4BBE	1,673	45	G3LHJ	1,090	68	VQ2W	635	91	G2KW	125
23*	VK2GW	1,663									

LOW POWER SECTION

Posn.	Call-sign	Points	Posn.	Call-sign	Points	Posn.	Call-sign	Points	Posn.	Call-sign	Points
1*	ZB1CR	2,327	5*	GW3JI	1,372	9	G3DYY	1,055	13	ZB1J	777
2*	VK2APK	1,690	6*	VK7SM	1,320	10*	VK4SS	1,005	14*	VQ2JG	755
3*	5H3HD	1,404	7*	VK3RJ	1,190	11*	9L1TL	898	15	G3GNS	275
4*	ZD6OL	1,395	8	VK3ZC	1,090	12*	ZL1MT	810			

RECEIVING SECTION

Posn.	Name	Points	Posn.	Name	Points
1*	W. E. Wilkinson, BRS20317	2,619	8	B. Crook, BRS21008	1,325
2*	E. Howell, BRS24775	2,170	9*	E. W. Trebilcock, BCRS195	1,050
3	M. Harrison, BRS24733	1,910	10	F. C. Powell, BRS18461	940
4	B. J. Curnow, A2340	1,595	11	P. G. Smith, A3331	730
5	N. A. T. Hardy, A2753	1,550	12	R. S. Unsworth, A3633	670
6	R. W. F. Thomas, BRS15822	1,530	§	J. P. Goodrick, ISWL, G10414	390
7	H. M. Davison, A2122	1,400			

* *Certificate Winners* † *Late Entry* ‡ *No power declaration* § *Ineligible—Rule 1*

(46 with bonuses); VK2APK had 141 contacts (50 with bonuses), and 5H3HD completed 119 contacts (41 bonus).

Committee's Comments

The standard of logs was, as usual in this event, very good. One log had to be rescored and as a result the entrant concerned will find he is now credited with more points than he originally claimed, but mistakes were generally few. A number of operators, however, commenced a contact but finished by receiving a different station's report operating on an adjacent frequency. This is not peculiar to BERU.

Several letters were received containing comments on the rules, such as: 50 watts for low power, multipliers instead of country bonuses, and GM, GW, etc., to count as separate countries for overseas entrants. These and other comments will be given consideration by the Committee when the BERU Contest rules for 1965 are formulated.

Remarks from Competitors

G2FYT: Amazing how signals pop up in dead bands for BERU. . . . G3DYY: Transmitter trouble—loose top cap on 6146—wrecked valve whilst repairs were being carried out. . . . G3FPK: Incessant QRM from suspected welding apparatus—all I worked in one hour was a food mixer, vacuum cleaner, and a jammer. . . . G3KSH: Usual calls from ineligible countries, but the crowning effort was when a G3 called another G3 for a serial number, and the latter admitted he had not read the rules. . . . G3MWZ: Can the Low Power Section be raised to 50 watts input—after all, this is low power nowadays. . . . VE3EVK: Unfortunately he could not make a sustained effort, for ski-ing conditions were excellent and the XYL insisted on making full use of newly acquired skis. . . . VS1LX: Had the same old troubles with non-contest stations who desperately needed my QSL. . . . VS9AAA: Second day was grim. The Russian contests didn't help, nor did the number of new applicants to the Commonwealth — W6, IT1, DL, etc. . . . 5B4CZ: Recovering from 'flu, so missed the first eight or nine hours. ZB1BX: The only snag was the WSEM "Chirp Test" which really spoiled 40 and 80 on Saturday night and Sunday morning.

There were other letters, but to do them justice it would be necessary to print them in their entirety. Unfortunately available BULLETIN space does not permit that.

Receiving Section

The winner for 1964, as in the previous three years, is W. E. Wilkinson, BRS20317. Second last year and again this year is E. Howell, BRS24775, and third for the third successive year M. Harrison, BRS24733. The consistency in the results of this trio deserves high praise, as also does their patience and the neat, informative logs submitted.

Their one complaint, other than WSEM QRM, is the use of BK by many stations. This practice leaves a listener high and dry complete with reports and serial numbers, but not *who sent them* or *who received them*. The Contests Committee therefore appeals to operators in contests not to forget that there may be someone else listening to you who would like to compete.

For the record, BRS20317 logged 178 contacts, of which 88 carried bonus points. BRS24775, 134 contacts (75 with bonuses) and BRS24733, 118 contacts (66 with bonuses).

* * *

The Committee thanks all those who entered and helped to make the contest interesting. Thanks are also due to G2YS, G3HCL, G3IYT, G5GH, G6JF, G8ON, VE1AE, VE1PA, VE3EPL, VE3EVK, VE6VO, VK5JJ, VS1FZ, VU2MD, ZB1A, and 5B4CZ who submitted useful check logs.

Rules for IARU Region I V.H.F./U.H.F. Contests

Five official v.h.f. contests shall be held each year under the auspices of the Region I IARU V.H.F. Committee but each national Society shall retain the right to organize such extra contests as it may see fit. The first four official contests each year shall be national (i.e., sub-regional) events designed to increase v.h.f. activity in the countries concerned, but QSOs with foreign amateurs are permitted. Rules for these contests are optional and any country may make its own, but the use of the international rules is recommended. The fifth official contest will be known as the IARU Region I V.H.F. Contest and will be arranged by a different Region I Society each year. The sequence will be Austria, Belgium (1964), Denmark, France, Germany, Great Britain, Holland, Italy, Yugoslavia, Sweden and Switzerland. For the International Region I V.H.F./U.H.F. Contest the official rules must apply.

Rules

1. Eligible Entrants. All licensed radio amateurs resident in Region I. Multiple operator entries will be accepted provided only one call-sign is used. Contestants must operate within the letter and spirit of the Contest and at no greater power than permitted in the ordinary licences of their Country. Stations operating under special high power licences do so hors concours and cannot be placed in the Contest proper.

2. Contest Stations. The first, second, fourth and fifth Contests will comprise the following sections:

i. Fixed stations, 2m.
ii. Portable/Mobile stations, 2m.
iii. Fixed stations, 70cm.
iv. Portable/Mobile stations, 70cm.
v. Fixed stations, 24cm.
vi. Portable/Mobile stations, 24cm.

The third contest will be operated on 70cm and 24cm only (Note 3). Portable/Mobile stations must operate from the same locations throughout the events.

3. Dates of Contests. The four general contests will take place during the first weekend of March, May, July and September each year; the third contest (70/24cm only) will take place during the last weekend in May. The sequence 31/1 or similar not to count.

4. Duration of Contests. The International Region I V.H.F./U.H.F. Contest will commence at 18.00 GMT on the Saturday and will end at 18.00 GMT on the Sunday, the exact times and/or time intervals being at the discretion of the organizing National Society, provided they fall within these two time limits.

5. Number of Contacts. Each station can be worked once only on each band whether fixed, portable or mobile. If a station is worked again during the same contest on the same band only one contact will count for points, but any duplicate contacts should be logged without claim for points and should be clearly marked as duplicates.

6. Types of Emission. Contacts may be made on A1, A3, A3a or F3.

7. Contest Exchanges. Code numbers exchanged during each contact shall consist of the RS or RST report, followed by a serial number commencing at 001 for the first contact on each band and increasing by one for each successive contact on each band. This exchange must be immediately followed by the QRA Locator of the sending stations (example 579021YG46E). QTHs may also be exchanged if desired.

8. Scoring. Points will be scored on the basis of one point per kilometre. The final claimed score must be shown at the top part of the first sheet.

9. Entries. Entries must be set out as shown in the example below. In the case of the International Region I V.H.F./U.H.F. Contest, two copies of the entry must be sent to the National V.H.F. Manager concerned postmarked not later than the second Sunday following the contest weekend. Late entries will not be accepted. The judging of the entries shall be the responsibility of the organizing Society whose decision shall be final. Submission of a log implies acceptance of the rules (Note 2).

10. Disqualification. Entrants deliberately contravening any of these rules shall be disqualified. Minor errors may result in loss of points. Errors in call-signs and code numbers will be penalized by deducting the following percentage of claimed scores for both stations.

One error: 25 per cent; two errors: 50 per cent; three or more errors: 100 per cent.

The claimed contact will be disqualified for (a) an obviously wrongly stated QTH, when no QRA Locator is exchanged; (b) a time error of more than 10 minutes (Note 1). Contest entrants will not be penalized for the failure of non-entrants to comply with these rules.

11. Awards. The winner of each section will receive a certificate. The top score on 2m, whether fixed or portable, will be awarded the Region I V.H.F. Trophy. The winner in the remaining 2m category will be awarded the PZK cup.

NOTES

1. In some countries it is customary to use a band identification letter (A for 2m, B for 70cm and C for 24cm). Should this letter be used or not used no penalty will be exacted.

2. Not later than the seventh Sunday following the International Region I

(*Continued on page 471*)

CONTEST NEWS

— RESULTS — REPORTS — RULES —

Low Power Field Day 1964

The rules for this year's Low Power Field Day are as follows:

1. **Duration:** 10.00 GMT to 17.00 GMT on **September 20, 1964.**
2. **Eligible Entrants:** All fully paid-up Corporate members of the RSGB resident in G, GC, GD, GI, GM and GW. Multiple-operator entries will be accepted provided only one call-sign is used (see General Rule 7).
3. **Contacts:** May be made on c.w. (A1) in the 3·5 Mc/s band only. Each transmission must include the letters LFD.
4. **Scoring:** Five points may be claimed for each contact with a portable or mobile station, and *one* point for each contact with a fixed station.
5. **Contest Exchanges:** RST reports followed by the contact number starting at 001 and the location, e.g. RST559001 Bradford.
6. **Logs:** (*a*) Must be tabulated in columns headed (in this order): " Date and Time (GMT)," " Call-sign of Station Contacted," " My Report on His Signals and Serial Number Sent," " His Report on My Signals and Serial Number Received," " Location of Station Contacted as Received," " Points Claimed."

(*b*) The cover sheet must be made out in accordance with RSGB Contests General Rule 5 and must include the weight of the equipment used. The declaration must be signed and the location as transmitted given.

(*c*) Entries must be postmarked not later than **October 6, 1964.**

7. **Equipment:** The total weight of all the radio and electrical equipment taken to the site must not exceed 20 lb.
8. The General Rules relating to RSGB Contests, published in the January 1964 issue of the RSGB BULLETIN, will apply except as superseded by the rules of this Contest.
9. **Awards:** At the discretion of the Council, the **Houston Fergus Trophy** will be awarded to the winning station and **certificates of merit** to the runner-up and to the non-transmitting member submitting the best check log in the opinion of the Contests Committee.

The General Rules for the RSGB Contests apply to this contest. Printed log forms and cover sheets are available from Headquarters on request.

Second 420 Mc/s Open Contest 1964

Members taking part in this contest are recommended to operate between 432-434 Mc/s in accordance with the British Isles 70cm Band Plan. As stations in this contest can work from more than one location they have the advantage of claiming the score for the best contact with any particular station. This applies equally to static stations who may work them at more than one site. A cordial invitation is extended to holders of Amateur (Sound) Licence B to take part.

1. When: 18.00 GMT on Saturday to 18.00 GMT on Sunday, **October 17/18, 1964.**
2. Station Locations: Stations may be operated from more than one site but the National Grid Full Six Figure reference must be recorded in the log for each location in the case of entries from G, GD, GM and GW. In all other cases, entrants must show latitude and longitude.
3. The General Rules relating to RSGB Contests, as published in the January, 1964 issue of the RSGB BULLETIN, will apply except as superseded by the rules of this Contest.
4. Eligible Entrants: All fully paid-up members of the RSGB resident in Europe. Multiple-operator entries will be accepted provided only one call-sign is used. /T stations are not eligible to take part.
5. Contacts: May be made on either A1, A3, A3A, A3H, A3J or F3.
6. Scoring: Points will be scored on the basis of one point per mile.
7. Contest Exchanges: RST (RS) reports followed by the contact number and location (e.g. RST559001 5NE Wigan). This location must be identifiable on the 10 mile to the inch Ordnance Survey Map.
8. Logs: (a) Must be tabulated in columns headed (in this order) " Date/Time (GMT)," " Call-sign of station contacted," " My report on his signals and serial number sent," " His report on my signals and serial number received," " Location of station contacted as received," " Points claimed."

Logs must show clearly when station locations are changed.

(b) The cover sheet must be made out in accordance with RSGB Contests Rule 5 and the declaration signed. The locations of the station as transmitted must be given on the cover sheet.

(c) Entries must be postmarked not later than **Tuesday, November 2, 1964.**

9. Awards: At the discretion of the Council, a **miniature cup** will be awarded to the winner and **certificates of merit** to the runner-up, the leading portable station and to the non-transmitting member submitting the best check log in the opinion of the Contests Committee.

D/F Qualifying Events

Details of the Wirral Qualifying Event are as follows:

Sunday, July 19, 1964
Organizer: J. K. Birch, 19 Lloyd Drive, Greasley, Wirral, Cheshire.
Frequencies and Call-signs: To be announced at the start.
Map: Ordnance Survey, New Popular Edition, Sheet No. 109.
Assembly Point: On application to Organizer.
Assembly Time: 13.00 BST.
Entries and Tea: Intending competitors should notify the organizer as soon as possible stating the number in the party requiring tea.

Details of the Salisbury Qualifying Event are as follows:

Sunday, July 26, 1964
Organizers: A. C. A. Newman, G2FIX, and B. Middleton, BRS22332.
Frequencies: 1875 kc/s and 1980 kc/s.
Call-signs: G3PQY/P and G3PAV/P.
Map: Ordnance Survey, New Popular Edition, Sheet 167, Salisbury.
Assembly Point: NGR 123423.
Assembly Time: 13.00 BST.
Entries and Tea: Intending competitors should notify the organizers by July 18 stating the number in their party requiring tea.

Can You Help?

● W. R. Steverson, G3JEQ, Merrydawns, Meadowside, Gt. Bookham, Leatherhead, Surrey, who requires the circuit diagrams and alignment instructions for the v.h.f. Command Receiver R19?

● K. Harvant Singh, BCRS886, 31 (774) Upper Museum Road, Taiping, Perak, Malaya, who requires instruction manuals for the CR100 and CR150 receivers and the TCS series transmitter?

● A. Auld, GM3SLW, " Hillview," Bridge Street, Halkirk, Caithness, who requires the Manual, circuits or any information on the W/S (Canadian) PO29 Set, consisting of the " A " or " B " set, and also the " U/S unit " (power unit).

IARU Region I V.H.F./U.H.F. Contest Rules

(continued from page 470)

V.H.F./U.H.F. Contest the V.H.F. Manager or properly constituted Contests Committee will forward to the Society organizing the Contest one copy of each entry, after examining the logs and certifying them to be acceptable to the best of their knowledge.

3. The May 70/24cm contest will be known as the IARU Region I U.H.F. Contest.

Sample Contest Log Sheet

Contest..... Date..... Claimed Score.....
Section..... Call-Sign.....
Name .....
Home address .....
Location of station..... Latitude..... Longitude.....
Height above sea level in metres.....
Transmitter..... Input power.... watts..
Operating frequencies..... Crystal or v.f.o.....
Receiver..... Aerials.....

Date/ Time	Call-sign	Serial Sent	Numbers Received	QTH	Emission	Distance km	Points claimed

Declaration

I declare that this station was operated strictly in accordance with the rules and spirit of the contest and I agree that the ruling of the organizing society shall be final in all cases of dispute.

Date..... Signed.....

Rules for the RSGB 21/28 Mc/s Telephony Contest, December 5-6, 1964

Radio amateurs throughout the world are again invited to take part in the annual RSGB 21/28 Mc/s Telephony Contest to be held this year on December 5-6.

Attention is drawn to changes in the scoring system described in detail in Rule 8. Contestants are advised that in previous years many points were lost by those who did not read this rule carefully.

1. **Duration:** The contest will start at **07.00 GMT** on Saturday, **December 5**, and end at **19.00 GMT** on Sunday, December 6, 1964.

2. **Eligible Entrants:** The contest is open to licensed amateurs in all parts of the world. There will be two sections: (i) for single operators; (ii) for multiple operator stations. Entrants in the multiple operator section will not be eligible for awards under Rule 9 but will be eligible for certificates of merit.

3. **Licence Conditions:** Entrants must operate in accordance with the terms of their licences.

4. **Contacts:** Contacts may be made using any telephony system for which the entrant is licensed. Contacts with unlicensed stations will not count for points. Proof of contact may be required. Only one contact on each band may be made with a specific station, whether fixed, portable, mobile or alternative address. Duplicate contacts must be logged and clearly marked as duplicates without claim for points. Cross-band contacts may not be claimed.

5. **Contest Exchanges:** An exchange of RS reports followed by a three figure serial number starting with 001 for the first contact and increasing by one for each successive contact (for example, 58001, 56002, etc.) must be made before points can be claimed.

6. **Operators:** In the Single Operator Section only the entrant will be permitted to operate his station for the duration of the contest. In both sections all operators must be licensed.

7. **Entries:** Entries (*a*) should be clearly typed or written on **one side only** of foolscap or International A4 size paper; (*b*) must be ruled in columns headed (in this order) (i) Date/Time (GMT); (ii) Call-sign of station worked; (iii) I sent him; (iv) He sent me; (v) Band; (vi) Bonus Points; (vii) Points claimed; (*c*) must be addressed to the **Contests Committee, Radio Society of Great Britain, 28 Little Russell Street, London, W.C.1, England,** the name of the contest being clearly shown on the top left hand corner of the envelope, which must be postmarked not later than December 21, 1964. Log sheets are available from RSGB Headquarters.

8. **Scoring:** British Isles stations may not work each other for points. Overseas stations may only claim points for contacts with British Isles Stations, (G, GB, GC, GD, GI, GM and GW). Scoring will be as follows.

British Isles Stations. Each completed contact will score **5 points.** In addition, a bonus of **20 points** may be claimed for the first contact with each new country on each band. For the purpose of scoring, the RSGB countries list will apply, with the exception that U, VE, VK, W/K, ZL and ZS call areas will each count as a separate country.

Overseas Stations. Each completed contact with a British Isles station will score **5 points.** In addition, a bonus of **50 points** may be claimed for the first contact with each British Isles country-numeral prefix on each band, i.e. G2, G3, G4, G5, G6, G8, GB, GC2, GC3, GC4, GC5, GC6, GC8, GD2, GD3, GD4, GD5, GD6, GD8, GI2, GI3, GI4, GI5, GI6, GI8, GM2, GM3, GM4, GM5, GM6, GM8, GW2, GW3, GW4, GW5, GW6, GW8. A further 50 bonus points will be scored for every ten stations worked in each of the above categories irrespective of band.

9. **Awards:** In the Single Operator Section, the **Whitworth Trophy** will be awarded to the leading British Isles entrant. In addition, **certificates** will be awarded to the leading station in each of the other five British Isles countries, and to the runner-up in the Trophy winner's country. Certificates will be awarded to the leading station in each overseas country, U, VE, VK, W/K, ZL, and ZS call areas counting separately as in Rule 8.

SAMPLE COVER SHEET

RSGB 21/28 Mc/s Telephony Contest Claimed Score.....

December 5-6, 1964 Call-sign.....

Name .....

Address .....

Transmitter .....

Receiver ..... Aerial(s) .....

DECLARATION: *I declare that this station was operated strictly in accordance with the rules and spirit of the contest and I agree that the decision of the Council of the RSGB shall be final in all cases of dispute. I certify that the maximum input to the final stage of the transmitter was.....watts.*

Date ..... Signed .....

Failure to sign the declaration may involve disqualification of the entry

Rules for the RSGB 21/28 Mc/s Telephony Receiving Contest, December 5-6, 1964

1. **Eligible Entrants:** The contest is open to short-wave listeners throughout the world. All entrants agree to be bound by these rules. Only the entrant may operate his receiving station for the duration of the event. Holders of amateur transmitting licences are not eligible to take part.

2. **Duration:** The contest will start at 07.00 GMT on Saturday, December 5, 1964, and end at 19.00 GMT on Sunday, December 6, 1964. The RSGB 21/28 Mc/s Telephony Contest for transmitting amateurs will take place during the same period.

3. **Entries:** (*a*) To count for points, logs must show, in columns: (i) Date/Time GMT; (ii) Call-sign of station heard; (iii) Report and serial number sent by station heard; (iv) Call-sign of the station being worked; (v) Band in Mc/s; (vi) Bonus points claimed; (vii) Points claimed. *CQ or test calls will not count for points.*

(*b*) Entries should be set out on ***one side only*** of foolscap or International A4 size paper, must be postmarked not later than December 21, 1964 and must be addressed to the **Contests Committee, Radio Society of Great Britain, 28 Little Russell Street, London, W.C.1, England.** The name of the contest must be shown clearly at the top left hand corner of the envelope. Log sheets are available from RSGB Headquarters.

(*c*) All entries must contain the following declaration:

I declare that this receiving station was operated strictly in accordance with the rules and spirit of the contest and I agree that the decision of the Council of the RSGB shall be final in all cases of dispute. I do not hold an amateur transmitting licence.

Date ..... Signed .....

4. **Scoring:** British Isles entrants may only log *overseas stations working UK stations in the contest.* Overseas entrants may only log *British Isles stations in contact with overseas stations in the contest.* A station whether fixed, portable, mobile or alternative address may be logged only once per band for the purposes of scoring. CQ or test calls will not count for points.

British Isles Entrants. Each complete log entry will score **5 points.** In addition a bonus of **20 points** may be claimed for the first station logged in each new country on each of the two bands (21 and 28 Mc/s). For the purposes of scoring the RSGB countries list will be used, with the exception that U, VE, VK, W/K, ZL and ZS call areas will each count as separate countries.

Overseas Entrants. Each complete log entry relating to a British Isles station heard will score **5 points.** In addition a bonus of **20 points** may be claimed for the first station heard in each British Isles country-numeral prefix on each band, i.e. G2, G3, GM4 etc., as listed in Rule 8 for the transmitting contest. A further bonus of **50 points** will be scored for each ten UK stations (in each of the categories in Rule 8 of the Transmitting Event) logged irrespective of band.

5. **Awards:** At the discretion of the Council, the **Metcalfe Trophy** will be awarded to the leading British Isles entrant. In addition, **certificates** will be awarded to the British Isles runner-up and to the leading entrant in each overseas country.

★ ★ ★

The closing date for posting entries is December 21, 1964.

Lord Fraser Guest of Honour at RAOTA Reunion

By JOHN CLARRICOATS, O.B.E., G6CL*

Lord Fraser of Lonsdale, CH, CBE, ex-G5SU, President of the Radio Society of Great Britain in 1928, was Guest of Honour at the Sixth Reunion of the Radio Amateur Old Timers' Association held at the Horse Shoe Hotel, London, W.1, on Friday, May 8, 1964. Other Past Presidents in attendance were Ernest L. Gardiner, G6GR, Victor M. Desmond, G5VM, Arthur O. Milne, G2MI, Frederick J. H. Charman, BEM, G6CJ, and Leslie Cooper, G5LC. Kenneth Alford, G2DX (ex-TXK-1912) presided.

During dinner, informal toasts were proposed to the two lady members of the Association present (Nell Corry, G2YL and May Gadsden "G1YL"); to those who held a licence prior to the first World War (Bill Pope, G3HT, ex-PZX, Roland Maidment, G5MM, ex-VXE, and Fred Crocker, G2NN, ex-XCP responded); to those who took part in the first Trans-Atlantic tests (about two dozen responded); to members of the old T & R Section; to all who attended the first RSGB Convention in 1926; to the Past Presidents, Honorary Members and Vice-Presidents of the RSGB.

In the course of his speech to introduce the Guest of Honour, Mr Alford referred to the important part played by Capt. Ian Fraser, MP (as he then was) in the formation of the Radio Transmitters' Society in 1923. The RTS was a break-away movement from the RSGB by a number of keenly interested transmitting amateurs who felt that the then existing RSGB did not cater fully for their needs.

In 1924 the RTS decided to unite with the RSGB as a self-governing body known as the Transmitter and Relay Section. Capt. Fraser became a member of the T & R Committee in that year and eventually joined the Council. Within four years he had been elected President. Since that time he had continued to take a close interest in the work of the Society.

Lord Fraser, in his reply, referred to the pioneer work done by radio amateurs; to the developments made possible by the introduction of the thermionic valve; to the days of Two Emma Toc, Writtle, and to Empire Broadcasting by the late Gerald Marcuse. He thanked those radio amateurs who have helped and are helping the blind by maintaining the Talking Book Service. He also spoke of the work being done by the Radio Amateur Emergency Network. Lord Fraser paid a tribute to G6CL and thanked him on behalf of all the Past Presidents and members present for the great services he had rendered to national and international Amateur Radio during the past 37 years. Mr Alford had previously mentioned that G6CL first became a Member of the RSGB Council during the Presidency of Capt. Fraser.

Mr Clarricoats, in his capacity as Founder-Secretary of RAOTA, reported that 27 old timers had joined the Association during the year and that the membership had increased to 159. He proposed that Lord Fraser should be elected an Honorary Member, a proposal that was warmly received and unanimously adopted.

Gift parcels had been sent at Christmas-time to the widows of past members and the Association is always ready to provide help when called upon.

Regretfully, no entry had been received for the Marcuse Memorial Prize for the year 1964, due perhaps to inadequate RSGB BULLETIN publicity. Wider publicity would be sought later this year for the 1965 prize. May Gadsden was thanked for dealing with all the typing, duplicating and posting of Association correspondence.

Arthur Milne, G2MI, spoke about the Spirit of Amateur Radio and L. Howard Thomas (Tommy), G6QB, reminded the gathering nostalgically of the early days.

During the evening the Chairman handed to Mr Clarricoats his certificate of Honorary RSGB Membership. Mr Milne in making the introduction explained that there had been some delay in finishing off the certificate due to the difficulty of obtaining certain signatures.

Silent Keys were remembered at 9 o'clock when the Association's Insignia (presented last year by G2DX) was unveiled. The Insignia remained illuminated throughout the rest of the proceedings.

The Reverend H. A. M. Whyte, VE3BWY (ex-G6WY) and Mrs Olive Whyte were present at the commencement of the proceedings but had to leave early to fulfil another engagement.

An attendance of 75 was recorded—the highest so far.

Roll Call

G2AK, DC, DX, HP, IY, KF, KI, KJ, MI, MR, NG, NH, NN, OA, QB, SC, UJ, UV, VB, YL, ZG, G3AG, BK, HT, WW; G4GA; G5BV, BZ, CD, CV, GR, HB, LC, LJ, MA, MM, PJ, PP, RS, RV, UM, VM, WP, XB, YY, ZK, GW5BI; G6BY, CJ, CL, GR, HR, IO, JQ, LL, LQ, NB, NR, OX, PA, QB, QM, RJ, SC, SN, XM, XY; G8CK, KW, NY, SM, TY.

Honorary Members May Gadsden "G1YL," Hugh Pocock.

Guest of Honour Lord Fraser of Lonsdale.

* Founder Secretary, 16 Ashbridge Gardens, London, N.13.

A Crystal Activity Tester (continued from page 452)

board, and this is conveniently held in position by the terminals of the meter.

Setting-up

After ensuring that the battery is wired up with correct polarity, the unit may be switched on. Without a crystal plugged in, the meter should indicate a very low current of the order of 150 μA—this is the collector leakage current of the OC71, and its value is dependent mainly upon the ambient temperature. The total current consumption from the battery should be approximately 500 μA.

A crystal is then plugged in. A large increase in meter current should immediately follow, indicating that the oscillator is working. The total current consumption should now be between 1 and 2 mA, depending on the crystal. It may be necessary to adjust the value of R5 to obtain a reasonable meter reading; it is suggested that the resistor is so chosen that the most active crystal available produces two-thirds f.s.d.

If the oscillator does not work, or only picks up sluggishly (and the crystal is known to be a good specimen), it is probable that the bias point of the OC170 requires attention. This may be raised by increasing the value of R2.

Conclusions

The tester has been found to save much time in the selection of crystals for use in s.s.b. filters, where an essentially flat top is desirable for a good quality signal. As well as the testing of crystals for use in oscillator circuits, the unit may also be employed as a signal source for determining the performance of converters and receivers, and for plotting polar diagrams of aerial systems.

Enquiries Regarding Bulletin Articles

Members who write to the authors of BULLETIN articles are asked to enclose stamped addressed envelopes if they require replies.

Letters to the Editor

Neither the Editor nor the Council of the Radio Society of Great Britain can accept responsibility for views expressed by correspondents. Letters for inclusion in this feature should be concise and preferably not more than 200 words in length.

Scoring in NFD

DEAR SIR,—Letters in the April BULLETIN suggest that feelings are running high on the question of the 1964 NFD scoring system. This caused considerable concern at the April Council Meeting, when it became apparent to me that these forthright opinions were based more on emotion than on fact.

I therefore approached the President for approval to investigate NFD scoring using the 1963 logs. This was granted. The exhaustive extraction of the data from the logs occupied me a full six days, but, though I have to re-check all my calculations, the following conclusions will, I think, be confirmed during that process.

(1) The Port Talbot Group would have won 1963 NFD under any reasonable scoring system, largely because of their 14 Mc/s performance.

(2) Stations in the South-West, including South Wales, had an advantage over all others because they were better placed to make transatlantic contacts.

(3) Stations in GM and GI were at a slight disadvantage relative to other areas, but not sufficiently to justify their being given bonus points ON ANY BAND.

(4) The so-called advantage enjoyed by stations located in London and the South-East is non-existent. The excellent performance on various bands of the Port Talbot, Cardiff and Belfast Groups has largely demolished these beliefs.

(5) If 1963 NFD had been scored under the 1964 system, the only change in the leading positions would have been that Gravesend just beat Cardiff for second place. However, Cardiff would have dropped from first to tenth in the 3·5 Mc/s list, the winners being Cannock Chase (on merit in my opinion).

(6) If 1963 NFD had been scored under the " Non-adjacent Counties " system proposed by GI3KYP, though Port Talbot would have still won, the next five groups would have been: Cannock Chase 2 (4 in NFD), Stourbridge 3 (5), Gravesend 4 (3), Oxford 5 (6), and Cardiff 6 (2).

Belfast would have dropped one place, and two Welsh Groups, Pontypool and Blackwood, from 17-18 to around 40.

This hardly seems to have the effect that its sponsors intend.

Band winners under this system would have been:
1·8 Mc/s Oxford (Port Talbot 2);
3·5 Mc/s Cannock Chase (Cardiff 6);
7 Mc/s Cannock Chase (Stourbridge 2);
14 Mc/s, 21 Mc/s, 28 Mc/s no change (Port Talbot, Belfast, Croydon respectively).

(7) Adoption of the suggestion by GW3BQY of a minimum distance of 100 miles for scoring contacts would tend to make NFD just another DX contest. I have apparently been under the misapprehension that it was primarily a UK contest.

(8) The " Non-adjacent Counties " system has some serious anomalies to which I shall draw attention in my complete report. My personal provisional opinion based on my study of the 1963 logs is that the most equitable system would be to score four points for all contacts between British stations irrespective of band and location. Incidentally, Port Talbot would still have won under this system.

It is my intention to consolidate all the data I have extracted into a comprehensive report to Council; I hope that they will consider publication of at least a summary of it. As the preparation of this will take some time, I will not enter into any personal correspondence until this work is complete. If required, I have offered (if I have the time) to conduct a similar investigation into the 1964 NFD logs.

Yours faithfully,

L. N. GOLDSBROUGH, G3ERB
Zone A (Northern England) Representative
Bebington, Cheshire.

DEAR SIR,—There would appear to be considerable bitterness, almost amounting to a persecution complex, in the minds of our friends at Port Talbot judging by the tone of the letter on their behalf by Mr. R. Edwards (May BULLETIN). Does he really think that we mind who wins NFD? Our group has supported the contest through good conditions and bad, whatever the rules since 1947 and has improved from 88th in that year until we finally reached first place in 1961. That represents 14 years of hard work and hard thinking, without any artificial aids by way of bonus points or other gimmicks. We are proud to have done this, the hard way, by our own efforts. When we were not doing well and things looked hopeless we did not write letters to the BULLETIN bemoaning the unfairness of the system or the unsportsmanlike attitude of others.

Mr. Edwards and his friends can be assured that we do not fear competition from anyone, anywhere. All that we ask and expect is a fair chance. We have never asked to be given any bonus of any kind on the grounds that we are a little further away from the continent than our South Eastern friends, or because we think there might be a few more local NFD groups in that area than there are around us.

We have continually and consistently campaigned against the bonus points on l.f. bands being given to stations in GW. We agree that a case can be made out for GI and GM. Our view is that bonus points are a compensation for inherent difficulty due to location. We cannot understand why a station in South Wales should be given five points for working a G station in the South of England, when we are only given three points for working the same station at the same distance or what is even worse, when a station in the far North of England has to work the same station over *double* the distance for only three points.

Under the scoring system of the last few years, when a two point bonus could be had for working outside one's own country, within the British Isles, on both 1·8 Mc/s and 3·5 Mc/s, it would be possible, in theory, for a station in South Wales to accrue a bonus of over 500 points against a possible 60, on the same basis, which could be scored by a station in England. That means a station anywhere in England, from the Scottish border to the tip of Cornwall. If distance is a measure of difficulty then Port Talbot group is much better off than *many* groups in England. Why then a bonus at all, let alone one amounting to a possible 440 point advantage? However I cannot write of the detailed conditions which apply in each case. I have no doubt that people all over the country will be stating their own cases. I do know the conditions which apply in the Midlands and so I propose to compare our situation with that of Port Talbot, as I see it and to see if our groups really have an equal chance.

NFD is, of course, a contest which does not depend upon performance on one band only, but on the aggregate of six bands. Under these circumstances an advantage on one band may be offset by a disadvantage on another. Nature takes care of this by way of changing sunspot conditions and varying skip distances. In the case of Stourbridge it works out like this.

On 1·8 Mc/s, we are fairly centrally placed, consequently it is necessary to work over a radius of about 150 miles in order to include 90 per cent of the available stations.

On 3·5 Mc/s the same considerations apply with the addition of European stations, the nearest of which is some 250 miles away and can only be worked during darkness.

On 7 Mc/s however the picture is rather different, as the very stations which are easiest to work on 1·8 Mc/s are now impossible to work at all except during sunspot maximum conditions. Last year the skip was such that we could only work G stations at all for a very short period around midday on the Sunday and then contacts were confined to the more distant ones. Although we were the leading group on this band a mere 56 contacts were obtained (including the fixed stations) in the whole of the British Isles.

On 14, 21 and 28 Mc/s our position has no bearing on results as virtually all contacts are overseas.

The above considerations apply to all stations necessarily workable by sky wave, which we consider to be stations more than 40 miles away. Stations nearer than 40 miles can be considered as being locals for radio purposes, but here is the rub; instead of the dozens of such stations fondly imagined by our rivals, the usual turn-out is five. In 1963, out of these five possible local contacts, we actually made four on 1·8 Mc/s, three on 3·5 Mc/s, one on 7 Mc/s, three on 14 Mc/s, one on 21 Mc/s and none at all on 28 Mc/s. This amounts to a grand total of 12 contacts on all bands worth 36 points out of a total

of 1859, a mere 1·93 per cent. Let us please hear no more about the easy local contacts supposed to be available in this area.

From all this it can be seen that our central position in the country, while perhaps being helpful on Top Band, is a dead loss on 7 Mc/s. I would call it Nature's way of levelling things.

When I examine the position of Port Talbot on the same basis I find that they have four stations within 40 miles, *one of which ranks for bonus points*. I see also that 90 per cent of possible G contacts are within 180 miles, the difference of 30 miles being nothing when considering sky wave and a half-wave aerial. The nearest European contact is a little nearer, being EI, but the continent is only 30 miles further away than it is from Stourbridge. This is negligible on 3·5 Mc/s. Where then is all the difference that would justify any bonus points at all let alone a possible 500? We suggest that our friends in South Wales re-examine the position and this time consider the facts, not the falacies.

This letter is written 10 days before this year's Field Day. Last year we had four operators to man the two stations, this year we have only two available. Very reluctantly we have decided to confine our efforts to a single station for this year. We have selected to operate on 3·5, 7 and 14 Mc/s, these bands, in our opinion giving the best chance of a good score. We do not, of course, know what will happen, or who will be the winner. We shall, as usual, do our best with what we have and hope for the best, but our opinion of Top Band as a gold mine for points can be deduced from our choice of bands.

I will, for the present, decline to comment on the Top Band Contest but I will recommend Mr. Edwards to examine the results of the last autumn contest and see how many local contacts were made by myself as compared with other stations. He may get a shock.

Yours faithfully,
I. T. CASHMORE, G3BMY,
for Stourbridge Amateur Radio Society.

Blackheath, Birmingham.

Four Metres

DEAR SIR,—Whilst attending the EI/GI Convention held on April 18, I heard the Executive Vice-President Eric Yeomanson, G3IIR, release the news of the extension of the 4m band. The new frequencies were enthusiastically received by all present and in particular by those of us who are currently active on the band.

This news will, I am sure, give an added boost to those who are contemplating operation on 4m. May I express my own thanks to the Society in successfully negotiating the extra kilocycles.

Yours sincerely,
R. PARSONS, GI3HXV

Belfast, N.I.

RST Reports

DEAR SIR,—Reading *Four Metres and Down* in the March, 1964 issue, I was once again aware of how little value the RST system of signal reports really is.

G3CCA implies that insertion of a parametric amplifier in front of G3CKQ's 2m receiver increased the signal strength of the Cornish Beacon from S0 to S3/4. An increase in signal strength can surely only be effected at the transmitting end of the link by increasing the effective radiated power and not by increasing the voltage gain of the receiver, the improvement with the parametric preamplifier should be expressed in the readability part of the signal report and the signal strength report should be S1 or S2 if necessary. RST reports appear to be given on the signal to noise ratio of the signal emitted from the loudspeaker or phones in many cases, which makes any comparison of reports between different stations absurd.

If signal reports are to have any real scientific value stations must use some common reference level of voltage at the input terminals of the receiver and the approximate aerial gain specified.

However, many operators will no doubt ask, " Who wants to be that scientific?"

Yours faithfully,
DAVID RICHARDSON, G3PGR

Rugby, Warwickshire.

Preventing Theft of Equipment

DEAR SIR,—During last weekend, a member of this Police Force was listening to his radio on the amateur wave band and happened to tune into a conversation between two Amateur Radio stations. He heard one of the conversationalists, who resides in the Cheltenham area, remark that he was going away on holiday. Not only did he give his name and address but also the date on which he was leaving.

A check was made at the Local Police Station but no report had been made by this person of his house being void.

Criminals these days are known to use radios and information such as this given over the air could present them with a golden opportunity to break in.

I should be grateful if you could find space in your publication to warn radio enthusiasts of the consequential dangers that could ensue from passing this type of information. Further, to include a warning to Amateur Radio mobiles to consider having some anti-theft device fitted to their vehicles to protect their valuable equipment when leaving them unattended. Thefts from unattended vehicles are increasing throughout the country and we do ask owners to ensure at the very least, that they properly secure their vehicles when leaving them.

Yours faithfully,
H. D. J. SMITH,
Assistant Chief Constable

Gloucestershire Constabulary,
Cheltenham.

Bulletin Advertising

DEAR SIR,—I feel I must write and tell you of the excellent results received from putting a recent advertisement in the BULLETIN. Within a few days of publication, I had numerous telephone calls and letters from buyers, which meant that, whereas I was entirely satisfied, there were unfortunately a number of disappointed would-be purchasers.

Yours sincerely,
(MRS.) M. E. MILLS, G3ACC

London, S.E.5.

Receipts

Receipts for subscriptions paid by cheque, bankers' order or postal order are not now issued unless specially requested.

CONTESTS DIARY

*July 5	- Second 144 Mc/s Portable Contest (see page 396, June 1964).
July 19	- D/F Qualifying Event (Wirral). (see page 471).
July 26	- D/F Qualifying Event (Salisbury). (see page 471).
August 1-2	- YO Contest.
August 1-2	- CR7 Contest.
August 8-9	- WAE DX (c.w.).
August 15-16	- WAE DX (phone).
August 29-30	- All Asia Contest.
September 5-6	— V.H.F. National Field Day.
September 5-6	— Labre (C.W.) Contest.
September 5-6	— Region 1 IARU V.H.F. Contest (see page 471).
September 12-13	— Labre (Phone) Contest.
September 13	— D/F National Final.
September 20	— Low Power Field Day (see page 471).
October 3-4	— RAEN Rally.
October 17-18	— Second 420 Mc/s Contest (see page 471).
October 31-November 1	— RSGB 7 Mc/s DX Contest (Phone).
November 21-22	— RSGB 7 Mc/s Contest DX (C.W.).
November 28-29	— Second 1·8 Mc/s Contest.
December 5-6	— RSGB 21/28 Mc/s Telephony/Receiving Contests.
December 13	— 70 Mc/s C.W. Contest

* *To coincide with Region 1 IARU Contests.*

CLUBROOM

A Monthly Survey of Group and Club Activities

Club Reports

Cambridge & District ARC. The club will be operating a station and demonstrating amateur television at the Bottisham Church Fête on July 11. There was a record attendance on May 22 when Messrs. Green and Davis, in person, spoke about some of their equipment which was on show.

Cheltenham Group. At the May meeting, C. W. Cragg, G2HDU, gave an interesting talk on "Modern Receiver Techniques," in which he concentrated on stability through the use of synthesizers. He also discussed the idea of improving signal-to-noise ratio by restricting the size of the aerial.

Chester & District ARS. The society meets every Tuesday, except the first in the month, at 8 p.m. in the YMCA, Chester. On July 14, H. Morris, G3ATZ, will be speaking on aerials. Full details may be obtained from the Honorary (Press) Secretary, P. J. Holland, A3784, Field House, 19 Kingsley Road, Great Boughton, Chester.

Conway Valley ARC. At a recent meeting there was a demonstration of Collins S-Line equipment by G. Moorfield, GW3DIX. A mock Field Day was held on May 31, and the experience gained proved invaluable when it came to NFD proper.

Crawley ARC. The next meeting will be on July 22 at 8.30 p.m. on the Hog's Back near Guildford when Crawley members hope that all their many friends from neighbouring clubs will join them for a "ragchew." The rendezvous is the lay-by half way along the south side of the Hog's Back between Guildford and Farnham. Crawley mobiles will be operating on 160m, 4m, and 2m. Recent events have included NFD when the club's equipment was conveyed to the site in a large horse box. Honorary Secretary: R. G. B. Vaughan, G3FRV, 9 Hawkins Road, Tilgate, Crawley, Sussex.

Cray Valley RS. At the AGM the following were elected: Chairman, G3JJC; Honorary Treasurer, G3ANK; Committee Members, G3DNC and G3MCA; Honorary Secretary, G3KYV, 30 Plaistow Grove, Bromley, Kent.

Dorking & District RS. NFD stations were operated at Newdigate and Leatherhead in Surrey. Another member has obtained his licence, G3TDB, and two others are in "RAE-throes." The meeting on July 14 is at the "Wheatsheaf" and on July 28 at the "Star and Garter," Dorking. Meetings begin at 8 p.m., and visitors are welcome, as always.

Derby and District Amateur Radio Society took part in the 1964 Affiliated Societies Contest. G3PRM (left) and G3JFD are shown operating G3ERD/A from the QTH of the ASR, B. J. Speakman, at Quarndon, near Derby.
(Photo by Martin Shardlow, A1706)

Echelford ARS. The society was formed in January and now has more than 50 members, many of whom are licensed. An RAE Course is being held. The next main meeting will be on July 29 at 7.30 p.m. at the Ashford Grammar School, Ashford, Middlesex, and visitors will be welcome. Honorary Secretary: L. Seaman, G3ATF, 40 Park Road, Ashford, Middx.

Ex-G RC. The Ex-G Club net on 14.345 kc/s at 19.00 GMT will be on the first and third Sundays during August instead of every Sunday. Weekly operation will resume in September.

Flintshire RS. On April 28 there was a most impressive amateur TV demonstration staged by GW3JGA/T and GW3PCZ/T. The signals displayed included a closed circuit flying spot scanner and Vidicon camera and an over-the-air frame sequential colour picture transmitted from G3JGA's QTH. In May members and friends visited the Post Office Telephone Repeater Station at Colwyn Bay: B. Clarke, GW3HGL, was the official guide. GW3MDK/P was operated during the First 144 Mc/s Portable Contest.

Kingston & District ARS. Meetings are held fortnightly on Thursdays at 8 p.m. at the YMCA Annexe, Eden Street, Kingston. The next meeting will be on July 9 when Mr Jones of the Decca Navigator Co. Ltd., will talk about "Navigational Aids," and visitors will be welcome. Although the society does not have its own station, it does enter most of the inter-club contests under the call-sign G3KIN and has achieved moderate success. Honorary Secretary: A. G. Wheeler, G3RHF, 22 Meadow Road, Ashford, Middx.

Liverpool Institute High School ARS. This is a new club with a nucleus of keen members several of whom have passed the RAE, and one of whom is licensed (G3SKT). Would those who are interested in joining, please contact M. P. Godwin, A3593, 24 Bundoran Road, Liverpool, 17.

Loughton & District RS. The society's special activity event run in conjunction with the local community centre's "At Home," held on Saturday, May 23, was a great success. Many hundreds of visitors from London and surrounding districts saw GB3LOU in operation and paraded in front of the TV cameras. The local press gave very good coverage and the occasion was mentioned on the BBC news. GB3LOU will again be in operation during the period July 11-18 and on the latter date the society will hold its first mobile rally. NGR TQ 438965. Talk-in stations will be in operation on 160m and 2m. Meetings are held on alternate Fridays at Loughton Hall, Debden Community Centre, Rectory Lane, Loughton, and all visitors are welcome. Honorary Secretary: A. W. Sheppard, G3JBS, 11 Barfields, Loughton, Essex.

Maidstone (YMCA) ARS. Meetings are held at the Hollingbourne Hall, YMCA HQ, Union Street, Maidstone, every Wednesday from 7.45 to 10 p.m. New members are always welcome. At the second AGM, held in May, the following committee was elected: Chairman, C. Robertson, G3ERY; Vice-Chairman, Magazine Publicity Officer and RAE Lecturer, P. Pickering, G3ORP; Honorary Secretary, B. G. Harber; Honorary Treasurer, H. Gibb; Contest Secretary, J. Austin, G3REM; Publicity Officer for local press, C. Cook; SWL Committee Member, P. Holder; Licensed Committee Member and Morse Instructor, C. Harris, G3ORH. Details of the programme may be obtained from the Honorary Secretary at 31 Cork Street, Eccles, near Maidstone, Kent.

March & District ARS. The President and Founder Member, Mr T. C. Williams, the Chief Constable of the Isle of Ely, has now left the district, and Superintendent J. W. Davis, the Deputy Chief Constable, has accepted the Presidency. At the AGM it was reported that the society had purchased a transmitter and sundry items and still has a healthy balance in the bank.

Northern Heights ARS. Two very well attended meetings were held in May: a junk sale, and a lecture on transistors by L. L. Cobb, G3UI. On July 8 there will be a Civil Defence talk

and demonstration and on July 15 and 29 there will be visits to the BBC Transmitting Station at Moorside Edge, Huddersfield. On August 1 there will be a demonstration station at Warley Charity Gala, on August 8 at the Halifax Agricultural Show, and on August 15 at Crossleys Carpets Gala, all under the call-sign G3OMM/A. Honorary Secretary: A. Robinson, G3MDW, Candy Cabin, Ogden, Halifax, Yorks.

Plymouth RC. A picnic outing will be held on Sunday, July 12, at a spot on the A384 approximately two miles beyond Two Bridges towards Ashburton on Dartmoor, and it is hoped the occasion will be a get-together of members of the Exeter, Kingsbridge, Torbay and Plymouth clubs. A very cordial invitation is extended to any amatuer, licensed or otherwise, who is in or near the area at that time to make himself known. The party will probably be identified by either the Webster Band-spanner on the back of G5ZT's white Jaguar, or by the loading coil wound round a detergent bottle in the middle of the whip protruding from the roof vent of G3PGJ's minivan. Meetings are held every Tuesday at 7.30 p.m. at Virginia House, Bretonside, Plymouth. Honorary Secretary: R. Hooper, G3SCW, 2 Chestnut Road, Peverell, Plymouth, Devon.

Reading ARC. The next meeting will be held on July 25 at 7.30 p.m. at the Palmer Hall, West Street, Reading, and will be devoted to " Simple S.S.B. Gear." The meeting on August 29 will be devoted to test equipment constructed by club members. The Annual Mobile Picnic will be held on September 13 at the Childs Beale Trust Pavilion, Lower Basildon, near Pangbourne, Berks. Talk-in stations will operate on 160m and 2m. Visitors are advised to bring their own food as none will be available at the site. On September 26, Messrs. Green and Davis will be showing some of their equipment. Honorary Secretary: R. G. Nash, G3EJA, 9 Holybrook Road, Reading, Berks.

Reigate Amateur Transmitting Society. A. J. Gould, G3JKY, of the Clifton ARS, gave a most lucid talk on direction finding at the May meeting, a field in which his club specializes. His two home-built 80m portable receivers drew well merited attention. Eight members attended the Thanet Mobile Rally and came away with three prizes. On July 18, at 7.30 p.m., there will be a talk on Amateur Television at the " George and Dragon," Cromwell Road, Redhill. Three members are awaiting the results of the May RAE, whilst D. Hollingsbee is now G3TDT. Honorary Secretary: F. D. Thom, G3NKT, 12 Willow Road, Redhill, Surrey.

Royal Naval ARS. GB3RN will be operating from HM Dockyard, Portsmouth, during Navy Days from August 1-3. All amateurs and SWLs will be welcomed at the radio exhibition. Mobiles will be talked-in on 160m, 4m and 2m on a.m. The main station will be on the h.f. bands using s.s.b. and c.w. The latest guided weapons ships will be on view together with HMS *Victory* and many special shows. Further information may be obtained from the Honorary Secretary, RNARS, HMS *Mercury*, Petersfield, Hants.

South Birmingham RS. A summer outside events programme is being planned and exhibition stations are being organized for August Bank Holiday and other occasions. The recent Junk Sale was a great success and so much gear was handed in that many bidders were given a " bonus." The club generator benefited from the recent BULLETIN article. Details of meetings may be obtained from the Honorary Secretary, R. M. Davies, G3RUK, 17 Silver Street, Wythall, near Birmingham.

South Dorset RS. The June meeting featured a Technical Forum in which the experts answered members' questions. The society will again be taking part in the Weymouth Model Engineering Exhibition from July 30 to August 4 when a demonstration station will operate under the call-sign G3SDS. A special QSL card will be sent to all contacts. Honorary Secretary: C. E. Biggs, G2TZ, 54 Prince of Wales Road, Dorchester, Dorset.

Surrey Radio Contact Club. On May 15, over 50 members participated in judging the exhibits at the club's Annual Constructional Contest on a points basis. The winner was C. R. Ayley, G3GRK, who received the Coronation Committee Cup for his multiband transmitter and receiver. Second was A. D. Naylor, G3GHI, with his 2m transmitter, and third R. Morrison, G3KGA, with his 2m converter. At the meeting to be held on July 14, two talks will be given, the first by D. Starling on " V.H.F. Weather," and the second by G. Mitchell, G3OFJ, on " Chemistry in Electronics." Non-members are welcome. Honorary Secretary: S. A. Morley, G3FWR, 22 Old Farleigh Road, Selsdon, South Croydon, Surrey.

An Amateur Radio Station was in operation at the Wiltshire Constabulary Arts and Crafts Exhibition, held at Devizes in April. The equipment visible in the photograph, from left to right, is: Heathkit grid dip meter, G2DAF receiver, KW77 receiver (owned by G3MQD), Vanguard transmitter with a.t.u. on top, Heathkit oscilloscope, and G3LOK receiver. All equipment, except the KW77, was built by G3RWY who has only been interested in radio for 3½ years and who has been licensed for 14 months. 60 stations in 7 countries were worked, and a special QSL card was printed for the event. The group are, seated, rear, G3RWY, front, G3MQD; standing, left to right, G3PYF, G8AX, ex-G3FPY, G3SGM, G3NMH, G3III/M, G3PXD, G3PYP, and G3ACG.

Sutton & Cheam RS. At the AGM held in April, the following were elected: Chairman, A. E. Mitchell, G8DF; Vice-Chairman, A. Tillin, G3MES; Vice-Presidents, L. R. Seaton, G3HSK; L. C. Cooper, G5LC; and H. W. R. Hampton; Honorary Secretary, P. J. Ball, G3HQT; Honorary Treasurer, A. W. Munden, G3BHR; Committee Members: F. J. Harris, G2BOF; R. G. Macdonald, G3DCZ; Junior Member, W. H. R. Hall, A2800; Publicity Officer, R. L. Harvey, G2FSA.

Torbay ARS. Details of the Dartmouth Mobile Rally were discussed at the May meeting. Meetings are held on the last Saturday of each month and details may be obtained from the Honorary Secretary, Mrs Gee Western, G3NQD, 118 Salisbury Avenue, Barton, Torquay, Devon.

University College of North Wales ARS. The AGM was held on May 12 when the following were elected: President, J. T. Lawrence, GW3JGA; Chairman, D. Wright; Honorary Secretary/Treasurer, G. Finden; Committee Member, R. L. Dilworth. Fortnightly meetings will recommence in September.

Wirral ARS. The local mobile function, " Basil's Outing," was well supported by members and visitors from the Ainsdale Club. The Radio Section was won by G3HAC, the D/F Section by G3EGX, and the non-radio Section by H. Schroeder. On July 1 there will be a talk on crystal etching and a Junk Sale on July 15. On August 15, L. Roberts, G3EGX, will lecture on valve uses and on August 19 there will be an evening D/F Contest.

Yeovil ARC. A tape lecture from the RSGB Tape Library was heard at a recent meeting: " International Conferences and Amateur Radio," by A. O. Milne, G2MI.

News from the Newsletters

The Wirral *Newsletter* discusses improvements for the front ends of some of the older receivers still in current use and reminds us that the 6K7, a popular r.f. amplifier, dates from 1936. The WAMRAC (Methodist) *Circular Letter No. 43* prints details of WAMRAC nets and members' sked times. The Cray Valley *Newsletter* prints extracts from the operating instructions of a certain semi-automatic key, from which it would appear that the operator has to be a bit of a contortionist. The Echelford *Newsletter* gives the circuit and constructional details of a compact add-on b.f.o. primarily intended for receivers with poor facilities for c.w. reception. *Radial*, journal of the Radio Amateur Invalid and Bedfast Club, prints the concluding article of its series on " Possum " and looks ahead to future developments such as a radio controlled electric powered wheelchair. Southampton's *QUA* has an advertisement of particular interest to mobile operators: Japanese headsets with boom microphone attached.

Forthcoming Events

Details for inclusion in this feature should be sent to the appropriate Regional Representatives by the first of the month preceding publication. A.R.s and club secretaries are reminded that the information submitted must include the date, time and venue of the meeting and, whenever possible, details of the lecture or other event being arranged. Regional Representatives are requested to set out the copy, preferably typed double spaced, in the style used below. Standing instructions for more than three months ahead cannot be accepted.

REGION 1

Ainsdale (ARS).—July 8, 22, 8 p.m., 77 Clifton Road, Southport.
Blackburn.—Fridays, 8 p.m., West View Hotel, Revidge Road.
Blackpool (B & FARS).—Mondays, 8 p.m., Pontins Holiday Camp, Squires Gate.
Bury (BRS).—July 14 (Discussion Night), 8 p.m., Knowsley Hotel, Kay Gardens.
Chester.—Tuesdays, 8 p.m., YMCA.
Eccles (E & DAC).—Tuesdays, 8 p.m., The Congregational Mission Church, King Street.
Liverpool (L & DARS).—Tuesdays, 8 p.m., Conservative Association Rooms, Church Road, Wavertree.
Macclesfield.—July 7, 21, August 4, 42 Jordongate.
Manchester (M & DARS).—Wednesdays, 7.30 p.m., 203 Droylsden Road, Newton Heath, Manchester 10. **(SMRC).**—Fridays, 7.45 p.m., Rackhouse Community Centre, Daine Avenue, Northenden.
Morecambe.—July 1, August 5, 125 Regent Road.
Preston.—July 14, 28 (all meetings start with a Morse practice at 7.30 p.m.), St. Paul's School, Pole Street.
Southport (SRS).—Wednesdays, 8.30 p.m., Sea Cadets Camp, The Esplanade.
Stockport.—July 1, 15, 29, The Blossoms Hotel, Buxton Road, Stockport.
Wirral.—July 1, 15, August 5, 7.45 p.m., Harding House, Park Road West, Claughton, Birkenhead.

REGION 2

Bradford.—July 7 (Visit to Esholt Sewage Works), July 21 (Display of members' gear), 7.30 p.m., 66 Little Horton Lane.
Catterick.—Tuesdays and Thursdays, 7.30 p.m., Club Room, Vimy Road.
Halifax.—July 28 (Visit to Fane Acoustics, Batley).
Hartlepools (HARC)—Mondays, 7.30 p.m., 42 Murray Street, (rear entrance), West Hartlepool.
Northern Heights.—July 8 (Talk and Demonstration by Civil Defence), July 15 (Second visit to BBC, Moorside Edge), July 22 (Ragchew and Committee Meeting), July 29 (Third visit to BBC, Moorside Edge), Aug. 1 (Demonstration station at Warley Charity Gala). Meetings at Sportsman Inn, Ogden.
Scarborough.—Thursdays, 7.30 p.m., Chapman's Yard, North Street.
York.—Thursdays, 8 p.m., 61 Micklegate.

REGION 3

Birmingham (MARS).—July 21 ("Transistor Practice for Amateurs," by G4LU), 7.30 p.m., Midland Institute, Paradise Street, Birmingham, **(MRCC).**—July 3, 7.30 p.m., Windmill House, Weatheroak, Wythall, Birmingham. **(South).**—July 16, 7.30 p.m., Friends Meeting House, Balsall Heath.
Cannock (CCARS).—July 2, The George Inn, Walsall Road, Cannock.
Coventry.—Mondays, 8 p.m., Westfield House, Radford Road, Coventry.

LOOKING AHEAD

August 30.—G6UT's Ham Party.
September 20.—Surrey Radio Contact Club 2m D/F Hunt.
October 28-31.—RSGB Radio Communications Exhibition.
December 18.—RSGB Annual General Meeting.
May 30, 1965.—RNARS Mobile Rally at RN Signal School, HMS Mercury.

East Worcestershire Group.—July 9, 8 p.m., Old People's Centre, Redditch.
Mid-Warwickshire (ARS).—July 13, 27, 7.30 p.m., Civil Defence Training School, Harrington House, Newbold Terrace, Leamington Spa.
Stourbridge (STARS).—July 7 (Film "Transistor Principles and Applications"), 7.45 p.m., Foley College, Stourbridge.
Stratford (ARS).—New venue, for details contact the Hon. Secretary, N. Smith, 54 Clopton Road, Stratford-on-Avon, Warks.
Wolverhampton (ARS).—Mondays, 8 p.m., Neachells Cottage, Stockwell End, Tettenhall.

REGION 4

Burton-on-Trent (B-o-TARS).—Wednesdays, 7.30 p.m., Club Rooms, Stapenhill Institute, Burton-on-Trent.
Chesterfield (C & DARS).—July 1, 7.30 p.m., Newbold Observatory, Newbold Road, Chesterfield.
Derby (D & DARS).—July 1 (Surplus Sale), July 8 (Mobile Rally Meeting), July 15 (D/F Practice Run), July 22 ("Vehicle Electrics," by R. Chambers, G3RTG), July 29 (Juniors' Night), August 5 (Surplus Sale), 7.30 p.m. Room No. 4, 119 Green Lane, Derby. **(DSW Exp. Soc.).**—Fridays, 7.30 p.m., Sundays, 10.30 a.m., Club Rooms, Nunsfield House, Boulton Lane, Alvaston, Derby.
Grantham (G & DARS).—Meetings are now held at the Westgate Club and Institute, Grantham, Lincs. The Hon. Secretary is B. Cox, BRS24990, 16 Cambridge Street, Grantham.
Grimsby (GARS).—July 2, 16, 30, 8 p.m., Grimsby Model Engineers Club Rooms, Fletchers Yard, Wellowgate, Grimsby.
Heanor (H & DARS).—July 7 (Open Evening—suggestions for activities during the holiday period), 7.30 p.m., Heanor Technical College, Ilkeston Road, Heanor.
Leicester (LRS).—Mondays, 7.30 p.m., Club Rooms, Old Hall Farm, Braunstone Lane, Leicester.
Lincoln (LSWC).—First Wednesday in each month, 7.30 p.m., Lincoln Technical College, Cathedral Street, Lincoln.
Loughborough (RCL).—Fridays, 7.30 p.m., Corporation Hotel, Wharncliffe Road, Loughborough.
Mansfield (MRS).—Fridays 7.30 p.m., ATC Headquarters, Sutton Road, Mansfield.
Nottingham (ARCN).—Tuesdays, Thursdays, Room No. 3, Sherwood Community Centre, Woodthorpe House, Mansfield Road, Nottingham.
Northampton (NSWC).—Thursdays, 7 p.m., Allen's Pram Works, 8 Duke Street, Northampton.

REGION 5

Cambridge (C & DARC).—July 3 (Junk Sale), July 10 ("Travels in Europe," by Dennis Barnes, G2CNT), July 11 (Station at Bottisham Fete), July 17 ("Modulation" Evening), July 24 (Informal), July 31 (No Meeting), 7.30 p.m., Club Headquarters, Corporation Yard, Victoria Road, Cambridge.
Luton (L & DARC).—Tuesdays, 8 p.m., ATC Headquarters, Crescent Road.
March (M & DRAS).—Tuesdays, 7.30 p.m., rear of Police Headquarters, High Street, March, Cambs.
Haverhill (H & DARC).—Mondays, 7.30 p.m., Haverhill Secondary Modern School.
Royston (R & DARC).—Wednesdays, 8 p.m., Manor House Social Club, Melbourn Street, Royston, Herts.
Shefford (S & DARC).—Thursdays, 7.45 p.m., Digswell House, Hitchin Road, Shefford, Beds.

REGION 6

Cheltenham.—First Thursday in each month, 8 p.m., Great Western Hotel, Clarence Street, Cheltenham.

REGION 7

Acton, Brentford & Chiswick (ABCRC).—July 14, 7.30 p.m., AEU Club, 66 High Road, Chiswick.
Bexley Heath (NKRS).—July 9, 23, 7.30 p.m., Congregational Hall, Chapel Road, Bexley Heath.
Barnet (BRC).—July 28, 8 p.m., Red Lion Hotel, Barnet.
Chingford (Group).—July 10, Secretary, Loughton 2397.
Chingford (SRC).—Every Friday (except first), 8 p.m., Friday Hill House, Simmons Lane.
Croydon (SRCC).—July 14, 7.30 p.m., Blacksmiths Arms, South End, Croydon.
Dorking (D & DRS).—July 14, 8 p.m., "Wheatsheaf," Dorking. July 28, 8 p.m., "Star & Garter," Dorking.
East Ham.—Tuesdays fortnightly, 7.30 p.m., 12 Leigh Road, East Ham.
East Molesey (TVARTS).—July 1, Carnarvon Castle Hotel, Hampton Court.
Edgware & Hendon (EARDS).—July 13, 27 8 p.m., John Keble Hall, Church Close, Deans Lane, Edgware.
Enfield.—July 16, 7.30 p.m., George Spicer School, Southbury Road, Enfield.
Gravesend (GRS).—July 15, 7.30 p.m., RAFA Club, 17 Overcliffe, Gravesend.
Guildford (G & DRS).—July 10 (D/F in Stoke Park), July 24, 8 p.m. ("Test Equipment"), City Cafe, Onslow Street, Guildford.
Harlow.—Tuesdays, 7.30 p.m., rear of G3ERN (G. E. Read), High Street, Harlow.
Harlow (SRC).—Wednesdays, 7 p.m., Edinburgh Way, Harlow.
Harrow (RSH).—Fridays, 8 p.m., Roxeth Manor County School, Eastcote Lane, Harrow.
Holloway (GRS).—Mondays and Wednesdays, 7 p.m., (RAE and Morse), Fridays (Club), 7.30 p.m., Montem School, Hornsey, N.7.
Hounslow (HADRS).—July 13 (Talk on "Radio Dictionary"), July 27 (Experiences of two newly licensed members, G3SZB and G3TDR), Canteen, Mogden Main Drainage Dept., Mogden Works, Isleworth.

LONDON MEMBERS' LUNCHEON CLUB
will now meet at the White Hall Hotel, Bloomsbury Square, London, W.C.1
at 12.30 p.m. on Fridays, July 17, and August 21, 1964
Telephone table reservations to HOL 7373 prior to day of luncheon. Visiting amateurs especially welcome.

Ilford.—Thursdays, 8 p.m., 579 High Road, Ilford (Nr. Seven Kings Station).
Kingston.—July 9, 8 p.m., YMCA, Eden Street, Kingston, Fridays (weekly Morse classes), 2 Sunray Avenue, Tolworth.
Leyton & Walthamstow.—July 28, 7.30 p.m., Leyton Senior Institute, Essex Road, E.10. Interested new members contact A. Rix, 17 Forest Drive East, E.11.
Loughton.—July 3, 17, 7.30 p.m., Loughton Hall (Nr. Debden Station).
Mitcham (M & DRS).—July 10, 7 p.m., "The Canons," Madeira Road, Mitcham.
New Cross (CARS).—Wednesdays and Fridays, 8 p.m., 225 New Cross Road, S.E.14.
Norwood & South London (CP & DRS).—July 18, CD Training Centre, Bromley Crescent, W.2.
Paddington (P & DARS).—Wednesdays, 7.30 p.m., Beauchamp Lodge, 2 Warwick Crescent, W.2.

Purley (P & DRC).—July 17, 8 p.m., Railwaymen's Hall (side entrance), Whytecliffe Road, Purley.
Reigate (RATS).—July 21, 7.30 p.m., (" Amateur TV "), George & Dragon, Cromwell Road, Redhill.
Romford (R & DRS).—Tuesdays, 8.15 p.m., RAFTA House, 18 Carlton Road, Romford.
Science Museum (CSRS).—July 20, 6.30 p.m., Science Museum, South Kensington.
Sidcup (CVRS).—July 2, 7.30 p.m., Congregational Church Hall, Court Road, Eltham.
Slough (SARS).—First Wednesday in each month, 8 p.m., United Services Club, Wellington Street, Slough.
Southgate, Finchley & District.—July 9, (Junk Sale), July 23, Atlasta Lodge, Tottenhall Road, London, N.13.
St. Albans (Verulam ARC).—July 15, 8 p.m., Hedley Road, St. Albans.
Sutton & Cheam (SCRS).—July 21, 7.30 p.m., The Harrow, High Street, Cheam.
Uxbridge.—July 6, 20, 8 p.m., St. Andrews Church, Scout Hut, Uxbridge Road.
Welwyn Garden City.—July 9, 8 p.m., Conference Hall, Murphy Radio, Bessemer Road.
Wimbledon (W & DRS).—July 10, 8 p.m., Community Centre, St. Georges Road, Wimbledon, S.W.19.

REGION 8

Crawley (CARC).—July 8 (Informal Meeting), for details contact G3FRV, July 22 (mobile meeting at 8 p.m., at the Hog's Back, Guildford).
Maidstone (YMCAARS).—July 1 (RAE and lecture), July 8 (Club Transmitter Night), July 15 (lecture and Junk Sale), July 22 (tape recording, " Basic Transistors "), July 29 (RAE and lecture), August 5 (film " Network"—shipping distress communication), 7.45 p.m., Hollingbourne Hall, YMCA HQ, Union Street, Maidstone.

REGION 9

Bath.—No meeting in July.
Bristol.—July 24 (" Home constructed equipment "), 7.15 p.m., Small Physics Theatre, Royal Fort, Bristol University, Woodland Road, Bristol 8.
Burnham-on-Sea (B-o-SARS).—Second Tuesday in each month, 8 p.m., Crown Hotel, Oxford Street, Burnham-on-Sea.
Camborne (CR & TC).—First Thursday in each month, Staff Recreation Hall, SWEB Headquarters, Pool, nr. Camborne.
Exeter.—First Tuesday in each month, 7.30 p.m. George and Dragon Inn, Blackboy Road, Exeter.
Plymouth (PRC).—Tuesdays, 7.30 p.m., Virginia House, Bretonside, Plymouth.
South Dorset (SDRS).—First Friday in each month, 7.30 p.m., Labour Rooms, West Walks, Dorchester.
Torquay (TARS).—Last Saturday in each month, Club HQ, Belgrave Road, Torquay.
Weston-super-Mare.—First Tuesday in each month, 7.15 p.m., Technical College, Lower Church Road.
Yeovil (YARC).—Wednesdays, 7.30 p.m., Park Lodge, The Park, Yeovil.

REGION 10

Cardiff.—July 13, 7.30 p.m., TA Centre, Park Street, Cardiff.

REGION 11

Llandudno (CVARC).—July 9 (" El-Bugs," by Brian Clarke, GW3HGL, and Bob Jones, GW3JII), 7.30 p.m., Cross-Keys Hotel, Llandudno.
Prestatyn (FRS).—July 14 (Discussion on RAE, Transmitters, and Interference), 8 p.m., Railway Hotel, Prestatyn. No meeting on July 28.

REGION 12

Aberdeen (AARS).—July 3 (" Receiver I.F. Considerations "), July 10, 17 (holiday period; clubrooms open for ragchew), July 24 (Junk Sale), July 31 (local v.h.f. activity), 7.45 p.m., 6 Blenheim Lane, Aberdeen.

REGION 16

Basildon (BDARS).—Meetings are held at the " Van Gogh." Details from G3IJB, Milestone Cottage, London Road, Wickford.
Chelmsford (CARS).—July 7 (talk by R. L. Varney, G5RV), 7.30 p.m., Marconi College, Arbour Lane, Chelmsford. No meeting in August.
Great Yarmouth (GYRC).—Fridays, 7.30 p.m., the Manager's Office, The Old Power Station, South Quay, Swanstons Road, Great Yarmouth. Details from G3HPR.
Southend (SDARS).—July 3, 17, 31, the Executive's Canteen, E. K. Cole Ltd., Priory Crescent, Southend-on-Sea.

REGION 17

Southampton.—Second Saturday in each month, 7 p.m., Engineering Lecture Theatre, Southampton University.

MOBILE RALLIES 1964

July 5 ..... ARMS Mobile Rally

RAF Station, Barford St. John, near Banbury, Oxfordshire
2m and 160m talk-in stations

There will be a comprehensive trade show, tombola, and a military band will be present.

Organized by the Amateur Radio Mobile Society

July 5 ..... South Shields Mobile Rally

Bents Park Recreation Ground, Coast Road, South Shields

Commencing at 2 p.m.
G3DDI/A ——— 160m } talk-in stations
G3OLW/M ——— 2m }

The 160m talk-in station will be operating from 11 a.m. Competitions will include a concours d'elegance, driving competition, transmitter test, odd sounds quiz, and races for the junior ops. Prizes for longest distance travelled, and the furthest contact with the control station. Light refreshments available.

Organized by the South Shields and District Amateur Radio Club

July 26 ..... Cornish Mobile Rally

Pentire Headland, Newquay, Cornwall
GB3CRC ——— 160, 80 and 2m talk-in station

The programme will include a treasure hunt and raffle. There will be adequate cover at the site which is only 300 yards from the beach.

Organized by the Cornish Radio Amateur Club

August 9 ..... Torbay Mobile Rally

Britannia Royal Naval College, Dartmouth
Commencing at 10 a.m.
G6VJ 1880 kc/s } talk-in
G3LMG/P 70·27 and 144·13 Mc/s } stations

The programme will include a mobile treasure hunt, fun and games for XYLs and junior ops, judo display, " DX " balloon race, side-shows and usual awards for attending mobiles.

Organized jointly by the Torbay Amateur Radio Society and the Britannia Royal Naval College Radio Club

August 16 ..... Derby Mobile Rally

Rykneld Schools, Bedford Street, Derby

Organized by the Derby and District Amateur Radio Society

August 30 ..... UBA International Mobile Rally

Ardennes, Belgium
For details see RSGB BULLETIN, May 1964, p. 307.

Organized by the Luxembourg (prov.) section of the UBA

September 12-13 ..... VERON Mobile Rally, Holland

Province of South Holland, between Amsterdam, The Hague, Utrecht and Gouda
Talk-in station operating on September 11
Full details are available from the Central Bureau of VERON, PO Box 9, Amsterdam.

Organized by VERON

September 13 ..... RSGB National Mobile Rally

Woburn Abbey, Bedfordshire

Organized by the RSGB

Coming to Geneva ?

International

HAMVENTION

5th and 6th September, 1964

- **FUTURE OF AMATEUR RADIO**
- **HAM - TECH - AID**
- **OPERATE 4U1ITU**

To the Secretary, International Amateur Radio Club
Geneva 20, Switzerland

☐ I intend to come to the IARC 1964 HAMVENTION.

☐ I apply for IARC membership. Please rush me information.

☐ I want a copy of the inaugural issue of the International Amateur Radio Club magazine 4U1ITU CALLING (I enclose 4 International Reply Coupons)

(Name) _____

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Please insert above advertisement in RSGB BULLETIN

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Date ..... Signed.....

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ADVERTISEMENT RATES. Members' Private Advertisements 3d. per word, minimum charge **5s. Trade Advertisements 9d. per word,** minimum charge **12s.** All capitals **1s.** per word, minimum charge **18s.** Write clearly. No responsibility accepted for errors. Use of Box number **1s. 6d.** extra. Send copy to **Sawell & Sons Ltd., 4 Ludgate Circus, London, E.C.4.**

OFFICIAL APPOINTMENTS

BRITISH FORCES BROADCASTING SERVICE

The MINISTRY OF DEFENCE (ARMY DEPARTMENT) invites applications for appointments abroad to the Engineering (Grade V) staff of the British Forces Broadcasting Service.

APPOINTMENTS Vacancies in Aden, Benghazi, Tobruk, Tripoli and Cyprus. Appointments will be for two years in the first instance to Aden and Tobruk and for three years elsewhere. Good prospects for extension of appointments thereafter.

DUTIES Operation and maintenance of MF, HF, VHF broadcast transmitters, studio equipment, and generating equipment.

QUALIFICATIONS Appropriate ONC, City & Guilds or equivalent qualifications or exceptionally to be able to demonstrate equivalent knowledge and experience.

SALARY Present scale (under review) for Grade V staff is £739-£1,039 p.a. Starting pay up to £891 p.a. will be assessed according to age and experience. In addition a generous non-taxable Foreign Service Allowance is payable—specimen rates will be provided with the application form.

GENERAL Return passages by sea/air, outfit and trunk allowances are provided. Families are granted free passages to the overseas station (and back to UK in due course) as soon as suitable accommodation is available. Three weeks and three days p.a. paid leave rising to 4 weeks 2 days after 10 year's service.

APPLICATION FORMS and further details from the Director, British Forces Broadcasting Service, Kings Buildings, Dean Stanley Street, London, S.W.1. Selection will be by interview in London. Closing date 29th July, 1964.

AN ELECTRONIC INSTRUMENT TECHNICIAN
is required by
THE RADIOCHEMICAL CENTRE
of the
UNITED KINGDOM ATOMIC ENERGY AUTHORITY

for the Instrumentation Section of the Physics Department to assist in the installation, calibration and maintenance of electronic instruments used for radioactive measurements throughout the Centre.

Applicants should have served a recognized apprenticeship or had equivalent training and should be experienced in pulse, high voltage or electrometer circuit techniques.

Starting salary, according to age and qualifications, is in the range of £800 to £1,015 rising to a maximum of £1,135.

Assisted Housing and Superannuation Scheme. 5-day week.

Apply to the Personnel Officer, The Radiochemical Centre, White Lion Road, Amersham, Bucks, quoting Reference No. 3/64/1.

BRITISH ANTARCTIC SURVEY has vacancies for WIRELESS OPERATOR MECHANICS to serve in the Antarctic. Candidates must be able to transmit and receive at 20 w.p.m. and be capable of elementary maintenance of transmitting and receiving equipment. Applications to 30 Gillingham Street, London, S.W.1. Tel: Victoria 3687.

RADIO TECHNICIAN

A number of suitably qualified candidates will be required for training, leading to permanent and pensionable employment. (Normally at Cheltenham but with opportunities for service abroad or appointment to other U.K. stations.)

Applicants must be 19 or over and be familiar with the use of Test Gear and have had Radio/Electronic workshop experience. They must offer at least "O" level GCE passes in English Language, Maths and/or Physics, or hold the City and Guilds Telecommunications Technician Intermediate Certificate or equivalent technical qualifications.

Pay according to age, e.g. at 19 £722, at 25 £929 (highest pay on entry) rising by four increments to £1,067.

Prospects of promotion to grades in salary range £997-£1,634.

Annual Leave allowance of 3 weeks 3 days, rising to 4 weeks 2 days.

Normal Civil Service sick leave regulations apply.

Apply:
Recruitment Officer (RT/43)
Government Communication Headquarters
Oakley
Priors Road
Cheltenham

SITUATIONS VACANT

Perfectionist maker of professional radio components has opening for

DYNAMIC, INVENTIVE ENGINEER

for important position with big future. Preference will be given to an applicant who possesses an honours degree in Physics, is a keen radio amateur, a linguist and an inventor.

Applications providing fullest details of qualifications, experience and present salary to be submitted to the Chairman:

OXLEY DEVELOPMENTS CO. LTD.,
Priory Park,
Ulverston,
English Lakes.

EDDYSTONE RADIO

require

A SENIOR DEVELOPMENT ENGINEER for development of semiconductor circuitry in connection with HF, VHF & UHF receivers and low power transmitter design.

also

DESIGN DRAUGHTSMAN for printed circuit and wiring layouts.

The Company operate a non-contributory Life Assurance and Pension Scheme.

Applicants must have worked in these fields and should write giving full particulars of experience and qualifications to:

The Technical Director,
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West Heath,
Birmingham 31.

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Experimental Work?
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ARE YOU—Educated to at least O.N.C. Standard?

DO YOU—Live in the East Kent (Sandwich) area?
If the answers are YES: A well-known firm of building materials manufacturers would like to hear from you.
Replies to:
C.P.I.
The Hammill Brick Co. Ltd.
Eastry, Sandwich
Kent

DEVICES LIMITED

Acknowledged leaders in the development of transistorised recording instrumentation for medical and industrial research and in the application of photo-electronics to the food industry, invite applications for the vacancy of:

CHIEF ELECTRONIC TEST ENGINEER

13-15 Broadwater Road, Welwyn Garden City, Herts.
Telephone Welwyn Garden 24146-7-8

LABGEAR LIMITED have vacancies for both Junior and Senior Communications Engineers for designing and building transmitting and receiving equipment. Excellent working conditions in a modern laboratory with really attractive prospects for sound practical men. Applications which will be treated confidentially should give full details of previous experience whether professional or amateur. LABGEAR LIMITED, CROMWELL ROAD, CAMBRIDGE.

SITUATIONS VACANT (contd.)

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REQUIRE
RADIO WORKSHOP MECHANICS
Weekly staff vacancies. Apply stating previous experience to: Chief Engineer.

EDDYSTONE RADIO

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Chief Inspector,
STRATTON & CO. LTD.
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BIRMINGHAM 31

MICROWAVE ENGINEERS, Senior and Junior, required for interesting work on a wide variety of high precision instruments. Applicants should be qualified or have at least three years' experience. Salary in the range £1,200–£2,000 and £800–£1,200 respectively dependent upon experience, etc. Write giving full résumé to the Research Director, Flann Microwave Instruments Ltd., Old Bridge Street, Kingston, Surrey.

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QSL CARDS. G.P.O. approved log books, cheapest, best, prompt delivery. Samples.—Atkinson Bros., Printers, Looe, Cornwall.

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GO ONE BETTER. Have your cabinets, panels, etc., stove-enamelled and lettered to your own or original specification. —For by-return quotations, contact: The Universal Productions (Enamellers) Ltd., 22 Aston Road North, Birmingham 6. Tel.: Aston Cross 2987.

CASES, chassis, panels. ANYTHING in metal: send your drawings, for quote. Stove enamelled, hammertone, or plain, in any colour.—Moss Watson, 40 Mount Pleasant Street, Oldham, Lancs. (Main 9400).

WANTED

WANTED.—All types of communications receivers, test equipment, tape recorders, amplifiers, etc. Prompt cash payment.—Details to R. T. & I. Electronics Ltd., Ashville Old Hall, Ashville Road, London E.11. (LEYton 4986).

WANTED (cont.)

IN URGENT NEED OF mumetal shield for C.R.T. 3BP1. Price around 30s. appreciated. Also require 50-100 watt dummy load. G3OWQ, 12 Robin Hill, Bedford.

WANTED—High power transmitter, components, valves, circuits, etc., also boat and W.H.Y. wide interest—will exchange 3X value in small radio/TV components. Tidswell, High Street, Gosberton, Spalding, Lincs.

WANTED. Contents, complete amateur shack, buy or swop my Armstrong Siddeley 346 Sapphire, an excellent example of this model. Box No. A.7139, c/o RSGB BULLETIN, 4 Ludgate Circus, London, E.C.4.

WANTED, AR88 or HRO Receiver with bandspread coils, triband beam and rotator or prop pitch motor. R. Field, 106 Greyhound Road, Hammersmith, London, W.6.

REQUIRED TO PURCHASE, RSGB BULLETIN Vol. 38, No. 3, September 1962. State price. E. R. Tudor, 179 Shelford Road, Trumpington, Cambridge.

EXCHANGE

HRO with 8 coils, top band home built TX, GEC P58 RX 300-650 Mc/s, 100 watt public address amplifier and numerous ham bits for: Mobile top band RX and TX factory built with p/pack. A. M. Deacon, G3NPH, 31a Moss Grove, Kingswinford, Brierley Hill, Staffs.

FOR SALE

FOR SALE ALL IN GOOD WORKING ORDER. Minimitter 120 watts £25. 36 Set sender and P.S.U. with R208 Rx £10. Morse inker and tape, £3. 30 feet mast with 2 Meter 6 over 6 unused and 36 feet Co-ax. Tiny Tim petrol generator 300 watts with self starter hardly used, £10. BUYER COLLECTS—G2FM DERwent 3122.

MARCONI CR.100. Excellent condition. Ideal for amateur radio. £15 o.n.o. plus carriage. Reply Box No. A.7137, c/o RSGB BULLETIN, 4 Ludgate Circus, London, E.C.4.

" ANTENNASCOPE " (James Millen, USA) for measuring antenna resonance, impedance, swr, radiation resistance, etc, complete with all coils up to 140 Mc/s. Brand new cost £28 will accept £15. TELESCOPIC alloy beam elements, brand new high tensile alloy already telescoped, average length 17ft, taper 1in to ⅜in, ideal for 20 metre beams, etc. £1 per length, 12ft lengths 15/-. ALLOY tubing 12ft long 1¼in and 1⅛in dia, 14/- per length. GM3BQA Quad complete £5. YAGI Boom/Element mounting clamps to fit 2½in boom and 1in to 1½in dia. elements. Super heavy duty for 20 metre beams cadmium plated and brand new, cost £2 to manufacture accept £1 each. CIRCULAR SAW alloy/steel/wood cutting 7in dia. blade, hardly used, cost £16 accept £8. Box No. A.7140, c/o RSGB BULLETIN, 4 Ludgate Circus, London, E.C.4.

FOR SALE: Eddystone 840C Receiver, 1963 model, in immaculate condition, £45. Prefer buyer collects. G. Wynes, 14 Brook Road, Bath, Somerset.

ZENER DIODES. VR9B, VR475B at 5/6 ea. IN430 at 6/6 ea. *Silicon Rectifiers.* IN459 at 1/6 ea. IN158 at 6/6 ea. 1N1271 at 30/- ea. *Valves.* 12BY7A at 5/- ea. 6094 at 6/6 ea. 6U8A at 5/6 ea. OZ4 at 2/6 ea. DF91 at 1/6 ea. 1A3 at 1/6 ea. 6BR7 at 6/- ea. *Transistors.* 2N217 at 3/6 ea. 2N43A at 5/- ea. TK41C at 3/- ea. OC16 at 6/3 ea. GET587 at 7/6 ea. All items post paid. J. Birkett, Radio Component Supplies, 9 Steep Hill, Lincoln. Phone 20767.

FOR SALE (contd.)

HALLICRAFTERS SX110, 0·54-34 Mc/s xtal filter. Excellent condition, unmodified. C/W 240V. transformer, £60. Delivery extra. Hoyle, "Ardtornish," Danby, Whitby. Castleton 319.

TRANSISTORIZED 12 volt 2 metre mobile Transceiver. Cost over £90. Offers or exchange good Communications Receiver, or W.H.Y. GW3KYT, 101 Penrhyn Avenue, Rhos-on-Sea, Denbs.

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OLYMPIC 100 watt TX. CW/Phone. 160-10 metres, new condition (list £80), £50. AR88 Receiver, £25. Carriage by mutual arrangement. Box No. Z.7134, c/o RSGB BULLETIN, 4 Ludgate Circus, London, E.C.4.

SERVICE SHEETS. Radio and Television, 3/6 post paid. S.a.e. with enquiries.—VEST AND EMERY, 17 Hallgarth Street, Durham.

SALE. HEATHKIT SB.10.U. As new. £30 o.n.o. Angle Iron Tower. £3. Ginder, 222 Whetstone Lane, Aldridge, Staffordshire.

COLLINS 75S-1 RECEIVER with accessory 500 cps filter and extra crystals £165. Collins 30L-1 Linear Amplifier, new 1963, £175. Heathkit HO-10 Monitor Scope, £30. Hammarlund HK1-B Electronic Keyer, £12. Jennings Vacuum Variable Capacitor 5-100pF. 7·5kV with dial, £10. Lots more gear, books, etc. All in new condition. G5RP, Old Gaol House, Abingdon, Berks.

FOR DISCERNING ENTHUSIASTS. Exotic semiconductors for short waves, UHF and power. 2N1742, 14-19dbs gain @ 200 Mc/s, 24s. 6d. RCA 2N3053, NPN silicon planar, 60V, 5W, fT = 100 Mc/s, 15s. 6d. ST&C thermistor R53, 21s. Tunnel diodes and other components, etc. Postage 6d., C.W.O. Please send 6d. stamp for new catalogue. J. Williams & Co. (RS), 208 Hagley Road, Birmingham 16.

HEATHKIT 0-12U 5 in. CRO, perfect condition, £21. Taylor Signal Generator 68A, 100 kc/s-220 Mc/s, CW/AM, £12 10s. Manuals and leads for both. 1960 ARRL Handbook 7s. 6d. Fry, G3NDI, Shirley 3730.

SELL/EXCHANGE Woden UM2, £2. 500-0-500 150 M/A, etc., £2. DT1, 10s. Two KT88s, £1. **WANTED** Valves for 430 Mc/s TX Eddystone 898 dial. J. Colebrook, G3BJD, 45 Lingmell Crescent, Seascale, Cumberland.

G2ADT offers useful data and circuit of Transistorised Crystal Calibrator, price 1/6. 5 Sussex Road, North Heath, Erith, Kent.

BUSINESS RADIO TELEPHONE EQUIPMENT comprising Pye P.T.C. 703 and four Pye P.T.C. 116 Reporter mobiles and two microphones. Offers invited from licenced amateurs (quote call sign). Apply: The Treasurer Pontypridd & Rhondda Joint Water Board, 28 Gelliwastad Road, Pontypridd, Glam.

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FOR SALE (contd.)

SALE. AR88LF, £30 o.n.o. Minimitter Mobile Whips, 160, 80, 40. WANTED SB1OU. G3MCN, 448 East Prescot Road, Liverpool.

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