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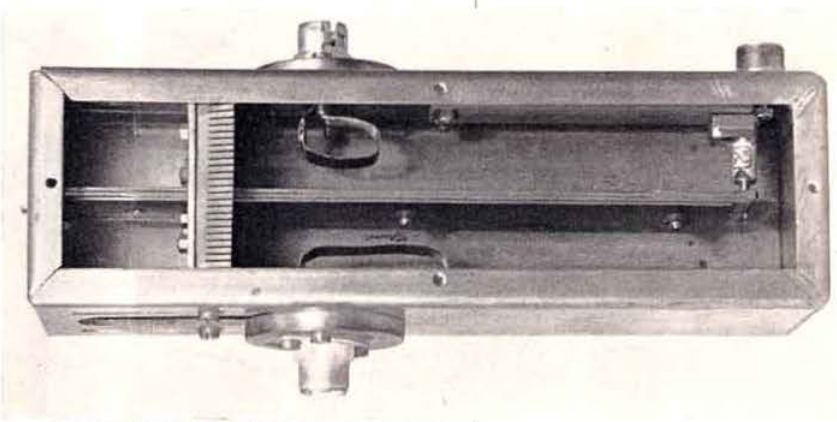

PARAMETRIC AMPLIFIER FOR 430 MC/S

JOURNAL OF THE RADIO SOCIETY OF GREAT BRITAIN

Volume 40 No. 6

June 1964

3/- Monthly

R.S.G.B. BULLETIN

CONTENTS

Front Cover: The construction of this parametric amplifier designed by Arnold Mynett, G3HBW, and an explanation of the theory of its operation, is described in the article which begins on page 366.

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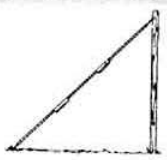
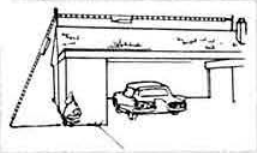
the EL TORO AERIAL by MOSLEY





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Current Comment

discusses topics of the day

New Licences for Old

AS this issue of the BULLETIN was about to go to press, the Post Office officially informed the Society that with effect from June 1 amateur transmitting licences would be issued in revised form. The new licences are the result of a tidying-up process which has been going on for some time and were considered in draft form by the RSGB GPO Liaison Committee in January last.

Replacement of existing licences will be spread over a year and will take place as renewal fees are paid. For this reason, it will be of considerable help to the Post Office if fees are paid promptly.

The new licences are the Amateur (Sound) Licence A, the Amateur (Sound) Licence B (the new phone-only u.h.f. licence), the Amateur (Sound Mobile) Licence and the Amateur (Television) Licence. For the most part, they are up-to-date versions of those which came into force in 1954. The Amateur (Sound) Licence B follows closely the pattern of the existing licence apart from the restriction to use of frequencies above 420 Mc/s and phone-only (telegraphy is not permitted).

The phone-only licences will have call-signs in the G8 plus three letter series while in future Amateur Television stations will have G6 . . ./T calls. The latter change will make TV stations particularly distinctive.

Other changes in call-signs are official recognition of /P operation at a temporary location (as opposed to /A operation at temporary premises) and variation of the prefix appropriate to the country in which operation is taking place. A new rule is that when the period of operation exceeds 15 minutes the call-sign must be sent at the beginning of each 15-minute period. Use of the " Alfa, Bravo, Charlie " phonetic alphabet contained in Appendix 16 to the Geneva Radio Regulations, 1959, is recommended.

Amateurs are now specifically authorized to receive transmissions in the Standard Frequency Service.

The log keeping requirements have been amplified and include the date, the time of commencement of every call (including tests made to ensure compliance with the non-interference clause of the licence), the call-signs of stations contacted and the time of closing down the station. Times must be stated in GMT. The frequency (not the frequency band) and the classes of emission must also be recorded in the log.

The use of recordings intended for entertainment is prohibited but special recordings of audio frequency tones can be used.

In the past there has been some doubt in the minds of amateurs as to whether visitors to an amateur station can be allowed to speak into the microphone. There is no change in the revised licences but a new sub-clause has been added to make it clear that speaking into the microphone is regarded as operation of the station and is therefore restricted to the licensee and other holders of UK amateur licences or the Amateur Radio Certificate issued by the Postmaster-General.

Minor amendments to the types of emission have been made and now include A3A (s.s.b., reduced carrier), A3H (s.s.b. full carrier), and A3J (s.s.b., suppressed carrier).

Finally, the licence must in future be kept at the station. A small point, perhaps, but one which mobile operators particularly would be well advised to follow strictly.

In this brief resume of the changes reflected in the new licences, it has been possible only to mention the most important. Next month, information will be given in greater detail.

The Swiss Quad Beam Aerial

By R. A. BAUMGARTNER, HB9CV *

THE cubical quad beam aerial has achieved world-wide popularity due to its superior performance in DX working. Its gain over long distances is comparable to that of a stacked two-plane Yagi array, although its height and width are only a quarter of a wavelength.

A factor which discourages widespread amateur and commercial use of this type of aerial system is its relatively complicated structure. During 1959 and 1960 the writer

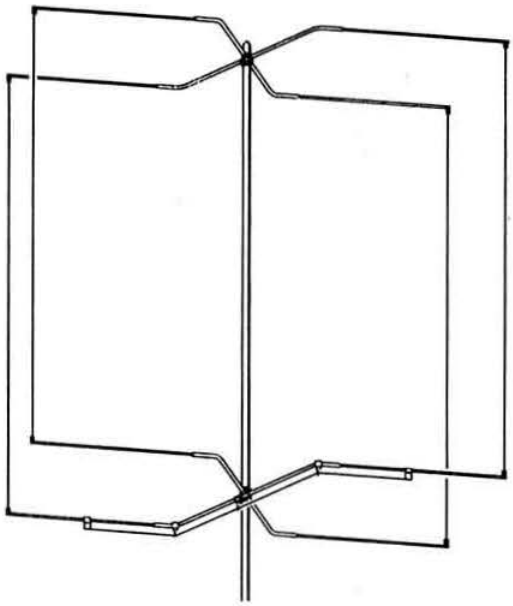


Fig. 1. General arrangement of the Swiss Quad.

endeavoured to find a design, based on the cubical quad, of a drastically simplified and improved form of construction which would not sacrifice electrical performance. Numerous tests and measurements with 145 Mc/s experimental aerials led to such new and positive results that in December, 1960, a patent application for a new type of quad was filed. This aerial was named the Swiss Quad.

Description

The Swiss Quad (Fig. 1) consists of two parallel squares having quarter wavelength sides and spaced 0·075 to 0·1 wavelength. The squares are fixed to the mast by bending the central sections of the horizontal elements at an angle of 45° towards the fixing points, thus avoiding the need for any supporting structure. All the horizontal components are made of light-weight metal tubes, and the vertical sections consist of litz wire, although v.h.f. aerials could be constructed entirely from metal tubing or rods. The horizontal tubes are continuous sections at the fixing points, thus avoiding mechanical weakening. Electrical insulation is omitted entirely as both fixing points at the mast coincide with the voltage nodes of the aerial. It has been proved that only in the parallel position can both squares produce the correct mutual phase relationship essential for the production of a polar diagram with sufficiently small minor lobes to concentrate about 95 per cent of the radiated power into the main beam. The radiation pattern is not seriously affected by the crossed aerial sections near the mast as the currents in opposite parts are in anti-phase, thus cancelling most of the radiation.

Low radiation resistance and narrow bandwidth appear to be a direct result of the unusually close spacing of 0·075 and 0·1 wavelength. As the whole aerial is driven, the power is distributed equally over all four dipoles, and the radiation resistance therefore remains between 30 and 40 ohms. By keeping the spacing to the recommended value of 0·1 wavelength there is ample bandwidth for the 40m, 20m, 15m, and the greater part of the 10m band. Though the reactances increase relatively rapidly when deviating from the resonant frequency, the polar diagram is almost unaffected by deviations of up to 9 per cent.

The whole aerial is driven by a simple feed system whose feeder connection is at the bottom fixing point; alternatively the top fixing point could be used. For co-axial cables of 50 to 75 ohms, the feed system can consist of a double gamma match (Fig. 2). For all twin feeder lines of 120 to 600 ohms, double T-match sections may be used (Fig. 3).

The two squares of the Swiss Quad are connected together at both voltage nodes and are fed 180° out of phase. No phase shifting network is required. A striking fact is that the correct phase relationship for unidirectional radiation, which is slightly off 180°, is achieved in the aerial itself solely by making the sides of both squares 5 per cent different in length. The smaller square is therefore acting as the driven director, and the larger as the driven reflector. The capacitance of the director and the inductance of the reflector cancel each other at the feed point. The resonant frequency of the aerial as a whole, measured at the feed point, lies midway between the separate resonances of each square. The figure of 5 per cent is the result of numerous field strength measurements. Differences of perimeter between reflector and director of less than 5 per cent produce enlarged minor lobes, and differences of more than 5 per cent widen the main beam, thus decreasing the gain.

When connected to a transmitter, the Swiss Quad draws power in the same way as a simple dipole. This is fair evidence of the proper functioning of the theoretically complicated relationship between the two directly driven

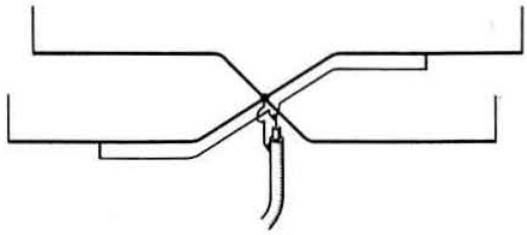


Fig. 2. Co-axial feed and matching system.

* Heimstr. 32, Bern 18, Switzerland.

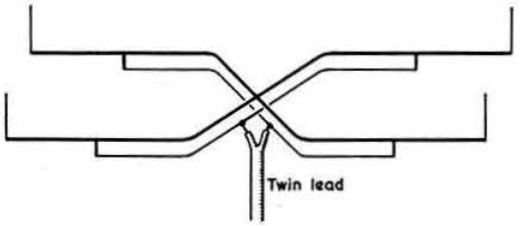


Fig. 3. Balanced feed and matching system.

squares, including their mutual coupling by radiation, and the coupling of the whole aerial with space.

The mechanical advantages of the Swiss Quad are: all metal construction (" plumber's delight "); no auxiliary structure; stability due to fastening the aerial elements directly to the mast; proved rigidity in gales, snow and ice. The electrical advantages are: simple and adequate feed system; no aerial insulators; low current losses due to equally distributed power in all elements, and use of tubes in high current areas; no voltage losses as high voltage points are in free space; all types of feeder in common use can be matched.

Design Features

The perimeter (L) of the Swiss Quad square must be slightly longer than one wavelength, the multiplication factor being 1·12. This figure is hardly affected by aerial size and conductor diameter and can thus be considered accurate for all practical purposes.

As the difference in perimeter length between the two squares is 5 per cent, the reflector square has to be 2·5 per cent longer, and the director square 2·5 per cent shorter than the resonant length. Thus the main dimensions are determined as follows:

Reflector perimeter $L_r = 1{\cdot}12\lambda \times 1{\cdot}025 = 1{\cdot}148\lambda$
Director perimeter $L_d = 1{\cdot}12\lambda \times 0{\cdot}975 = 1{\cdot}092\lambda$
Spacing $= 0{\cdot}1\lambda$ to $0{\cdot}075\lambda$

In practice, all vertical components are made equal in length, and the required difference in perimeter is achieved by altering the lengths of the horizontal components only (Fig. 1).

The dimensions for 10m, 15m, 20m and 40m Swiss Quads are given in Table 1.

Construction

The fastening of the two sets of crossed tubes to the mast, and the use of 45° bends are two features of the Swiss Quad. A mast junction which can be made with simple tools is shown in Fig. 4. The crossed elements are secured to a short length of right angled bar by four aluminium cleats, and the whole assembly is then clamped to the mast with Jubilee clips. This type of mast junction has the disadvantage of the

TABLE 1

Band and Frequency	Wave-length (metres)	Aerial height (inches)	Reflector width (inches)	Director width (inches)	Spacing (inches) 0·1λ	Spacing (inches) 0·075xλ
10m 28,500 kc/s	10·52	116	121·5	110	41·3	31
15m 21,200 kc/s	14·14	156	164	148	55·5	42
20m 14,150 kc/s	21·20	234	246	222	83·5	62·5
40m 7050 kc/s	42·60	470	493	443	168	126

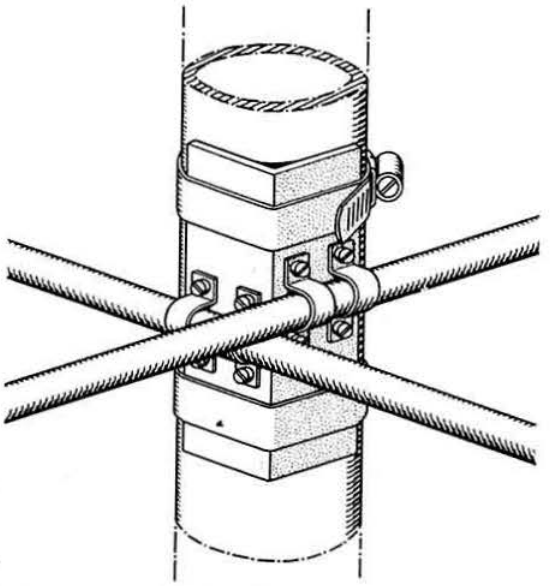


Fig. 4. Simple method of securing aerial elements to mast. See text regarding insulation required due to slight electrical asymmetry.

element fastenings lying slightly outside the voltage node: the crossing points of the tubes are the electrical and mechanical centres of the aerial, and are the only points where the tubes can be connected together and to the mast (Fig. 5). Therefore, if this method of fixing is used, the tubes must be insulated from the securing cleats with weatherproof insulating tape or some suitable plastic strip. This insulation can be kept very thin as the r.f. voltage is low at these points.

A commercial type of mast junction is shown in Fig. 5. This can be considered an ideal solution, although rather more difficult for home construction. No insulation of any sort is required as the voltage node, crossing point, and fastening all coincide.

The satisfactory bending of light metal tubes by 45° requires a certain amount of practice. The tube has to be packed firmly with dry sand, corked at both ends, and bent around a metal object of suitable radius. Hard and medium alloys should be softened by heat treatment prior to bending, but as they are weakened by this procedure, it might be advisable to have the job done by an experienced metal-worker.

As a guide to construction methods, the tube dimensions for a 15m Swiss Quad are given as an example. The four central sections consist of hard aluminium alloy and extend beyond the 45° bends by 8 in. The outer diameter is $\frac{8}{8}$ in., and the wall thickness is 18 s.w.g. The eight straight outer tubes, of the same material, are of $\frac{1}{2}$ in. outside diameter, and have 24 s.w.g. walls. The clearance which exists when they are telescoped into the central sections is taken up by wrapping aluminium foil around the ends. A firm joint between the telescoped tubes is made by slotting the outer tubes, and compressing them with small clamps (Fig. 6). The total weight of the whole 15m structure is only 6 lb.

Mechanical stability of the aerial can be improved considerably by bending the horizontal sections so that the top elements bow slightly upwards and the bottom elements slightly downwards. When tied together by the vertical wires, and thus held in the correct shape, both aerial squares

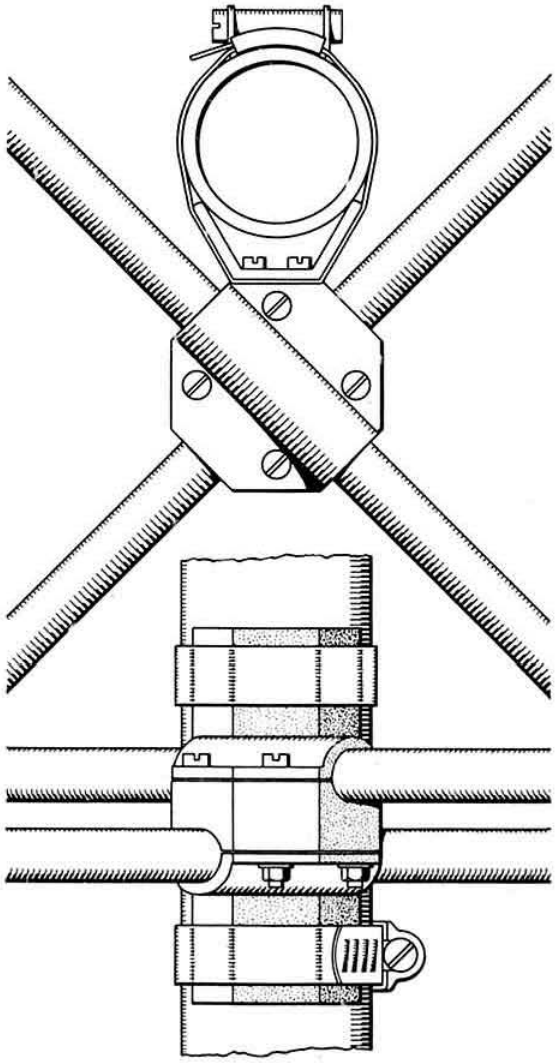


Fig. 5. A commercial type of aerial fixing requiring no insulation due to electrical symmetry. See text.

are under tension and remain rigid even in strong winds. Any temporary detuning effects and fatigue damage are consequently avoided.

The feed system is shown in Fig. 6. Standard plastic insulated wire has proved to be excellent for gamma- and T-matching sections. A wire diameter similar to that of the feed line is recommended; thicker conductors or tubes for the matching system are unnecessary. Spacing between the matching section and elements is not critical, and an adequate distance is $\lambda/200$. The insulation should only be removed at the connecting points. When using co-axial feeder, a 72 or 75 ohm cable is recommended as this gives a broader bandwidth than 50 ohm cable. For symmetrical feed systems, twin feeders of 300, 240 or 150 ohms are suitable.

Aerial Tuning

Correct tuning is essential to achieve efficient operation, and the Swiss Quad is easily adjusted with the help of a grid dip meter and standing wave indicator. Exact positions of the gamma- and T-matching taps cannot be given because of the unknown factors involved such as aerial construction, height, and surrounding objects. The first step in the setting-up procedure is to set the taps halfway between the 45° bends and the outer ends of the horizontal elements, leaving a few inches to spare at the ends of the matching sections.

The grid dip meter is now loosely coupled to the transmitter end of the feeder to determine the resonant frequency of the aerial. Several sharp and pronounced resonance dips may occur, depending on the length of the feeder, whereas the true aerial resonance dip is broader and weaker owing to the radiation resistance load. If the resonant frequency is found to be too far off the desired frequency, then the necessary correction to the aerial length can be calculated proportionately. Changes in aerial length are carried out by moving the lower fixing point up or down the mast, and altering the lengths of the vertical wires at their bottom ends accordingly. After tuning, the impedance matching has to be carried out by moving the gamma- or T-matching taps until a standing wave ratio of 1·2 is achieved. As changes to the impedance matching system cause slight changes to the aerial's resonant frequency, a final check of resonant frequency and s.w.r. should be made.

A Multiband Swiss Quad

The superiority of this type of aerial is in its high DX gain, and therefore it would be fundamentally wrong to construct a single multiband Quad using traps. Any such compromise would result in the loss of that much sought after and extremely useful extra gain. Consequently separate Swiss Quads for each band should be considered, as is the practice in cubical quad construction.

Several Swiss Quads can be fastened concentrically on the same mast. A 10m aerial can be mounted inside a 15m aerial which in turn can be mounted inside a 20m aerial. It is assumed that any mutual coupling effects will be avoided if the 15m aerial is turned 90° out of azimuth.

V.H.F. Aerials

The Swiss Quad concept makes it possible to construct handy v.h.f. aerials from thin tubes, rods, or even copper wire. For mobile work its small size is a big advantage. It must, however, be pointed out that its gain for ground wave propagation is only 6 to 7·9db. It has not yet been investigated whether the gain for v.h.f. aurora contacts is over 10db as is normal for h.f. DX contacts. Experienced v.h.f. operators will find no greater problems in constructing Swiss Quad arrays than other types of aerial.

Swiss Quad Performance

The following measurements have been proved in actual practice, and are the results of tests and comparisons on the 145 and 21 Mc/s bands.

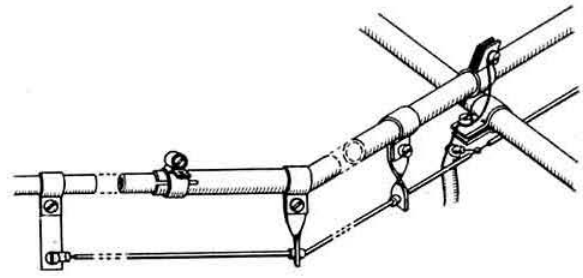


Fig. 6. Detail of matching system for co-axial feeder.

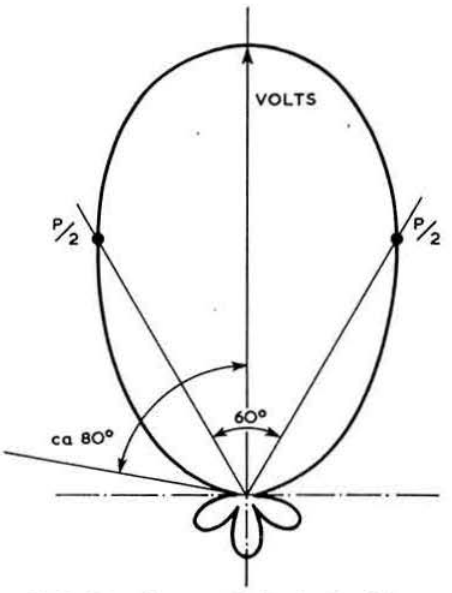


Fig. 7. Polar diagram of Swiss Quad aerial.

Power gain in comparison to half-wave dipole:

Direct radiation (short distance)	6 to 7·9db
Intercontinental distances	12 to 14db

Front-to-back ratio:

Short distance (10 miles)	15db
Short skip (600 miles)	10 to 12db
DX working (over 2000 miles)	18 to 24db
Side minima (80° off main beam)	−32 to −40db

Main beam width between half power points 60°
Polar diagrams: see Fig. 7.

Results using a 15m Swiss Quad

The writer erected a 15m Swiss Quad on a three storey house, which makes the electrical centre of the aerial 50 ft. above ground. The house is in a typical suburban area, surrounded by high blocks of flats and factory buildings. The figures given above were recorded at this site during a test period from July, 1961 to July, 1962. The radiated power was maintained at approximately 50 watts (70 to 75 watts input), and all tests were carried out on phone. The aerial withstood several severe gales and heavy falls of snow for more than 18 months without the slightest damage occurring.

The outstanding electrical feature of the Swiss Quad is its DX gain of 12 to 14db. As confirmation of this high figure, it can be stated that amid the densest weekend traffic, the aerial proved its superiority. Rare DX stations, besieged by numerous Europeans, generally acknowledged the first short call, even if they had tried for some minutes previously to identify one of the many other calls. A 50 watt station in an average location could not become one of the top European amateur stations if the aerial gain were not so exceptional.

A most interesting fact is that the unusually high gain of this aerial has proved to be decisive in establishing and maintaining contacts under difficult conditions. The other radiation properties are of minor significance since moderate side and back lobe suppression can easily be compensated for by using modern receivers of high selectivity and accurate v.f.o.'s. During contests, however, fair reception from all directions may even be desirable. Another advantage of the light 15m quad is that it can be easily turned through 360° within 8 seconds. Furthermore, a strong interfering signal can be placed in one of the side minima, 80° either side of the main beam, thus attenuating it by 40db.

Conclusion

Cubical quad beam aerials are rather complicated structures which present the beginner with some problems. However, any amateur with only slight experience of beam aerial construction should be able to build the Swiss Quad successfully.

The only significant disadvantage inherent in this aerial is that the mast has to reach the top, and is thus relatively high and more difficult to erect. However, the mechanical stability of the Swiss Quad is better than that of a cubical quad and makes really light-weight " plumber's delight " construction possible.

The construction of an " invisible " Swiss Quad using very thin stainless steel tubes for the horizontal sections appears very tempting to the writer. The weight and wind resistance would be so small that the mast could be kept extremely light. The aerial would be almost invisible from a distance, and certainly no more conspicuous than a ground plane. Many amateurs living in flats might therefore obtain their landlords' permission to erect this most efficient aerial.

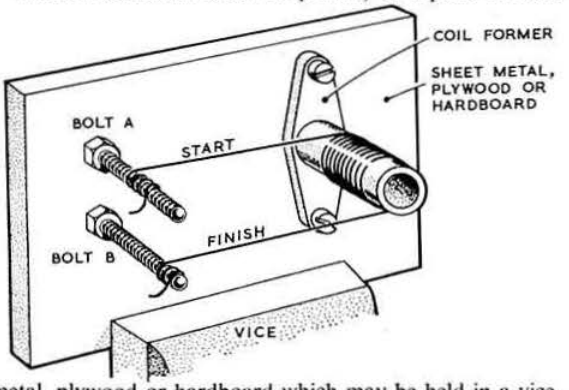
Commercial production of Swiss Quad kits is at present being investigated, and it is hoped they will be available in the near future, thus simplifying the problems of home construction.

The author wishes to thank G2SC for his co-operation in connection with this article.

A Simple Pre-Amplifier for 3·5 to 30 Mc/s

In this article, which was published in the December, 1963 issue of the BULLETIN, reference was made to the use of Sellotape in the construction of the coils, this material being employed to secure the turns of wire to the former during the process of winding, as well as to cover the completed coil. It has since been revealed that the adhesive in Sellotape may attack copper, and although the writer has not experienced this trouble, the following alternative method of constructing the coils has been suggested by R. J. Hughes, G3GVV.

The coil former is bolted temporarily to a piece of sheet



metal, plywood or hardboard which may be held in a vice. Two 4BA bolts *A* and *B*, are fitted to this plate as shown in the drawing. One end of the wire is secured to bolt *A*, either by tying or by soldering it to a tag, and the required number of turns wound on the former. The finishing end of the wire is then secured to bolt *B* and polystyrene cement applied to the winding. Naturally, the distance from the bolts to the former should be such as to leave ample wire for connections.

It is regretted that in the original article, the number of turns on the coil for range 4, covering 16·5 to 30 Mc/s was omitted. 13 turns should be wound on the former.—W.H.A.

Some Notes on the Construction and Alignment of the G2DAF-type Receiver

By GEORGE C. MONKHOUSE, BRS25729*

IT all began in a Southampton boat train in 1962 when my twelve-year-old son spotted the description of the G2DAF receiver in the RSGB *Handbook*. Handing it to me he said, " I'll bet you couldn't make that! " Here indeed was a challenge because although I had been interested in radio receivers for over 40 years, and in more recent times we had modified a Marconi CR100/8 and a Hallicrafter 36A as well as making up the Mohican and many of the excellent Heathkit instruments, this was the sum total of our experience.

I would like to make it quite clear that what follows is not intended for the expert but rather for people like me who have only a superficial knowledge of the technical problems involved in the design and construction of a modern s.s.b. communication receiver. There must be many people who hanker after such a receiver but it is either beyond their pockets, many of them costing two or three hundred pounds or more, or they imagine that the construction and alignment of such a complicated piece of equipment is beyond them. The G2DAF receiver is described in detail by Mr. Thornley in the RSGB publication *Communication Receivers* and this is a must for would-be constructors. This receiver, carefully constructed and aligned not only has a professional appearance but will more than hold its own with the majority of commercially available receivers as regards sensitivity, stability, signal-to-noise ratio, ease of operation on s.s.b. and general handling qualities.

No two layouts will be identical and, therefore, the problems and difficulties met by other constructors will not necessarily be the same as I have experienced, but what follows will I hope be of assistance to would-be builders of this delightful receiver.

Components

G2DAF's estimate of at least six months' spare time work is near the mark and in view of the many hours of labour involved I would strongly advise the use of the best components you can afford. I decided to go the whole hog and start with top grade components to minimise the troubles from this score, and I am very glad I did so. A Philpotts chassis and cabinet, Electroniques switches, coils and i.f.t.'s, a set of 18 crystals from the Quartz Crystal Co., Eddystone capacitors and slow motion drive, the mains transformer, chokes and other components, including the valves, will cost nearly £90 of which one-third is the price of the crystals. In any case I am not clever enough to regrind surplus crystals but I doubt if these are as good as their modern glass or metal enveloped counterparts. I used a tunable i.f. of 5-5·5 Mc/s, and to economize in space had the 115V bias winding put on the mains transformer.

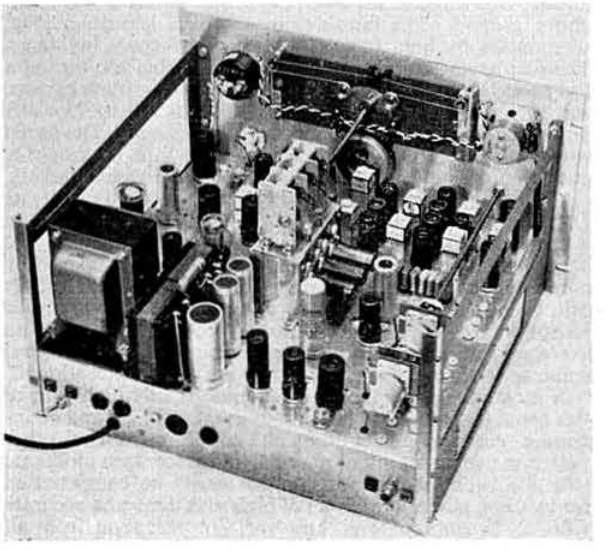
I suggest that you should acquire all the major components before you make a start on the metal work. We all have our individual preferences as regards front panel layout and by the same token that I did not want a Chinese copy of G2DAF's layout, neither will you want a replica of mine. I used two sheets of thin white card, 17 in. × 16 in. for the chassis and 19 in. × 10½ in. for the panel and set on them all the major components and controls keeping a careful eye on the location of the under-chassis partition screens, the length and run of important leads and the accessibility of minor components under the chassis. It is well worth spending quite a lot of time and thought on this initial setting out as it will avoid a lot of trouble later on. Having arrived at your ideal layout draw this out full scale on your white cards which you can then use as templates for marking out if you so desire.

Metalwork

At this juncture a few words on the metalwork may not come amiss. I used ½ in. aluminium angle fixed with 6BA screws, nuts and shakeproof washers at the ends of all the main partition screens, which makes for a much more rigid job. In addition I made side frames to the chassis which not only stiffen up the chassis and front panel but also serve as handles for lifting the receiver, but perhaps more important they enable it to be stood on either side or to rest upside down on the bench without damaging the components. Your receiver will spend much of its early life in this position! I also made a little nine hole drill jig for the i.f.t.'s—it is well worth it and saves a lot of marking out.

I committed the unforgivable " sin " of doubling the 460 kc/s i.f. strip back on itself which will send cold shivers down the spines of the pundits! I have, however, run a low level screen between the two legs as well as screening off the a.g.c. system. I have also put in an additional short screen between the cascode anode coils and the conversion oscillator coils.

Since the Eddystone slow motion drive necessitates mounting the tunable i.f. capacitor 3¼ in. above chassis level, I have mounted this capacitor on the top of a little sheet metal box which houses the three valves of the tunable i.f. and the associated coils and other components. This unit can then, of course, be roughly set-up before mounting it on the chassis. I have replaced the grub screws on all spindle



The completed G2DAF-type receiver. Switch on rear of chassis controls monitoring loudspeaker for test purposes. See text.

* Wyck Cottage, Oakhill Avenue, Pinner, Middx.

couplings with Allen screws as these can be done up really tight and I have used solid brass couplings where the last trace of back-lash must be eliminated as for example in the tunable i.f. capacitor.

Another minor but useful refinement is a small monitor speaker on the front panel which is a godsend in the setting-up of the receiver as it means one less pair of leads to get snarled up when you turn the chassis over. A switch on the front panel to cut the h.t. supply to the *Q* multiplier to make certain it is off when not required and a 25 pF variable capacitor in the tunable i.f. oscillator which facilitates edging-in s.s.b. stations which although nominally in a net, are not quite on frequency, without having to retune the receiver, are also useful. Since this trimmer is in the oscillator cathode circuit and it lies directly under the tunable i.f. unit no special precautions are necessary.

I have included on the rear chassis flap a Bulgin fuse in each mains lead as well as the h.t. negative, a 3-pin outlet with 150V stabilized h.t. and 6·3V for heaters which is useful for any accessory equipment that may be required and a d.p. switch to change over from the front panel monitor speaker to a pair of sockets for an external speaker.

If you want to light the Eddystone dial you will have to find a way of doing this yourself since, surprising to relate, the makers do not supply anything for this. I made up some little aluminium brackets with rubber grommetted holes into which I pushed 8V Japanese miniature bulbs, one at each corner of the scale. These give adequate illumination. This reminds me that I put grommetted holes right, left and centre of each of the main partition walls, fifteen in all at chassis level, to carry the wiring from one compartment to another.

Construction

I mounted the product and a.m. diodes with their associated components on a tag board on the top of the bracket carrying the s.s.b./a.m. changeover switch; similarly the a.g.c. bias components lie very close to the r.f. gain and a.g.c. switch and the a.g.c. valves V11 and V12. The wiring is coded in coloured and candy stripe p.v.c. which makes for easy lead tracing. All of it is unscreened except for the lead joining the grids of V9 and V11 through a 500 pF capacitor, the *Q* multiplier lead from V10 to V7, the leads from V14 and V15 to the audio gain control and the connection between the tunable i.f. mixer and i.f.t.1. Extensive use was made of stand-off and feed-through insulators marketed by Oxley

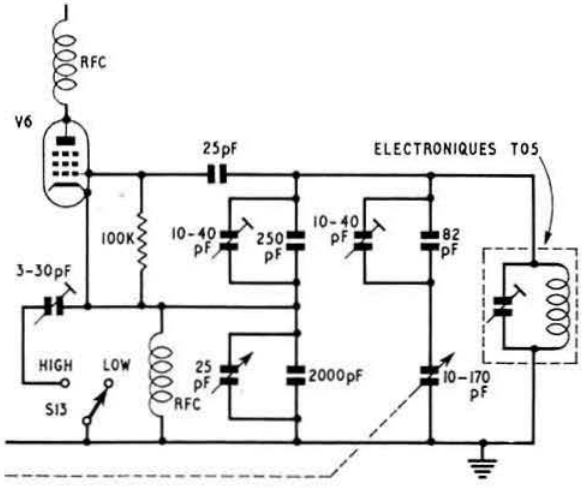


Fig. 1. Circuit diagram of the tunable i.f. oscillator.

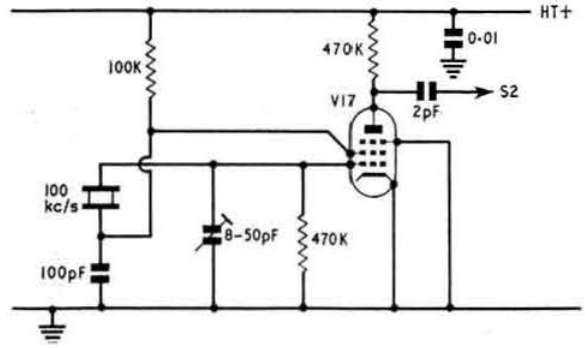


Fig. 2. Circuit diagram of the calibration oscillator.

Developments, the $\frac{5}{32}$ in. holes being drilled as you go along. These give proper support and anchorage to components which would otherwise be liable to flop about. For the same reason long leads are firmly anchored with wiring clips.

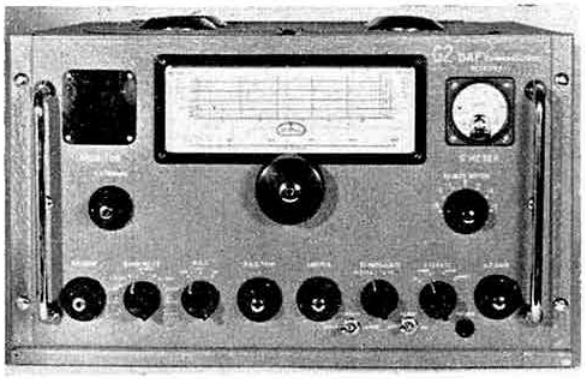
I started by putting in all the heater wiring and used double wiring throughout to minimise eddy currents in the chassis, earthing one of the leads back at the mains transformer. If you get instability you can in addition try earthing the heater of the offending valve at the valveholder. The h.t. and bias circuits should come next followed by the audio section which can then be tested and will give you heart to proceed with the more difficult sections. Next came the detectors and the carrier insertion oscillator, the 460 kc/s i.f. strip and the a.g.c. system, then the conversion oscillator, the cascode r.f. stage and the calibration oscillator. The tunable i.f. was, as mentioned earlier, made as a separate unit.

The Electroniques tunable i.f. oscillator coil required different capacitor values to those given by G2DAF and I have indicated these in Fig. 1. These fixed and preset padders will help you to obtain a reasonably linear calibration. I have also shown the oscillator trimmer which makes for easier tuning of slightly off-frequency s.s.b. stations. I have at the instigation of G2NH modified the circuitry of the calibration oscillator V17 (Fig. 2) as this gives a higher harmonic output on the 28-30 Mc/s range. Otherwise all the component values are exactly as given by G2DAF.

Do be patient and careful over the wiring and soldering, for wrong connections are tiresome enough to find but badly soldered or dry joints can be the very devil. With such a complicated receiver it will be little short of a miracle if you do not have feedback and/or instability troubles, but you can eradicate a lot of these from the start by taking certain elementary precautions to eliminate r.f. strays. Keep all the wiring short, running it as directly as possible from point to point and keeping it tight down to the chassis or screen. All components should be mounted as close as possible to the valveholder or i.f.t. pins, resistors uppermost and the capacitors, preferably disc ceramics, pressed down flat on the chassis. All valveholder spigots should be earthed and all components should have their earthed ends brought to the same earth point of their associated stage. Keep grid and anode leads as far apart as possible.

Alignment

Now for the alignment for which you need a frequency meter such as the BC221 or LM14. With the a.g.c. off, start with i.f.t. 7 and work back to i.f.t. 1, getting each transformer centred on 460 kc/s. If you are using Electroniques transformers be sure that Nos. 1-5 are of the "X" type. A diode probe and a valve-voltmeter are particularly useful when you come to the half-lattice filters to ensure that you are not peaking the signal on one or other of the crystal



Front panel of receiver showing monitoring loudspeaker.

frequencies instead of midway between. As you tune the wavemeter through 460 kc/s there should be two peaks separated by a shallow trough. The trough at 460 kc/s being in the middle is slightly lower than the peaks which are on 459 kc/s and 461 kc/s, and outside these the reading drops very rapidly. This takes a little time and you may well find as I did that as you reach optimum alignment that one or more of the i.f. stages wants to take off, which in my case was V7. It is, of course, absolutely essential to get the i.f. strip stable on centre frequency before attempting to adjust the shape of the passband. Finally peak i.f.t. 9 for the a.g.c.

Some people have, I believe, managed to shape the passband with a diode probe and a valve-voltmeter which involves a great deal of laborious plotting whereas with a "wobbulated" signal generator, an oscilloscope and the little rectifier unit described by G2DAF in the RSGB BULLETIN,† it is not only much easier but much quicker. If, and I repeat if, your i.f. strip is stable and on centre frequency it will only take you an hour or so to touch up the dust cores on the i.f. transformers to obtain the correct passband shape and with modern crystals you should have no trouble with side lobes, but perhaps I was fortunate.

Now tackle the tunable i.f. unit remembering that it is the heart of the receiver and that it is imperative that it operates over the correct frequency range if signals are to be on the right band. A tunable i.f. of 5-5·5 Mc/s and a fixed second i.f. of 460 kc/s means that the t.o.V6 must tune from 5·46-5·96 Mc/s. If you are using an Eddystone dial the capacitor is fully meshed at the right-hand end of the scale. In other words the right-hand end is the low frequency end of the tunable oscillator and the high frequency end of the band, and *vice versa* for the left-hand end. Fix a strip of transparent tracing paper on the window of the Eddystone dial and mark the two ends of the scale. If you want a small overlap of say 25 kc/s, which is about ¼ in., then start at the right-hand end and make another mark ¼ in. below the scale end mark and set the pointer on this. With the frequency meter set to 5·46 Mc/s adjust the dust core of the oscillator until you hear the signal. Similarly having reset the pointer to ¼ in. above the left-hand mark and the frequency meter to 5·96 Mc/s, adjust the oscillator preset trimmer until you hear the signal. You may have to repeat this procedure a number of times as well as playing with the two 10-40 pF preset capacitors to get the tunable oscillator correctly centred on the scale. Now feed in a 5 Mc/s signal at the front-end of the tunable i.f. and with the dial pointer on the right-hand mark adjust the dust cores of the two t.i.f. V4 grid coils for maximum signal. Then with the pointer on the left-hand mark and a 5·5 Mc/s signal adjust the preset trimmers for maximum signal. Leave the scale linearity alone for the time being.

The conversion oscillator V3 and first mixer V2 are quite straightforward, and having peaked the nine anode conversion oscillator coils to resonance with the crystals, check that you are getting the correct grid current at V2.

Cascode R.F. Stage

The cascode r.f. stage V1 can be extremely difficult to stabilize and I know of people who, after weeks of fruitless effort, have abandoned it for the conventional r.f. pentode. I would most strongly advise you not to do this, but if you must, then do not use a high-slope valve. G2DAF has been at some pains to point out that for an amateur band receiver the only gain required before the first mixer is that necessary to overcome the mixer noise; any further gain than this will not increase the signal-to-noise ratio in any way whatsoever. It will, however, amplify strong unwanted signals to a level where they will cross-modulate the mixer and in this respect the cascode r.f. amplifier is the answer.

You may have to rewire the cascode stage several times before you tame it. You must keep the grid and anode leads well away from one another and all the components should be mounted tight up on the valveholder pins. Having peaked the aerial and anode coils on each band, preferably with the r.f. tuning capacitor set somewhere near the middle of each band as this makes for easier operation when the receiver is switched from band to band, the next step is to neutralize the cascode stage. With the aerial disconnected and no dummy load adjust the neutralizing capacitor until the r.f. stage is stable on all bands and at any setting of the r.f. tuning capacitor. The relative earth points on the chassis of the aerial and anode coils can be quite critical and if you encounter this particular trouble you will have to find these points experimentally.

Calibration and Carrier Insertion Oscillators

The calibration oscillator V17 trimmer should be adjusted for zero beat on 5 Mc/s with MSF Rugby. The adjustment of the *Q* multiplier V10 for reject is rather critical and I am still not completely satisfied with its performance. The setting of the balancing potentiometer VR4 for the product detector is simple but critical, whereas the core adjustment of i.f.t. 8 is not at all critical.

I found it necessary to put in an r.f. choke and a 0·01 μF capacitor in the anode circuit of the c.i.o.V13 between i.f.t. 8 and the junction of the 2·2K ohm and 150K ohm resistors to prevent r.f. getting back down the 150V stabilized h.t. line into the t.o.V6 which affects the a.g.c. giving a false *S* meter reading and reducing the gain on s.s.b. There should be no change in the *S* meter reading when switching from a.m. to s.s.b. If there is, there is something wrong!

Receiving Signals

You should now be able to receive signals, and once you have familiarized yourself with the operation of the receiver it only remains for you to make the final adjustments. Don't be misled by lack of noise. One of the chief fascinations of the G2DAF Receiver is its quite extraordinary signal-to-noise ratio. It does not make a loud rushing noise and on "dead" bands, like 10m has been in recent times, one at first begins to wonder whether the receiver is working. You will soon, however, have plenty of evidence that if there are any signals to be heard you will hear them but with very little background noise, hash-mush, call it what you will. The receiver is also virtually free from spurious signals and whistles.

Scale Linearity

The adjustments for scale linearity are time consuming yet intriguing, and you can, if you want near perfection, go on juggling with these for a long time! Switch the receiver to "calibrate" and leave it to warm up for an hour or so. You should hear the pips from the calibration oscillator on each

† "Single Sideband," RSGB BULLETIN, February 1963, page 424.

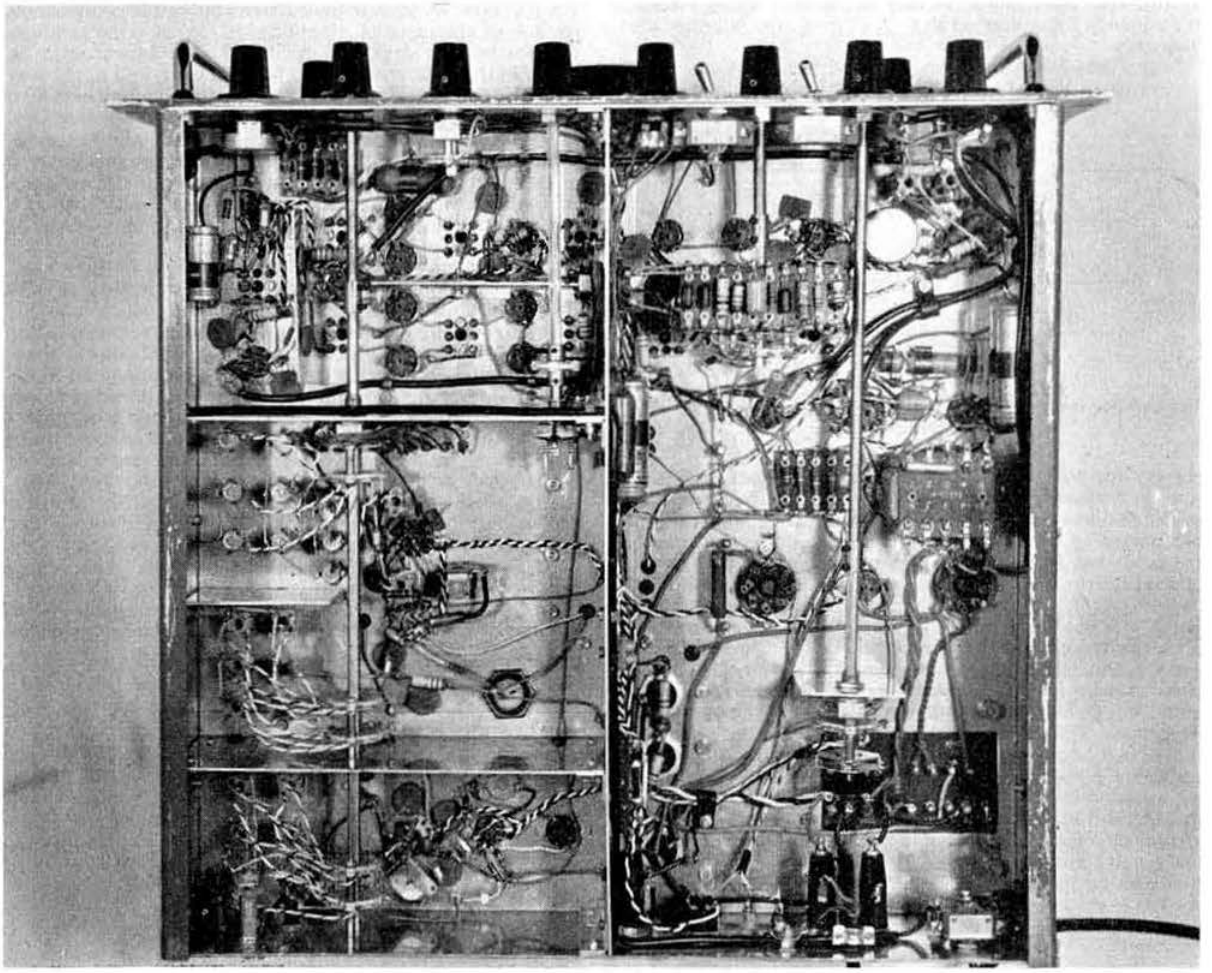
of the two points you have marked on the tracing paper as the ends of your 0·5 Mc/s tuning band at any position of the bandswitch after peaking the r.f. tuning control. If you don't, then check that the conversion crystals are in their correct holders and that their respective anode coils are on the right frequency. If you are still in trouble one or more of your crystals may be off frequency. Now tune slowly across the scale and you should hear six 100 kc/s marker pips, one at each end, and four more between them, which you should faintly mark on the tracing paper. In all probability these will not be evenly spaced. I have given the capacitor values I have used with Electroniques coils in Fig. 1. A very small " tweek " one way or the other on the preset padders will open or close the scale at one end or the other, and by ringing the changes you should be able to obtain a reasonably linear scale. Having marked the 100 kc/s bars you can then use your frequency meter to divide each 100 kc/s into 10 kc/s units and scale calibration is complete. A draughtsman friend can " write " it on the Eddystone dial for you. Don't clutter it up with a lot of superfluous lines and figures, but for easy reading keep it as simple as possible. It is well worth the relatively small additional cost to have the front panel properly engraved instead of using transfers because however adept you may be at applying them the final appearance cannot compare with an engraved panel.

I have recently replaced the 5Z4 rectifier valve which generates a great deal of unnecessary heat with a pair of SD910A silicon diodes which, together with their two 47 ohm surge resistors, can be snugly housed in a Bulgin octal plug and inserted into the valveholder.

I realize that much of what I have written is rather sketchy, and to the experienced constructor quite superfluous, nevertheless I hope that it will help and encourage those who might otherwise funk it, so depriving themselves of the pride and pleasure of owning such a really wonderful receiver.

G2DAF has done all the donkey work and his explanations and conclusions in *Communication Receivers* will become all the clearer when you have got your receiver to work reasonably well, and as a result you will then be able to make it absolutely " au point."

During the construction stage a number of people took a great deal of interest and gave me much useful advice: G3SM and G3PBR, Mervyn Amor and Richard Mann. Later during the setting up and alignment both G2TA and G3HBW came to the rescue with their wealth of experience of such matters, but I suspect they enjoyed it! Finally, I would once again like to thank G2DAF for making all this possible.



A view underneath the receiver chassis.

PARAMETRIC AMPLIFIERS

By A. L. MYNETT, B.Sc., G3HBW*

THIS is a design for a variable capacitance diode parametric amplifier for operation in the 430 Mc/s band, preceded by a discussion of the factors involved in designing such a device.

Principles of Operation

The principle of the parametric amplifier is bound up with frequency changing and may be simply explained as follows:

Frequency changing by mixing is normally accomplished by modulating a non-linear resistance with an a.c. voltage at a frequency f across it at some other frequency f_1. It can be shown that the output from the modulated resistance then contains, apart from f and f_1 themselves, their harmonics $2f$, $2f_1$, $3f$, $3f_1$, etc., and also components of the form f-f_1, f+f_1, and higher order components. This is essentially what happens, for instance, when a normal crystal diode is used for frequency changing. The relatively strong local oscillator voltage at frequency f_1 modulates the resistance of the diode from low to high values, so that the weaker signal voltage at frequency f is converted to $f-f_1$ or $f+f_1$, the intermediate frequency.

It can be shown that this form of frequency changing always gives less i.f. output power than the input signal

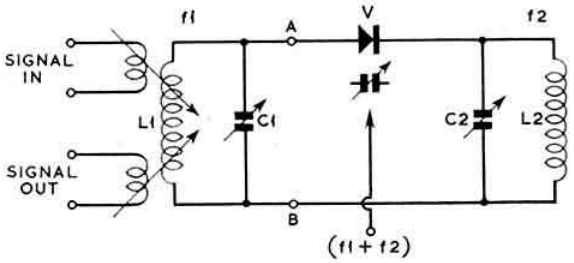


Fig. 1. Basic theoretical circuit of a parametric amplifier using a Varactor diode.

power, due to loss in the modulated resistance. It is possible to frequency change in another way. If a reactance is modulated instead of a resistance, by a strong signal in the presence of a weak one, then the same output sidebands are produced, but it is now possible to obtain more power at the i.f. than is fed in at the signal frequency, although, of course, the i.f. power cannot exceed the sum of the applied signal and oscillator powers! Suppose that a device which possesses the property that its reactance changes with input voltage, and which we will call a varactor, is connected in the circuit shown in Fig. 1. Note that the terminology is now different, f_1 being the signal and (f_1+f_2) the oscillator frequency. Tuned circuits at f_1 and f_2 are connected across the device and some means is found to inject the local oscillator power of frequency (f_1+f_2) at the same time. An input power P_1 at f_1 produces an output power KP_1 at f_2, the i.f., and if the conditions are correct, K may be made greater than unity. The circuit may now be looked upon as a frequency changer from f_2 to f_1, again using (f_1+f_2) as the oscillator frequency. The output power at f_1 becomes LKP_1, where, if the conditions are simultaneously favourable for both conversions, L is also greater than 1. Hence, LK is greater than 1, and if the relative phase conditions can be made correct, a given drive voltage at f_1 across AB is frequency converted twice to become a larger voltage at f_1 across AB, i.e., the device is regenerative at f_1. By employing two separate couplings to the tuned circuit L_1C_1, power at frequency f_1 may be fed into and then extracted from L_1C_1 and if the couplings are adjusted correctly, amplification will be obtained at f_1. The circuit is obviously symmetrical in f_1 and f_2 and amplification could be obtained at f_2 instead, if desired, by coupling into and out of L_2C_2 instead of L_1C_1. Like all regenerative devices, such an amplifier has no true upper limit to the gain that can be obtained, and ultimately, as the performance of the double frequency changing effect is improved, the amplifier will break into self-oscillation at f_1 and f_2 simultaneously, irrespective of the relative loading at each frequency. There is, however, a practical limit to the useful gain obtainable, for two main reasons. As the gain increases, so the stability deteriorates and the amplifier becomes unmanageable. Also, with increasing gain above a certain level, the bandwidth starts to fall very rapidly and is soon too small to be useful.

A little terminology might now be considered worth while. The frequency f_2 is usually called the " idler," perhaps as a flippant analogy with mechanical engineering! The local oscillator (f_1+f_2) is termed the " pump " and f_1 is, of course, the signal frequency.

Up to now, we seem to have a novel but rather complicated method of obtaining r.f. amplification. What is the justification for using a device of this type? The answer is to be found in the great reduction in noise at v.h.f. and u.h.f. over normal receivers, particularly if the voltage-sensitive capacitor has only a very small component of resistive loss. It is difficult to show exactly why this occurs without somewhat advanced mathematics, but it is essentially because of the lower operating temperature of a circuit element such as a voltage-variable capacitor, as compared with that of a hot-cathode valve, and also because of the low values of resistive loss that can be achieved.

The most obvious major problem standing in the way of utilising such a device would seem to be in the finding of a suitable voltage-sensitive capacitor, without which it would lack practical application. Fortunately, some semiconductor diodes, when biased in the region just beyond cut-off, show characteristics of the right type, due to variation in the width of the so-called " depletion layer " with applied voltage. The shunt resistance of the reverse biased diode is of importance as this resistance represents r.f. loss, and being at room temperature, it generates noise. The shunt resistances of most diodes exhibit one of two types of behaviour, when reverse biased, as exemplified in Fig. 2. Fig. 2(a) shows a gradual fall in resistance with increasing reverse voltage but in 2(b) the resistance remains high until suddenly it falls very rapidly: the so-called " avalanche " effect. This latter behaviour is characteristic of voltage-stabilizing, or " Zener " diodes, and is obviously the better of the two for the purpose, provided that the peak-to-peak oscillator voltage swing is

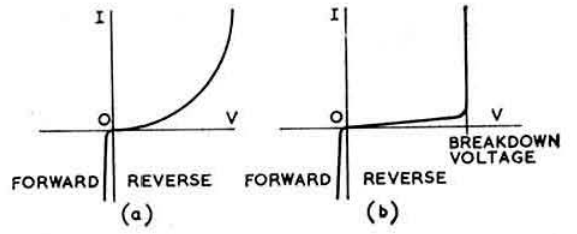


Fig. 2. Characteristics of semiconductor diodes. (a) Gradual fall in resistance with increasing reverse voltage. (b) Zener diode showing " avalanche " effect.

* 52 The Rutts, Bushey Heath, Watford, Herts.

limited to the Zener breakdown voltage. All true variable capacitance diodes have characteristics of this type and any junction diode intended for experimental use in a parametric amplifier should possess this property.

Another "vital statistic" is the available capacitance swing. The absolute maximum swing given by a particular diode is that produced between the condition just prior to reverse breakdown and that just before the start of forward conduction. For most v.h.f. and u.h.f. circuits, this need only be 1 to 3 pF at the most, and too large a value renders a diode unsatisfactory. The performance as a varactor also depends on the "spreading resistance" R_s in the semiconductor material. In fact, if the minimum capacitance is C_{min}, then the cut-off frequency f_c, given by:

$$f_c = \frac{1}{2\pi C_{min} R_s} \quad \ldots [1]$$

is a useful criterion of the usefulness of a particular diode for this application. The value of f_c should be at least 2 or 3 times the highest pump frequency to be used.

Generally, it will be found that silicon junction diodes have the right sort of properties to be used as varactors. Germanium junction diodes are less effective and point contact diodes of any type are virtually useless. The 1N660 and SX761 have been used with some degree of success at 144 Mc/s, but at 430 Mc/s and above, only true varactors have given success so far.

Choice of Frequencies

Now, what criteria govern the choice of pump and idler frequencies? To obtain regenerative amplification, theoretically it is only necessary for the pump frequency to be equal to the sum of signal and idler frequencies. In the simplest form of parametric amplifier, known as the degenerate type, the idler and signal frequencies coincide, or at least the idler and signal modes are supported under the resonance curve of a single tuned circuit, the pump frequency then being approximately twice both the idler and signal frequencies. It can be shown mathematically [1] that the gain for a given bandwidth is increased and the noise figure reduced by using the highest possible pump frequency at which the varactor being used is physically and electrically able to operate. Therefore the simple degenerate type of amplifier is not to be considered for serious applications, especially when the sort of difficulties which are likely to occur when the signal and idler frequencies are close together, are fully realized. For instance, the pump is usually a free-running oscillator, and as it drifts, signal and idler will produce a differential output of variable low frequency. Stabilization of the pump frequency is difficult, as will be seen later.

Circuit Organization

It can be shown that to obtain amplification from a parametric device, the idler power must be fed into, and dissipated in, a substantially resistive load which, for low-noise operation, should be kept at a low temperature. The simplest way to achieve this is to couple the varactor to a circuit resonant on the idler frequency, as in Fig. 1. The two tuned circuits are in series across the varactor and each looks like a relatively low impedance at the other's resonant frequency. Consequently, as the signal and idler frequencies are well separated, there is little mutual disturbance. How is the pump power to be coupled in? Although the pump and idler frequencies are reasonably close for desirable high pump-to-signal frequency ratios, it is clear that any attempt to couple pump power into the idler tuned circuit may well produce undesirable variable loading of the latter. Introducing a pump-frequency tuned circuit in series with the other two would probably lead to similar problems. The difficulty is overcome rather neatly. The tuned circuits to be used in the upper v.h.f. region and at u.h.f. are probably end-capacity loaded transmission line resonators. Such a device has a fundamental quarter-wave resonance, but also of course, exhibits higher order modes characterized by adding numbers of complete half-waves to the open-circuited

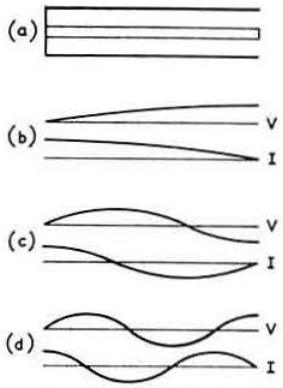


Fig. 3. Quarter-wave line resonator showing higher order modes.

quarter-wave section (Fig. 3). Consequently, the resonant frequencies are represented by $(2n + 1)f_1$, for $n = 1, 2, 3$, etc., where f_1 is the frequency of the fundamental resonance. The trick is simply to use f_1 for the signal and one of the higher order modes to support the idler, tuning the pump frequency until a suitable idler resonance is found. As the pump frequency is the sum of the signal frequency f_1 and the idler $(2n + 1)f_1$, it is of the form $(2n + 2)f_1$, for $n = 1, 2, 3$, etc., i.e., the idler frequency is $3f_1$, $5f_1$, $7f_1$, etc. and the pump frequency is $4f_1$, $6f_1$, $8f_1$, etc. These relationships are only approximate because the quarter-wave open-circuited part of the line is foreshortened by the capacitance added across its end, according to the usual formula:

$$\frac{1}{2\pi fC} = Z_0 \tan \frac{2\pi l}{\lambda} \quad \ldots [2]$$

where C is the end capacity,
Z_0 is the characteristic impedance of the line section
l is the resonant length of the section.

The signal power is preferably coupled into and out of the common tuned circuit at points where the idler is not loaded by the signal couplings (Fig. 4). If this should prove difficult, idler power can usually be prevented from entering the signal coupling circuits by the use of resonant chokes or even

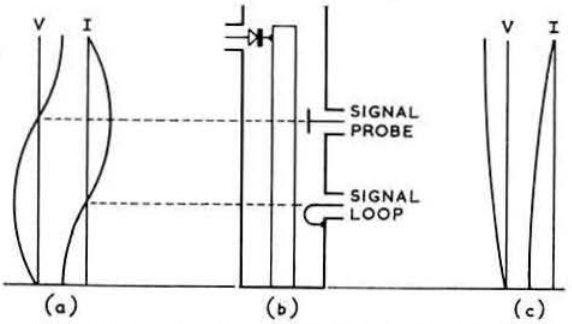


Fig. 4. Method of avoiding loading of idler by signal coupling.

transmission line filter sections. Pump power is injected at the end of the varactor remote from the signal tuned circuit, using another tuned circuit of low characteristic impedance to provide an effective short circuit at idler and signal frequencies. Some means must also be found for connecting the varactor d.c. bias, and this can usually be arranged by constructing the inner conductor of the signal line in the form of a pair of concentric tubes, mutually insulated and having the bias and the varactor terminal connected to the inner one.

Parametric Amplifier for the 430 Mc/s Band

It is now possible to detail the form of construction of an actual parametric amplifier for the 430 Mc/s band. The amplifier to be described is suitable for use with varactors having minimum capacitances between about 0·4 and 1·2 pF, but it can easily be modified to suit other reasonable values of capacitance.

The main resonant line is built in the form of a rectangular brass box as the outer conductor, with the inner conductor formed by a sandwich of three brass strips interleaved with two strips of 0·006 in. thick polythene sheet, the assembly being bolted together using insulated Tufnol bushes and short 8BA brass screws. The outer two brass strips have lugs bent outwards at right angles to the strips and are bolted to the inside end wall of the box. A tag is left on the inner strip, insulated from the other two, and protruding through a rectangular slot in the wall of the box. This tag is used as the varactor d.c. bias connection. The active length of the line is varied by means of a movable short-circuiting bridge, constructed as shown in Fig. 5(c). This is clamped in position in the line with four 6BA, one-quarter inch long, brass screws,

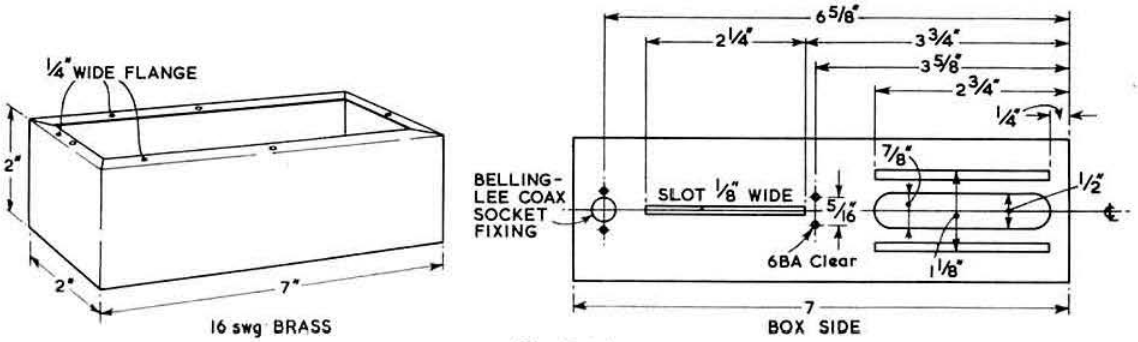


Fig. 5 (a).

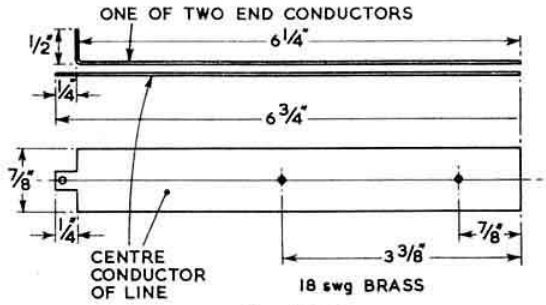


Fig. 5 (b).

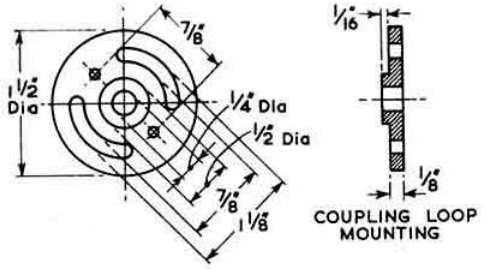


Fig. 5 (d).

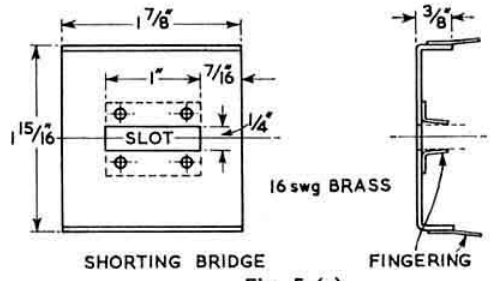


Fig. 5 (c).

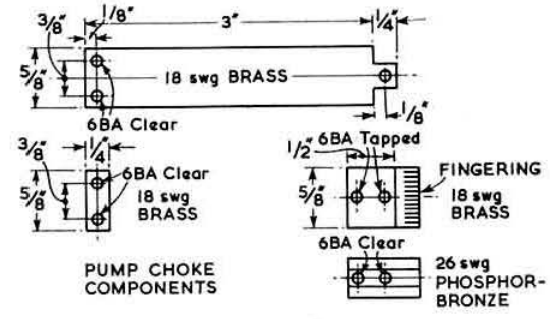


Fig. 5 (e).

Fig. 5. Constructional details of parametric amplifier. (a) Outer case. (b) Inner conductor. (c) Shorting bridge. (d) Coupling loop mounting. (e) Pump choke components. (f) Input and output coupling loops.

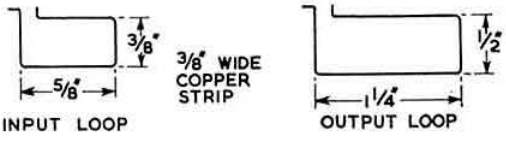


Fig. 5 (f).

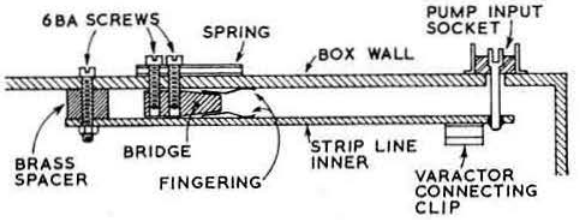


Fig. 6. Detailed assembly of shorting bridge.

utilising the four narrow parallel slots in the walls of the box (Fig. 5(a)). These slots, together with two wider ones between them, are used to locate and fix the mountings for the input and output signal coupling loops (Fig. 5(d)).

The pump oscillator input socket, a Belling-Lee type, is mounted on one side wall of the box, remote from the short-circuited end of the main tuned line. The auxiliary strip-line, tuned to quarter-wave resonance at the pump frequency and termed the " pump choke," is also bolted to the side wall of the box. The inner connection of the pump input socket passes through a hole in the end of the line, being soldered thereto. The actual construction of the pump choke and its associated shorting bridge is clearly shown in Figs. 5(e) and 6. Two small clips, bent from 28 s.w.g. phosphor-bronze sheet and bolted to the " hot " ends of the pump choke and the main tuned line respectively, using 8BA brass screws, hold the varactor. The mounting rings for the input and output coupling loops are turned from $1\frac{1}{4}$ in. diameter brass rod (Fig. 5(d)) to which Belling-Lee sockets are bolted, the inner conductors projecting through clearance holes. Turned shoulders serve to locate the mounting rings in the wide slots in each side of the box. Two quadrantal circumferential slots cut in each shoulder with the aid of an Abrafile allow the ring to be screwed loosely to the side of the box with 6 BA brass bolts and nuts. This permits 90° rotation and also longitudinal travel over about one third of the length of the box. The loops themselves are made from $\frac{3}{8}$ in. wide, 22 s.w.g. soft copper strip (Fig. 5(f)), fixed at their earthy ends to the flat faces of the mounting ring shoulders by screws fitting into 8BA tapped holes in the latter. The high potential ends of the loops are soldered to the inner connections of the Belling-Lee sockets. These operations can only be performed with the mounting rings in position in the box.

Setting-up and Operation

The first stage in setting-up the amplifier requires it to be adjusted to operate as a tuned filter at signal frequency with minimum insertion loss. To do this, the input loop is coupled to a matched source of signal (aerial or signal generator) and the output loop connected to the 430 Mc/s receiver. The varactor is then inserted and the main shorting bridge moved to its mid-way position and clamped. Varactor bias of the right polarity is connected between the bias supply terminal and the box proper, using the circuit shown in Fig. 7. A standard 3 watt carbon potentiometer may be used as a voltage control but a helical potentiometer allows much finer adjustments to be made. The bias is varied until the line section is brought into resonance at 430 Mc/s, as evidenced by a pronounced rise in signal level at the receiver. If this cannot be done within the permissible range of varactor voltage adjustment, i.e., between zero bias and the breakdown point at which the meter begins to read, the shorting bridge setting is changed until it can. Then the bridge position, varactor bias, and both longitudinal and rotational positions of the coupling loops are all adjusted for minimum signal transfer loss through the device. This should be at the most 1db as compared with direct coupling, and may, if the input matching of the receiver is rather poor, even appear to be negative in some cases!

A suitable pump oscillator is now required. The lowest usable pump frequency for non-degenerate operation will be in the region of four times the signal frequency and the next higher one will be about six times, as previously explained. A small co-axial oscillator, perhaps with a DET22 or TDO3/10, giving a few hundred milliwatts output, with a variable output coupling and continuously tunable over the range 1500 to 3000 Mc/s should serve, and will enable both modes mentioned to be tried. Both anode and grid current should be monitored. The oscillator is coupled up to the pump input socket through a short length of co-axial cable, and the oscillator output coupling is slowly increased until the grid and anode currents begin to change slightly. The oscillator is then tuned very slowly through its entire range, taking particular care in the region within 200 Mc/s of the estimated pump frequencies. A setting should be found at which the 430 Mc/s test signal peaks up sharply. If this condition cannot be obtained, increase the coupling to the oscillator somewhat and try again. It must be emphasized that extremely slow and careful tuning of the pump oscillator will probably be required to find a suitable idler frequency. Even when all possible care is taken, it may still be found impossible to locate a pump frequency giving rise to a peak in signal strength. If this is so, the most likely cause is spurious loading of the idler either by the pump injection circuit or else the signal coupling loops. Try moving the pump-choke shorting bridge a centimetre or so and changing the length of the pump input lead. If these subterfuges do not work, alter the sizes of the signal coupling loops. The final *tour de force* to prevent idler loading is to insert bandpass filters at signal frequency in the signal coupling leads, but this should not be found necessary. Suitable bandpass filters may be constructed from lengths of transmission line with periodic loading [2].

Once the idler resonance has been located, systematic adjustment of the variables, i.e., line length, varactor bias,

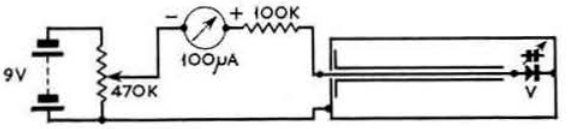


Fig. 7. Circuit for determining the operating bias of the Varactor

input coupling, output coupling, pump power and pump frequency, should be undertaken. With such a host of variables, many happy hours may be spent just " fiddling with the thing! " The most satisfactory method of checking progress is to use a weak, steady signal, such as that produced by a " Poor Man's Signal Generator " [3], and to measure continually the signal-to-noise ratio on a sensitive S-meter or similar instrument. It is almost impossible to measure the noise figure of a parametric amplifier directly using a calibrated noise source because of the difficulty in setting up the amplifier with a noise source as the feed. The easiest method of obtaining an estimate of the noise figure is to measure the signal-to-noise ratio on a weak, steady signal as suggested, and then to compare it with that measured on a receiver of known noise figure. If the noise figure of the parametric amplifier is N_1 db, that of the receiver itself is N db, the signal-to-noise ratio using the parametric amplifier is S_1 db and that using the receiver alone is S db, then:

$$N_1 = N - (S_1\text{-}S) \qquad \ldots [3]$$

It is essential, if this method is used, that both the receiver and the signal generator are accurately matched to the cable

impedance in use. These are rather awkward requirements to meet, as padding attenuators cannot be used to ensure this. Additionally, if the weak signal in use for testing is actually being fed through an aerial feeder, one must ensure that the aerial cable loss is at least a few db, otherwise the relationship [3] no longer applies: a given difference in noise figure between two receivers resulting in a larger difference in signal-to-noise ratio on a particular signal.

As previously mentioned, with too great a pump power or insufficient loading, the amplifier will usually break into oscillation, and it should be possible to reach this condition with a pump power of only a few tens of milliwatts. This is a rough test of the efficiency of the system. It is not possible, however, to obtain any measure of drive power by observing rectified current in the varactor, as most of these devices operate correctly when not quite driven into conduction by the pump. Therefore some other method of power measurement must be used. It will probably be found that, when hard pumping, the optimum bias setting for a varactor is very different from that when the circuit is operating passively. This is a useful check that the diode is being driven across most of its usable V/C characteristic by the pump.

Typical measured results, using a Microwave Associates Type MA460C device are as follows:

f_s = 435 Mc/s (signal)
f_p = 2,450 Mc/s (pump $\approx 6f_s$)
$(f_p\text{-}f_s)$ = 2,015 Mc/s (idler $\approx 5f_s$)
Gain = 20db
N.F. = 1 to 2db, estimated.
Useful bandwidth = 1 Mc/s.

The characteristics of the MA460C tested are:

C_o = 1·9 pF (zero bias)
C_{min} = 0·6 pF (max. reverse bias)
f_c = 74 kMc/s
E_b = 13 V (breakdown)

Although some limited success has been enjoyed in 144 Mc/s degenerate mode operation (pump near 288 Mc/s) using ordinary junction diodes not designed for use as varactors, such as the 1N660, 1N661, SX761, etc., these diodes were not found to exhibit detectable amplifying effects at 430 Mc/s signal frequency. The MA460C, however, was very satisfactory in use, and in accordance with the maker's claims, it was found possible actually to pump it into the forward voltage region without degrading the noise performance appreciably. The usable bandwidth was increased considerably under these conditions.

Future Work

It is anticipated that larger bandwidths and even more stable operation with the MA460 may be obtained by an alternative method of separating and dissipating the idler power involving the use of ferrite isolators. It is also hoped soon to test the new GEC SVC11 to SVC17 series of varactors, which were not available when the original work was done.

Although of only limited interest on 144 Mc/s and below, it is expected that parametric amplifiers will revolutionize work on and above 430 Mc/s. The reason for this is that although the best noise figures of normal receivers on 144 Mc/s, 430 Mc/s and 1300 Mc/s are about 3db, 6db and 10db, respectively, the parametric amplifier can show about 1db noise figure on all these frequencies, so that a 2db apparent advantage on 144 Mc/s becomes 5db on 430 Mc/s and 9db on 1300 Mc/s. However, due to the very low noise temperatures of aerials at 430 and 1300 Mc/s, for most beam directions, the advantage can be even greater than this, provided that the feeder loss between aerial and amplifier is negligible. i.e., less than 0·1db. This means that the parametric amplifier must be coupled directly to the aerial to show its full advantage which could then be about 9db on 430 Mc/s and no less than 15db on 1300 Mc/s, over the best conventional receivers now available, also, of course, when mounted directly at the aerial feed-point.

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Special Events Stations

Magnus Radio Society will be operating **GB3NRC** in Newark Town Hall during a Hobbies Exhibition sponsored by Newark's Rotary Club from June 10 to 13. The station will transmit on 20, 40 and 80m, according to the following schedule: June 10, 6 to 9 p.m., June 11 and 12, 2.30 to 9 p.m., and June 13, 10.30 am. to 8 p.m.

The Royal Signals will be celebrating their anniversary, " Princess Royal Day," from June 26 to 28, and the Royal Signals Amateur Radio Society will be operating **GB3RCS** during this period. A.m., c.w. and s.s.b. will be used on either 14 Mc/s or 21 Mc/s between 8 a.m. and midnight on June 26 and 27, and from 8 a.m. to 8 p.m. on June 28.

A station using the call-sign **GB3GP** will be operating on the h.f. bands during the International Patrol Leaders Weekend on June 13 and 14. This event will be taking place at Gilwell Park, Chingford, Essex, and participation by an amateur radio station was organized by a new group being formed at Baden Powell House.

GB3WYE will be in operation during the Wye College Cricket Week from Wye College (University of London), Ashford, Kent. Activity will be on 160 to 10m, particularly on 80m, from June 24 to July 1. Contacts with other University and School stations will be welcome, and also SWL reports. Reports should be sent to A. M. Pomfret, G3LZZ, at the above address.

The Northern Heights Amateur Radio Society will be operating **G3OMM/A** on the following dates: June 6 (Halifax Charity Gala), June 27 (Forest Cottage Gala), August 1 (Warley Charity Gala), August 8 (Halifax Agricultural Show), August 15 (Crossleys Carpets Gala).

Single Sideband

By G. R. B. THORNLEY, G2DAF*

MANY amateurs feel they do not have sufficient constructional experience to build a complete amateur band receiver and get it to work properly. They are also diffident about delving into the works of their AR88, CR100, or similar receiver, in case they do something wrong and perhaps make it worse, instead of better! Notwithstanding this, they are prepared to have a go at building a relatively simple item of equipment such as a crystal controlled converter so long as this can be built as a separate unit.

Most of the ex-service receivers have adequate bandspread and frequency stability on the lower frequency bands. If the receiver is used as a tunable i.f., following a stable crystal controlled front-end, it is possible to maintain these advantages while receiving on 20, 15 or 10m. Additionally the signal-to-noise ratio, the overall sensitivity and the cross modulation performance is determined by the converter, and with modern valves and techniques this can be made much better than that of the main receiver.

A recent correspondent suggested that the front-end of the G2DAF Communication Receiver would make an excellent converter and that the tunable i.f. of 5·0 to 5·5 Mc/s would be a suitable range in regard to stability and bandspread for most of the general coverage receivers in common use. This appears to be an excellent idea because not only will the proposed front-end make a good converter, but the experience gained is likely to give the right kind of confidence to encourage the builder to go ahead and build the rest of the G2DAF receiver.†

* 5 Janice Drive, Fulwood, Preston, Lancashire.

† Described in detail in *Communication Receivers*, and obtainable from RSGB Headquarters, price 3/- post paid.

A Crystal Controlled All Band Converter

An additional advantage of using the G2DAF front-end is that ready wound coils are available as a set from Electroniques (Felixstowe) Ltd., and this eliminates the major difficulty—for some—of making coils and getting the windings right for each of the six bands.

The only difficulties remaining are the two always associated with an outboard unit coupled into a sensitive receiver. These are:

(i) the correct impedance match between the output of the converter and the aerial input of the receiver, and

(ii) preventing i.f. breakthrough, i.e. a method of coupling that will not pick up stray signals over the tunable i.f. range of 5·0 to 5·5 Mc/s.

Both these difficulties can be overcome by using co-axial cable as the coupling medium, correctly terminated with screened plugs and chassis sockets. These items are freely available as TV components for 75 ohm impedance.

At the time the *Communication Receivers* manuscript was written in 1959 it was considered worth while to use a cascode r.f. stage because of its improved cross-modulation performance. Since that time however, worsening propagation conditions have made amateur signals weaker and the commercial teletype signals very much stronger. Many commercial point-to-point networks have moved down from the higher frequencies and are now in and around the 80m

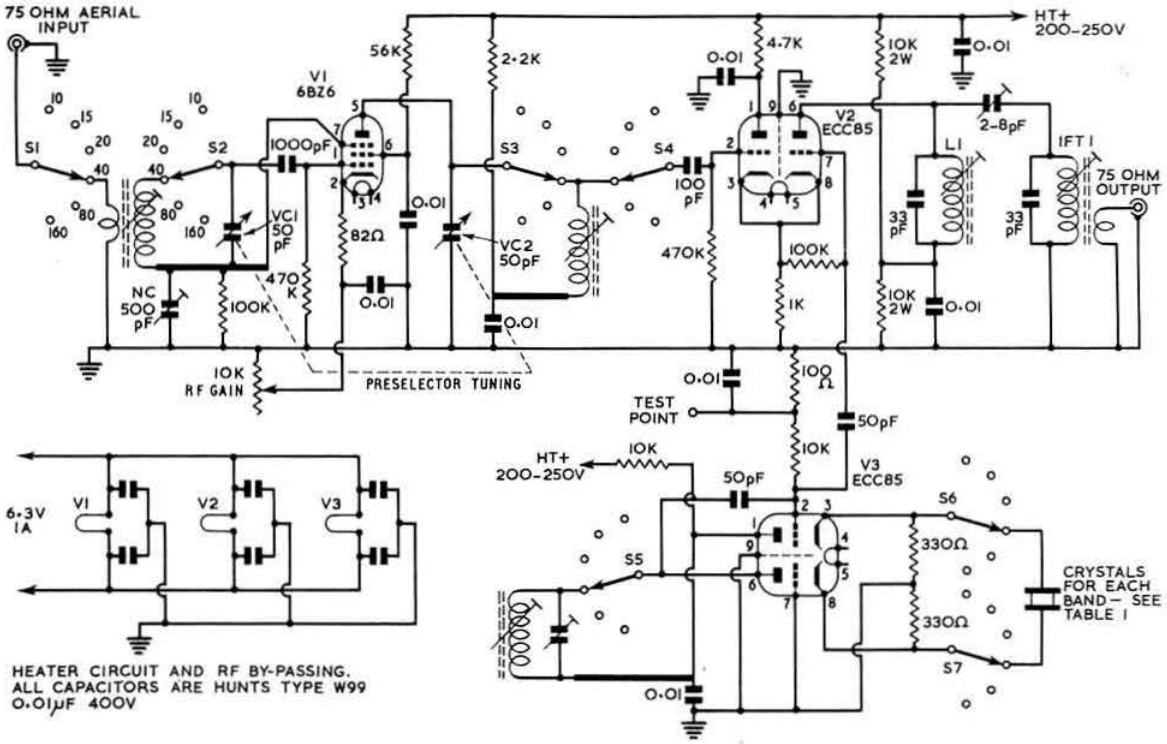


Fig. 1. Circuit diagram of the G2DAF h.f. bands crystal controlled converter. For clarity, only the 40m band coils are shown, and the common connecting points for the other ranges are indicated by heavy lines.

band. In order to overcome their own propagation problems power has been increased and many stations are using elaborate rhombic arrays giving a considerable effective radiated power gain. Notwithstanding these much more difficult reception conditions—particularly at night on the 80m band—it has been the writer's experience over the years that when cross-modulation did occur, it was never in the r.f. stage, but was always in the following converter. In addition to this, improved performance r.f. valves such as the 6BZ6 and the 6DC6 with more linear characteristics are now readily available from RCA in this country.

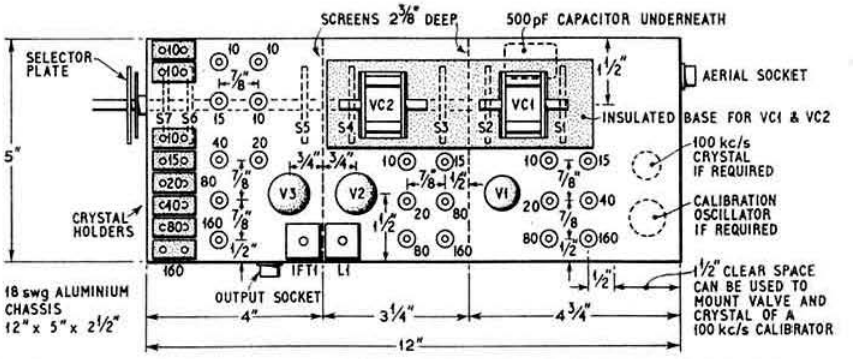


Fig. 2. The top view of the chassis showing the suggested positioning of the major components. Provision has been made for eight crystals and eight oscillator coils, which enables three 500 kc/s sections of the 10m band to be covered. If all the ranges are required, the switch banks S1 to S7 will be 1 pole, 8 way wafers, with the three 10m contacts of S1 to S4 strapped together, and connected to the appropriate 10m band coil.

The original receiver used a 6BE6 mixer; again improved valve types have been developed—particularly in the r.f. double triode range. An ECC85 has an excellent conversion gain, very low noise output, and much superior cross-modulation and overload performance. It is therefore logical to abandon the cascode and the multi-grid frequency changer and use a 6BZ6 r.f. stage and an ECC85 double triode as the mixer. It is also assumed that at the present very competitive prices, most constructors will be prepared to purchase new current production crystals correctly ground for optimum operation on the required frequency. Accordingly a second ECC85 valve is used as a fundamental or overtone oscillator. This ensures that there is less risk of harmonics from the main receiver v.f.o. beating with the conversion oscillator output frequencies and producing birdies.

Circuit Details

The complete circuit is shown in Fig. 1 and a suggested chassis layout in Fig. 2. It will be noted that the r.f. stage is suppressor-grid neutralized by feed-back controlled by adjustment of the 500 pF compression trimmer capacitor. This necessitates isolating the frame of the first section of the two gang preselector tuning control from the chassis, but it is well worthwhile as an effective aid to complete stability on all bands. Any regeneration in the r.f. valve would not only ruin the signal-to-noise ratio, but would give excessive stage gain and cause cross-modulation and overload of the following converter. A stable r.f. stage without tuned circuit damping is an essential requirement if optimum image rejection and weak signal performance is to be obtained.

TABLE I

Band	Mode	Output Frequency
160	Fundamental	7,000 kc/s
80	Fundamental	9,000 kc/s
40	Fundamental	12,500 kc/s
20	Third Overtone	19,500 kc/s
15	Third Overtone	26,500 kc/s
10	Third Overtone	33,500 kc/s
10	Third Overtone	34,000 kc/s
10	Third Overtone	34,500 kc/s

All crystals FT243 type holder with ½ in. pin spacing for series resonance operation.

It will be noted that the mixer circuit (V2) is unconventional and it may be new to some constructors. The first half of the valve taking the required input signal is a cathode follower, coupling into the cathode of the second half. This section of the valve receives the heterodyning input from the crystal oscillator V3. This type of converter operates well with a relatively small injection voltage, 1 to 2 volts r.m.s. being ample. Potential for the second anode is fed through the output circuit and it will be noted that the small value of h.t. required is obtained from a potential divider comprising two 10K 2 watt resistors directly across the main h.t. rail. To obtain optimum low noise performance it is very necessary that the valve is fed as shown; the potential divider must not be omitted. The cathode resistor shown of 1K ohm is an average value. If a noise generator is available it is worth while trying other values between 560 ohms and 2000 ohms to obtain the best noise figure.

Switch banks S1, S2, S3, S4, S5, S6 and S7 are standard Yaxley type single pole six way without shorting plates and may be either paxolin or ceramic. They can of course be more than six way if it is required to accommodate three 500 kc/s sections of the 10m band. The switch S4 was fitted in the original design to select tapping points on the 20, 15 and 10m band anode coils to keep the stage gain more nearly constant and maintain the accuracy of the S meter reading. If required it can be left out of this circuit and the 100 pF grid capacitor of V2 taken directly to the anode of V1 in the usual way. All switch banks are of course ganged together on a common shaft.

For the sake of circuit clarity the 40m band coils only are shown in the circuit diagram. To help the novice the common connecting point for all the other coils is shown as a thick horizontal line.

V3 is a conventional Butler oscillator except that both sides of the crystals are switched—this prevents the capacitative load of the unused crystals unbalancing the cathode circuit and gives a better output voltage into V2, particularly on the 26·5 and 33·5 Mc/s ranges. Either a 1mA meter or a voltmeter can be connected between the TEST POINT and earth, the trimmer across each of the oscillator anode coils being adjusted for resonance at the required frequency; this will coincide with an increased reading on the meter. The meter deflection is quite sharp and this is therefore an easy method of adjusting this type of oscillator.

The output circuit of V2 is an inductance L1 resonated with a fixed capacitor of 33 pF and top capacity coupled through a Philips 2 to 8 pF trimmer to the output trans-

(Continued on page 376)

Introducing the V.H.F. Transverter

By T. P. DOUGLAS, M.B.E., Assoc.I.E.E., G3BA*

DURING the last 15 years or so, circuit design of amateur v.h.f. transmitters in this country has altered very little and the valve arrangements used during the late forties are still much the same today. Perhaps the old 832 and 829B double tetrodes have been replaced by the more efficient QQV03/20A and QQV06/40A, but a typical line-up still consists of a crystal oscillator, several multipliers, a buffer amplifier and then a final p.a.

For the bands between 1·8 and 30 Mc/s, however, there have been quite spectacular changes in transmitter design using extremely sophisticated circuits and ingenuous mechanical layouts. The growth of s.s.b. has certainly been a contributory factor to all this progress and its gain in popularity has been brought about by the never ending search to accommodate more and more amateur operators

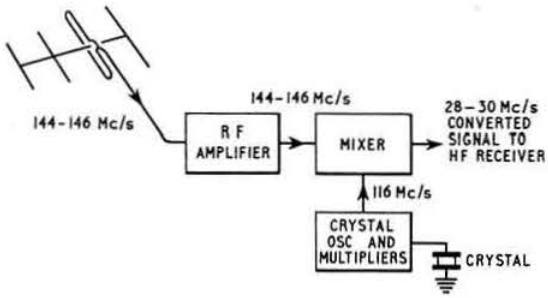


Fig. 1. Block diagram of crystal-controlled receiver converter.

inside the frequency allocations which have tended to shrink rather than expand over the years. V.h.f. band occupancy has never reached anything like the proportions experienced on the l.f. and h.f. bands, but nowadays, during contests and periods of abnormal propagation, the v.h.f. bands, particularly 2m and 4m, are packed to bursting with stations and QRM can be almost as bad as on 80m. Much of this QRM is brought about by the use of crystal control and the government surplus spot frequency crystals so cheaply available. The v.h.f. zone plan is a very admirable thing and works well for most of the time, but it is difficult to find a clear frequency for " one's own " these days in some zones, and it must be obvious to forward thinking amateurs that the days of rigid crystal control are numbered and some means of moving about at least within the zone with perfect stability is urgently required.

Many operators below 30 Mc/s, the writer believes, would like to try v.h.f., possibly as a complement to their h.f. interests, but they are often deterred from making any attempt because they fear that activity is almost non-existent, or because of the apparent technical complexity, or because they know full well that v.h.f. operating is reminiscent of the late thirties with crystal control and " searching the whole band " as the order of the day. On the first point I would refer the reader to *Four Metres and Down*; the activity reported therein is surely enough proof that the phrase " there is nobody to work " is quite unfounded. V.h.f. construction practice is certainly no more complex now than current work for h.f. sideband. You can see the point of the h.f. man who has nice equipment with all the modern aids and facilities to make for sensible operating, if he virtually has to go back to the pre-war era again with " old hat " equipment and a " fist of rocks."

* 141 Russell Bank Road, Sutton Coldfield, Warwickshire.

A Modern Approach to V.H.F. Operation

The purpose of this article is to try to present the case for a more modern approach to v.h.f. work and to show how easy it is to make use of existing h.f. equipment of proved reliability and performance as the prime mover for v.h.f. transmitters yet retaining all the facilities of the h.f. installation such as VOX, BK, press-to-talk, s.s.b., a.m., f.s.k., c.w., n.b.f.m., in addition to the great advantage of stable v.f.o. control to permit in-zone QSY and netting, if need be. For readers who have not been particularly v.h.f.-minded up to now, I would like to deal with one or two elementary aspects of v.h.f. technique which might help them to understand more clearly the process of frequency translation, i.e. the conversion of a transmission from one band to another by mixing.

Early v.h.f. receiving equipment was quite self-contained and used perhaps three or four stages rather like the old straight receiver. These " rush boxes " gave way to the converter plus communications receiver combination, the idea being to convert the v.h.f. signal desired to a much lower frequency which lay within the range of the current popular communications receivers and thus impart to v.h.f. reception the facilities enjoyed by h.f. enthusiasts. These converters usually consisted of an r.f. stage, a mixer and a variable oscillator and were very efficient except for their rather poor frequency stability. Next came the crystal-controlled converter and the stability problem was cured. The idea of a crystal-controlled front-end has now spread to the h.f. communications sphere and the most modern receivers use this v.h.f. inspired technique. So we have had the gradual process of making v.h.f. reception as easy to tune and operate as on the lower frequency bands. Now, it might well be asked, if you can do this sort of thing for reception, might you not reverse the process and apply it to transmission? And this is exactly what can be done and I feel sure that the method to be described will be typical of the pattern of v.h.f. transmitter design for the future.

The Transverter

The device for transmitter conversion is popularly known in the USA as a transverter and this name will probably stick, as it expresses quite well the purpose of the unit, which is, after all, a transmitter converter as opposed to the better known receiver converter.

So much for the history lesson, let us now turn on to something more practical and see how best we can achieve this new arrangement. Reference to the block diagram in Fig. 1

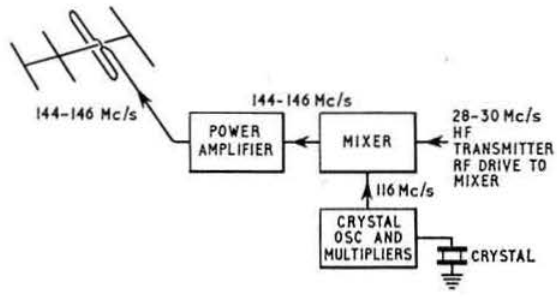


Fig. 2. Block diagram of crystal-controlled transmitter converter.

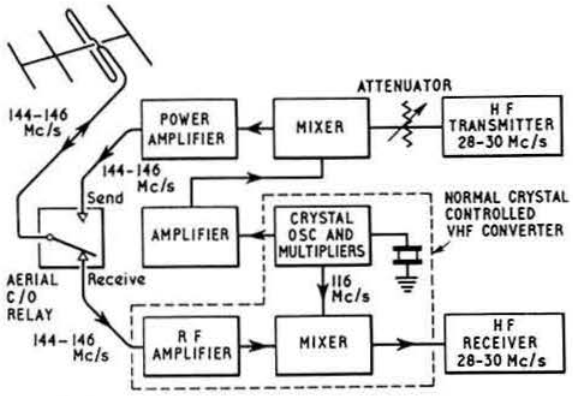


Fig. 3. Block diagram of crystal-controlled transverter.

will show first of all a simple basic crystal-controlled receiver converter. In Fig. 2 the essential parts for a transmitter converter are shown and the reader will note the similarity between the two drawings. As there is a common factor between the two combinations, namely the crystal control chain, the third block diagram, Fig. 3 shows a combination which saves duplication of the crystal chain. This last diagram then gives the essentials of a v.h.f. transverter as being a device which can work both as a translator of v.h.f. received signals down to h.f. and of h.f. radio frequency energy up to v.h.f. The basic concept is as simple as that, but let us see how we can put this idea into practice.

The 2m band is 2 Mc/s wide, from 144·0 to 146·0 Mc/s, as more or less is the 10m band from 28 to 30 Mc/s (actually 28-29·7 Mc/s), and it is quite obvious that here we have a ready made h.f. band to act as a conversion channel. Nearly all modern amateur transmitters cover 10m, and so do receivers, and, generally speaking, their stability is adequate for the mode used. If we do not further impair the stability in the transverter, and this is unlikely with good crystal oscillator design, then the stability of the h.f. receiver and transmitter will be imparted to the v.h.f. equipment, as no multiplication of the signal frequency is used.

I can see some of you busy men sighing that this is all very well, but there is no time to make all this stuff for v.h.f., and anyway why spoil commercial equipment with home-brew attachments. All right, we will not argue, you can go out and buy a first class converter for 2m with a 28-30 Mc/s output for a modest price and its performance will be up to the best home-brew equipment. By this means you will have got over one piece of constructional work, the converter, which includes the crystal control chain. So, if you can bear to drill a small hole in the converter chassis it would not take too much effort to pass a loosely coupled link from round the oscillator chain output inductance and take it via a short co-axial lead to the next unit. This you will have to make, as, at the moment, there are no commercial transverters of British manufacture available, although some may well be in the planning stage or in early production. I would really prefer to make the transverter as a single unit, but I have mentioned the foregoing as a suggested means of getting going quickly with the minimum of home-brew, but do not take too much r.f. out of the oscillator chain or the commercial boys will be after me for degrading their converter performance, and you only want a sniff of r.f. anyway into the next unit's amplifier stage.

Fig. 4 shows the essential part of the circuit diagram for a transmitter mixer, but before we get immersed in fine detail let me explain a few things about it. It will be noted that we have an amplifier for the conversion frequency from the crystal-controlled chain which would normally feed the receiver mixer. The purpose of this is to isolate the whole family of frequencies living in the crystal-controlled chain compartment and so that by loose inductive couplings and high Q tuned circuits we can get down to the conversion frequency *only* for passing on to the mixer input.

The next vital thing which we have to do is to ensure that the signal drive from the h.f. rig is free of harmonics. If it is not there will be coincident beats, side by side wanderers and other carrier followers which are not wanted. The harmonic cancellation is done by making the mixer balanced and feeding the signal frequency on to the common cathode of a miniature double tetrode, taking the output at v.h.f. from the anodes in push pull. This means that the grid circuit has to be connected in push pull also but this presents no problem and is in fact convenient, as the conversion frequency, being fixed tuned and the cathode load of the drive frequency resistive, a change in frequency can be done without tuning adjustment of any of the mixer input stages.

Having obtained just the two wanted frequencies into the mixer we should for all practical purposes have F_1 (conversion frequency) + F_2 (signal frequency); $F_1 - F_2$ and F_1 at the output of the mixer. If we tune to $F_1 + F_2$ with a reasonably selective circuit in the anode we can easily discriminate against the others which are not required. F_1 will be at least −40db down at the mixer output and after the following stages have been added no F_1 will be radiated at all. Correct operation of the mixer is essential for linear output and the anode current of the mixer when conversion frequency drive is applied should be adjusted by the drive control potentiometer to 23 mA with 300V on the anode. A stabilized voltage of 150 was chosen for the QQV03/10 in this instance. Note that the output r.f. is link coupled to

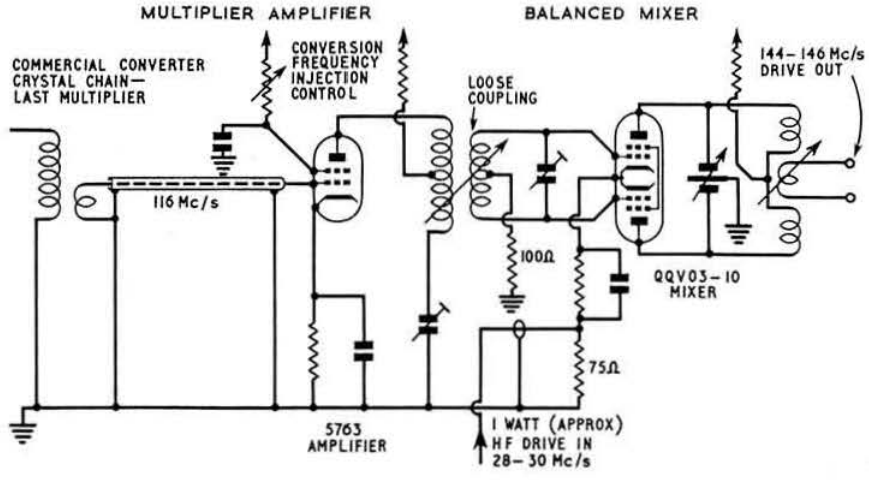


Fig. 4. Basic circuit of transmitter mixer.

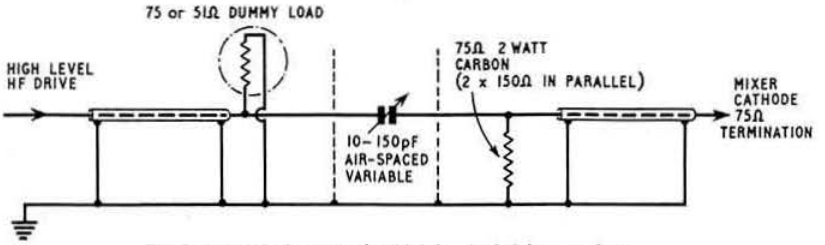


Fig. 5. Method of attenuating high level r.f. drive to mixer.

the following amplifier stage and this should preferably be preset but adjustable.

The level of signal frequency from the h.f. transmitter required is just under 10 volts r.m.s. swing across 75 ohms and will just cause the mixer anode current to rise about 1 mA at the most. These are the main points about the mixer, and they have been detailed as so much depends on understanding the reasons behind the choice of circuit, type of mixer valve and operating conditions to obtain correct and optimum performance.

Choice of Amplifier Circuits

At this stage we might discuss briefly the possible choice of amplifier circuits with which to follow the mixer and also how we obtain the right signal frequency level into the mixer. Taking amplifiers first, we have two main choices open to us for increased power level; one is a single linear amplifier whilst the other is a normal class C stage with anode and screen modulation if a.m. is desired.

The output from the mixer is more than enough to drive valves of the type such as the QQV06/40A, a pair of 4X150A's or a pair of 4CX250B's to full output, all running in class AB1. This will take any modulation method through it and is the nice easy way of converting your favourite operating mode from h.f. to v.h.f., whether it be a.m. or s.s.b., c.w. or f.s.k.

A word of advice however for the man new to linears and their operation; if you wish to run a.m. remember that the peak input of a QQV06/40A with 600 volts on the anodes for example will be about 120 watts, i.e. this is the positive peak value reached at 100 per cent modulation. The r.f. carrier therefore must be 6db down on this, i.e. quarter of the power. A 120 watt input in AB1 will represent 60 watts r.f. output peak or 15 watts of carrier at the most, therefore do not expect to set the heather on fire with this sort of power unless you sit on top of a hill 600 ft. high and use an 8-over-8 beam aerial!

In the second method, which I strongly advocate for all those who have not yet used s.s.b., the output of the mixer drives a small buffer stage using a QQV03/10. This is then link coupled into the final amplifier which is operated under class C conditions.

Taking the QQV06/40A again as example: if it is in class C at an input of 100 watts carrier, this will be 400 watts p.e.p. input at 100 per cent modulation positive crest value, or translated into r.f. values, approximately 60 watts r.f. carrier with 240 watts p.e.p. r.f. output. With this 6db increase in output power you will make a much more noticeable impact on the band. But it does not pay to get too cock-a-hoop

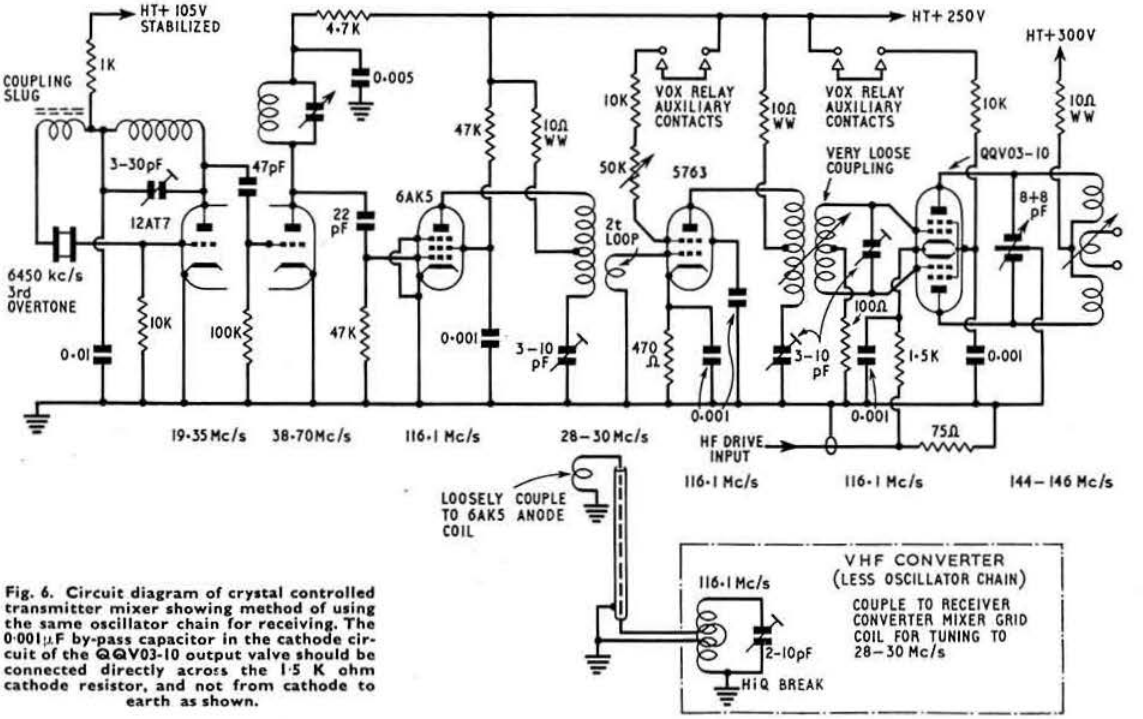


Fig. 6. Circuit diagram of crystal controlled transmitter mixer showing method of using the same oscillator chain for receiving. The 0·001μF by-pass capacitor in the cathode circuit of the QQV03-10 output valve should be connected directly across the 1·5 K ohm cathode resistor, and not from cathode to earth as shown.

about the wonders of linears until you know how to work them to best advantage. The second method will cope with all modes except s.s.b. and is the best buy for most amateurs who have not tasted the fruits of s.s.b.

Drive and Power Requirements

The drive requirements from the h.f. rig are rather modest and a watt of r.f. is not very much, particularly if it is derived from one of those " I'll slay you " power amplifiers so common nowadays. However, if you are going to operate on v.h.f. take things a little easy first of all, and get your r.f. from an early stage, such as the driver for the final of the h.f. rig. If you do this, you will have the right amount of r.f., more or less, to drive the transverter without needing to use an attenuator.

It does not take much imagination for the average amateur to devise a means of taking the p.a. power supplies to the v.h.f. final amplifier and buffer stage—a simple way often is to use a valvebase plug to go into the normal h.f. p.a. in place of the output valve or valves, so leaving all the metering and function switches exactly as they are meant for use on the h.f. and l.f. bands. If you do not wish to make any modifications to the main rig then you will have to work the h.f. transmitter into a dummy load (what! you don't use one?), and then attenuate the voltage across the dummy to the 10 volts r.m.s. or so required. Fig. 5 shows a suggested method that has proved useful in the past.

The transverter power supply requirements are very modest and a small receiver power supply unit will be more than adequate. If you have to use separate power supplies for the v.h.f. final then see that you obey the rules, particularly so if the stage is operated as a linear—it pays in the long run and we want to keep the standard high on v.h.f. you know!

A Complete Transverter

For those who wish to roll their own complete transverter Fig. 6 is the important part of the circuit of the unit at G3BA which is for both 2m and 4m. All supplies and the signal input are paralleled but the supply to the heaters of the transverter valves are switched in each half section.

A few points, however, before you rush out to make a transverter; v.h.f. working is most satisfying, but like so many things you have to do the job properly. The weak spot lies in the aerial, and, unless you have the necessary test gear available to line up any home-brewed efforts at aerial design which you may fancy, then I do suggest you get a proved commercial beam right at the beginning. This means you will possess an aerial of known standard and no doubts need exist as to its functioning. Having got the aerial, spend your money wisely on the best co-axial cable you can afford, and lastly get the aerial up outside as high and in the clear as possible.

With a sound aerial system and a reasonable location, I am sure you will take to v.h.f. Let us see if we can introduce the efficient methods of operating such as we are accustomed to accept as current practice on the l.f. and h.f. bands such as VOX, BK-in and press-to-talk and by example help to reduce the number of time-wasting monologues reminiscent of the early days of radio. Lastly I should say that, like a car, a v.h.f. v.f.o. can be dangerous so take it carefully, and do not switch about all over the place; stick to your zone.

Single Sideband continued from page 372

former IFT1. These two circuits form a wideband coupler with an impedance step-down at the output socket of 75 ohms. L1 is 75 turns of 36 s.w.g. enamelled wire close wound on a Neosid or Aladdin 0·3 in. diameter former with a dust core and 2¼ in. × 13/16 in. × 13/16 in. aluminium can. IFT1 is identical to L1 except that it has a secondary winding of 3 turns of 24 s.w.g. enamelled wire tightly coupled at the cold end of the primary. The correct bandpass characteristics are obtained by fully unscrewing the 2 to 8 pF Philips trimmer (minimum capacity) and peaking both dust cores for maximum output at exactly 5·25 Mc/s. The Philips trimmer is then screwed in (increasing capacity) until the response at 5·0 and 5·5 Mc/s is not more than 3db down. Once the dust cores have been set at 5·25 Mc/s they must on no account be touched again—all adjustment in regard to the required 500 kc/s bandwidth must be made by adjustment to the top coupling. The final value should be around 5 pF.

VC1 and VC2 are the tuning capacitors taken from a surplus RF27 unit. These can be obtained as new items from Home Radio of Mitcham or other BULLETIN advertisers and are manufactured by Wingrove & Rogers Ltd. (Polar Type C28-141-12/.015). Both capacitors are coupled together with an Eddystone 529 flexible shaft coupler and mounted on an insulated base which may be paxolin or Perspex or well seasoned hardwood with the frame of the first section taken to an insulated feed-through bush connecting to the 500 pF neutralizing capacitor; the frame of the second section is connected to a soldering tag bolted to the chassis.

It is most important that the converter chassis and the main receiver chassis are connected together with a co-axial cable screened throughout its length. If the main receiver does not have a screened aerial input socket, this should be fitted and the centre pin connected in parallel with the existing aerial terminal. The Belling-Lee co-axial socket Type L.604S is very suitable.

Power supply requirements for the unit are very modest, 6·3 volts at 1 amp for the heaters and 200 to 250 volts at 10 to 15mA for the h.t. Most receivers will stand this small additional drain and the unit can be fed directly from the existing power supply. The r.f. bypass capacitors shown across the h.t. and heater connections should not be omitted —this is to ensure that there is no unwanted signal pickup on the connecting leads between the converter and the main receiver.

In regard to performance this unit is capable of a measured noise factor—on any of the six bands—of 5 to 6db; this is equivalent to a 20db signal-to-noise ratio for about 1 μV signal input at the aerial terminal. The image and i.f. breakthrough rejection is better than 60db and the cross-modulation and overload performance much superior to that of a conventional receiver. On the odd occasion when cross-modulation might be experienced under the difficult night conditions on 80m, this can be completely cleared by backing off the RF GAIN control.

It must be appreciated that cross-modulation can occur in the main receiver if the input signal is strong enough to overload the second r.f. or the frequency changer valves. This applies particularly to AR88s or CR100s with two stages of r.f. amplification. Keep the r.f. gain control turned down, so that you are using as little amplification as possible between the frequency changer of the converter unit and the frequency changer of the main receiver. If in doubt put a Belling Lee L.729/24 or L.729/36 co-axial attenuator between the converter connecting cable and the main receiver aerial input socket.

A ready made, machine pressed box chassis 12 in. × 5 in. × 2½ in. of 18 s.w.g. aluminium with a bottom cover plate may be obtained from N.W. Electrics, Great Ancoats Street, Manchester 1.

Suitable crystals with FT243 type holders and ½ in. pin spacing may be obtained from Cathodeon Crystals or Quartz Crystal Co. Ltd. The required frequencies and modes of operation are given in Table 1. All crystals should be ordered for series resonance operation, and fundamental or third overtone operation should also be stated.

THE MONTH ON THE AIR

A CHRONICLE OF EVENTS ON THE HF AMATEUR BANDS

By R. F. STEVENS, G2BVN*

AN increasing number of complaints are reaching Society Headquarters that the c.w. section of the 3·5 Mc/s band, i.e. 3500 to 3600 kc/s, is being used by telephony stations. These complaints are backed by details of times, call-signs and exact frequencies, and cannot be dismissed as hearsay evidence. Further, listeners to the Society News Bulletins complain that the transmissions on this band suffer severe interference, and one of our Northern correspondents names a Warrington station that, in so far as he was concerned, ruined three readings of the news bulletin.

The European Band Plan set out below is a voluntary arrangement and was again agreed at the Malmo Conference in 1963 amongst IARU Region I Societies. It is pointed out that in a number of countries, notably the USA, band division by modes is governed by the amateur licence and any infringement is dealt with accordingly. It would be a matter of great regret if this state of affairs ever came to pass in the UK and would demonstrate that amateurs are unable to obtain order in their own house. With regard to the News Bulletins surely the six kc/s of the 3·4 Mc/s band can be spared from QRM (often believed to be deliberate) for the short time whilst the Bulletin is read.

The new Amateur (Sound) Licence A will come into operation as from June 1, 1964, and the document will come into possession of operators when the station licence is renewed. Careful reading is advised, and users of s.s.b. in particular should note an addition in Section 9(2) in which the new licence states that " when the period of use exceeds 15 minutes the call-sign shall be repeated at the commencement of each succeeding period of 15 minutes." Further, it is now clear beyond doubt that if a station changes location to another country within the UK, either permanently or temporarily, then the prefix letter must be varied appropriate to the new location, e.g. if GD2XYZ operated temporarily from Birmingham then the correct call is G2XYZ followed by the relevant suffix.

News from Overseas

A news item from **W1BB** gives the information that the Japanese authorities have granted permission for **JA** stations to use **Top Band** specifying a power of 200 watts on a spot frequency of 1880 kc/s. Only a small number of licences are expected to be granted. This concession follows months of tests to determine non interference with Loran; the principal negotiator was JA1CR, a director of JARL.

It is hoped that we shall again have the pleasure of hearing **ST2AR** on the air, but at the time of writing he is negotiating with the Sudanese authorities for a renewal of his permission to operate. It can now be told that following the misdirection of a QSL, both ST2AR and his equipment were impounded by the police pending enquiries. Fortunately Eric's right to operate was substantiated and the gear was returned after a short period. ST2AR (or will it soon be 6U2AR ?) hopes to be in the UK on leave around midsummer.

From **5A3TH** via G4MJ it is learnt that the former (at one time G3HUA) who comes from the Southampton area is now active on the h.f. bands looking especially for UK contacts and QSOs with members of the Ex-G Club. **G4MJ** is General Secretary (UK) for the Ex-G Radio Club which produces an excellent bi-monthly bulletin, of which the editor is Reg, W3HQO, who has probably worked more UK stations than any other North American operator! The object of the Club is to keep together amateurs coming from the UK and judging by the comments made by contributors it appears that Great Britain is not such a bad place after all, a fact some of the residents temporarily overlook on occasion.

VS1FZ anticipates returning to the UK later this year and asks that all QSLs should be sent in future via **G2ATM**, to avoid the long return journey to Singapore. VS1FZ notes that QSLs are being received for VS1EG and VS1PF mostly confirming 7 Mc/s QSOs. As neither of these stations are on the air obviously there must be pirate(s) at work. Stan suggests VS1LU or VS1LP as likely to be heard on 7 Mc/s, and both are active regularly.

EP2AB (Phyllis) and **EP2DJ** (John) will be permanently QRT from Iran on June 5, 1964. QSLs have been mailed to all first contacts. Anyone who has not yet received QSO confirmation may obtain a duplicate QSL from **K3YZN**. Both operators pass along their thanks to one and all for the opportunity to chat with you from EP land.

VP8GQ will be going QRT from Port Stanley around June 5 and should be arriving in the UK towards the end of the month. Simultaneously it is learnt that Peter was the leading single operator station in the world on 14 Mc/s

The European Band Plan

The plan, which is voluntary and supported by all IARU Societies in Europe, is as follows:

Frequency Band Mc/s	Type of Emission
3·5 — 3·6	c.w. only
3·6 — 3·8	phone only
7·0 — 7·05	c.w. only
7·05— 7·1	c.w. and phone
14·0 —14·1	c.w. only
14·1 —14·11	RTTY and c.w.
14·11—14·35	c.w. and phone
21·0 —21·15	c.w. only
21·15—21·45	c.w. and phone
28·0 —28·2	c.w. only
28·2 —29·7	c.w. and phone

* Please send all items to RSGB Headquarters to arrive not later than June 9 for the July issue and July 17 for the August issue.

during the recent *CQ* Magazine WW DX Contest (C.W. Section). Scores and further details will be available next month. The *CQ* Contest logs from VP8GQ which were lost in the post have been replaced and QSLs are now being sent out for these QSOs.

DXpeditions

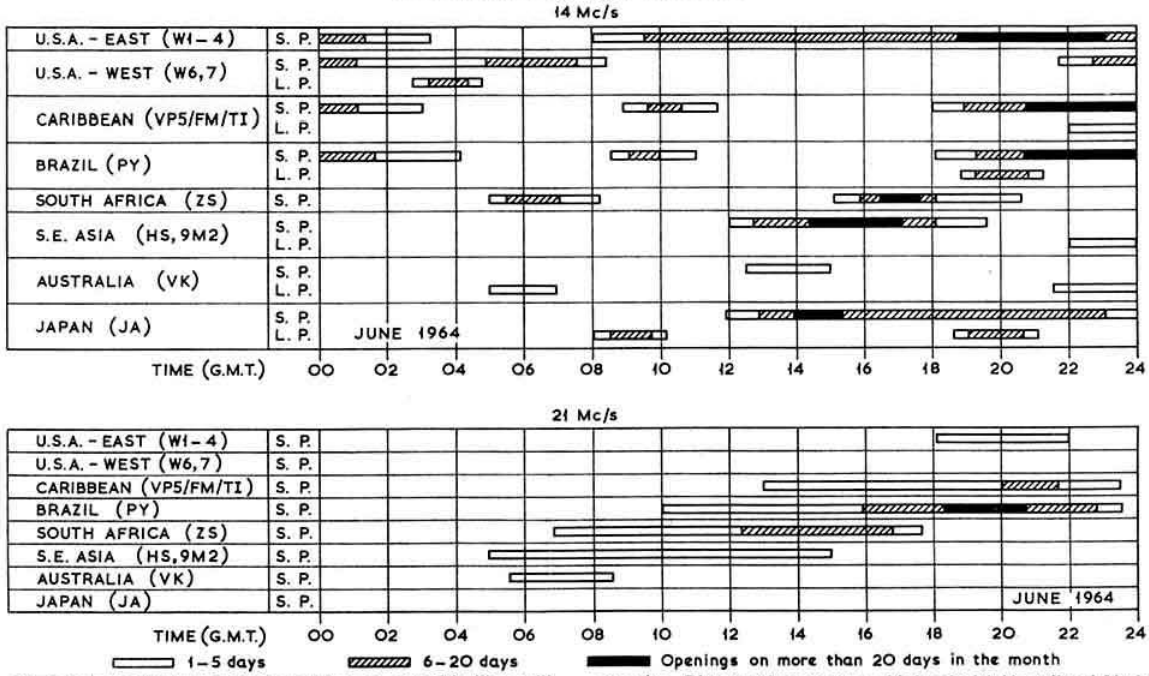
The ZC5 operation of **ZC5s AJ, AM** and **AT** was an undoubted success, but Bob, VS1LX, points out that the going was harder than it should have been owing to the very heavy JA QRM, which at times, completely covered up the European signals. Also, on several days the path to North America was very poor. The equipment used at Labuan was subsequently on the air under the calls **VS5TA, VS5MH** and **VS5LX,** and will also be used from Gan as **VS9MG.** It is hoped that the operation from Gan will last about two weeks, and after the return of VS1LX to Changi the equipment will go to **VS4RS** for about three weeks for a period of intense s.s.b. activity. Cards for European stations are being dealt with through the Bureau; QSLs for US contacts are being routed through WA2WUV, who was responsible for the loan of the equipment. VS1LX reports that the new prefix for Singapore will be 9M4, but that the effective date is not yet known. As might be imagined the working conditions in the various spots mentioned have not been particularly good and the operators are to be congratulated on putting a first class signal into Europe, often being the only one on 14 Mc/s from that part of the world.

The **VQ8BFC** operation of VQ9HB from **Chagos** continues and amongst the welter of rumour and counter rumour, the firm fact is that on some evenings the signals from 'BFC have been good, bearing in mind that a beam was not being used. QSLs should go directly to G8KS with reply postage.

The Lord Howe Island operation of **VK2AGH** was not a resounding success in so far as the UK was concerned although a number of European contacts were made, including G3JAG who made the grade on 7 Mc/s despite the continual (and often unnecessary) QRM. Propagation conditions were not favourable on 14 Mc/s and the signals, when heard, were weak. Conditions from Lord Howe Island do not seem to be on the same pattern as those from the Australian continent, and it is recollected that the previous station on the island was also very difficult to contact.

The Region 4 group of the **IRTS** are making a trip to **Valentia Island** off the Kerry coast between July 4 and July 6. All bands between 1·8 and 144 Mc/s will be used and a.m.,

PROPAGATION PREDICTIONS



Summer ionospheric conditions, which commenced in May, will continue during the present month and also during July and August. This will lead to a decline in conditions on 21 Mc/s; 28 Mc/s is of little use for DX working at this stage of the sunspot cycle, although on exceptional days the latter band may open to South America between 18.30 and 20.30 and to Central and North Africa between 16.00 and 19.30. On this band, as well as on 21 Mc/s, sporadic-E conditions will enable contacts to be made over distances of 300 to 1,200 miles, and this type of working will continue until September. On days of strong geomagnetic disturbances there will be opportunities for contacts on 28 and 21 Mc/s with European stations by means of reflection from the Northern aurora. On 21 Mc/s South America will certainly be heard between 16.00 and 19.30, whilst Central and North Africa may be occasionally heard, and the East Coast of North America, Australia and South-East Asia will only be workable on days of exceptional conditions.

On 14 Mc/s the summer conditions will lead to an improvement in DX conditions especially during the late evening and early morning. Direct path contacts on this band with Hawaii and Alaska should be possible between about 05.00 and 09.30. The summertime short skip conditions which on one hand can liven up the 28 and 21 Mc/s bands can also interfere with DX contacts on 14 Mc/s, mainly during the afternoon and early evening, by bringing in a noticeable amount of European QRM. As 14 Mc/s is appreciably lower in frequency than 21 and 28 Mc/s and skip distance is correspondingly less and therefore on 14 Mc/s more European stations are audible than on the other two bands. The summer conditions also make possible contacts on the long path particularly with Japan, South America and the West Coast of North America. Propagation conditions on 3·5 and 7 Mc/s will be little different from those prevailing last month.

The provisional sunspot number for April 1964 was 7·7, with the period of greatest activity lying between the 21st and the 24th of the month. The predicted figures for August, September and October 9, 8 and 7 respectively.

G6LX (centre) with VS1FJ, left, and VS1FZ.

c.w. and s.s.b. equipment will be available. The call-sign will be **EI0AC** and QSLs should go to EI5AB. Between June 20 and July 8, **EI9AE** (also G3MVV) will be active on all bands between 1·8 Mc/s and 144 Mc/s, with s.s.b. as the modus operandi on the h.f. bands.

YV8AJ commenced operation on May 15 and is a station sponsored by the Hammarlund DXpedition of the Month organization; QSLs should go to the Box 7388 address. The station was much in demand, due no doubt, to the unusual prefix, and also as a contact will count towards the Hammarlund certificate which, it is understood, will be available for contacts with DXpedition of the Month stations in all continents.

VR1B did operate from the Phoenix Islands as anticipated but propagation conditions were not favourable for Europe. It is rumoured that a group of CR6 amateurs will make a trip to **Annobon Is.** and other EA0 islands, and July is given as a likely date. There are also similar underground movements regarding the possibility of a spell at **St. Barthelemy Island** by FG7XT, with the second half of June as the favoured period. It is said that this island qualifies for separate country status, and further pronouncements are awaited. The HB9TL s.s.b. rig is still at **FB8ZZ** but the signals have been only rarely heard and then only at poor strengths.

The trip by **GW3MWZ/P** was not as successful as the two previous forays, due partly to increased QRM from commercial stations. However c.w. contacts on Top Band were made with G, GW, GI, EI, OK1ACC and OK1AHZ.

Contests

The following leading *claimed* scores were made in the RSGB **Low Power Contest** held on April 5, 1964: G6VC (1810 pts.); G3JVJ (1320); G4JW (1240); G3NEO (1064); G3RBP (1052) and G3ORU (1042).

The Phone Section of the *CQ* **WW DX Contest** attracted over 700 entries from 117 countries. Amongst the leading entrants were:

All Band Single Operator		*Multi-operator Single Transmitter*	
5A1TW	662,546 points	DL1KB	623,948 points
ZD7BW	598,647 ,,	TI0RC	595,358 ,,
5N2JKO	543,415 ,,	HC2JT	499,722 ,,
CX3BH	446,558 ,,	9A1AIJ	446,145 ,,
4X4AS	402,391 ,,	UA9KCF	433,780 ,,

The leading multi-operator, multi-transmitter station was CX2CO with a score of 1,026,086 points.

Leading UK stations were:

G8FC	All band	150,781 points
G5ZT	,,	121,342 ,,
G6RJ	,,	93,170 ,,
G3NFV	,,	56,025 ,,
G3MWZ	,,	6864 ,,
G2AJB	,,	6160 ,,
G3FXB	14 Mc/s	270,692 ,,
G4CP	,,	185,640 ,,
G3LSF	,,	108,019 ,,
G3MEA	,,	36,524 ,,
G3PZO	21 Mc/s	7876 ,,
G3PRP	,,	6336 ,,

G3FXB was the highest scorer in Europe on 14 Mc/s, with GI3CDF in a similar position on 3·5 Mc/s.

Awards

An attractive certificate is offered by the **US Boy Scout Troop 52,** Coplay, Pennsylvania under the following conditions:

1. The applicant must QSO club station K3WQW and one other member. (K3VWH, W3UQX, KN3YIC, KN3ZRJ, KN3ZSK, KN3ZUN and KN3FCB).
2. A GCR list with one dollar or seven IRC should be sent to K3VWH, 1120 Hokendauqua St., Coplay, Pa., USA. Most of the activity from the stations listed is on 14 and 21 Mc/s c.w. during the weekends.

From **OE7PG** via G3FKJ comes details of the **Olympia Award:**

1. All bands and all modes are allowed.
2. Effective date for a QSO must be between July 1, 1963, and December 31, 1964, and this must be with an Austrian station.
3. There are three classes, viz: Class 1, Class 2 and V.H.F. and for European stations (except Austria) the requirements are 10 QSLs, 5 QSLs and 2 QSLs respectively. The same OE station may be worked once per band.
4. The award should be claimed by a GCR list, and is also available to short wave listeners.
5. Applications, accompanied by 12 IRC should be sent to T. Anton, OE7TAI, Dreiheiligenstrasse 6, Innsbruck, Tyrol, Austria.

From **ZL2GX** via G3HCT comes the following list of **Worked All Pacific** certificate holders:

Phone and C.W.		*Phone only*	
4	G2PL	34	G3DO
14	G6RH	42	G5VT
21	G6ZO	59	G3HLS

Hamfest in Ghana
At the recent GARS Hamfest in Accra were 9G1s: DR CC ED EM DG FB (back row), DY EZ FA EX EH DV (middle), GN AB EW EO (front). 9G1AB is President of the Ghana Amateur Radio Society.
(Photo via G6CL)

QTH CORNER

EI0AC	via EI5AB.
EP2AB	via K3YZN/8, Major J. P. Denham, Det 4 USA ROTC Instr. Group, University of Cincinnati, Cincinnati 21, Ohio, USA.
FG7XT/FS7	via K5AWR.
K1KDS/AM	Bob Le Page, US Navy Div. 80, Capodichino Airport, Rome, Italy.
OY8KR	via Box 10, Torshavn, Faroe Islands.
PZ1CE	via K5YCT, K. C. Morton, 1455 Martin Drive, Houston, Texas, USA.
VR4CM	via K5HVW.
VS1FZ	via G2ATM.
VS1ME	I. H. Crowther, 20 Shed, 2 Site, 389 MU, RAF, Seletar, Singapore 28, Malaysia.
VS5MH, VS5TA	via VS1LX.
YA4A	via K4KMX.
ZC5DS	via VS1MF.
ZP7FF	via K1RZW.
ZS6AP/ANT	via ZS6BDS.
5R8AH	M. Meyzie, BP 61, Fort Douglas, Malagasy Rep.
7X3CT	via W2CTN.
9L1WN	W. Northey, Ministry of Works, New England, Freetown, Sierra Leone.
9M2JJ	The Trade School, Ipoh, Malaysia.

* * *

RSGB QSL Bureau: G2MI, Bromley, Kent.

84	G4CP	87	G8KS
161	G6XL	102	G2BVN
205	G3YF	111	G3FKM
210	G3FKM	124	G3KZI
215	G8KS		
216	G3AAE		
307	G3HDA		
315	G6VQ		
322	G3HCT		

* *

GM3DHD holds No. 75 (phone and c.w.) and No. 15 (phone only) certificates.

In connection with the **WAZ Award** (issued by *CQ* Magazine) it should be noted that Gan, one of the Maldive Islands, lies to the South of the Equator and is therefore in **Zone 39** and *not* Zone 22. VS9MB and VS9MG have recently been active from this location.

The Directory of Certificates and Awards published by K6BX contains details of several hundred certificates available from organizations in all continents. The *Directory* is published quarterly from January 1 in each year and the cost of a single copy is 18/6. A three ring binder to contain the *Directory* is an additional 7s. 6d. Orders may be placed via G2BVN and the books are despatched direct from K6BX to the subscriber. Each issue contains details of the Certificate Hunter's Club and allied organizations.

Around the Bands†

Very few reports have been received this month and so a realistic assessment of conditions is difficult. **1·8 Mc/s** is obviously in the doldrums whilst **3·8 Mc/s** has yielded a little DX. **BRS20317** (Bromley) has heard his 130th country with OR4VN (23.42). Other stations heard include VE2TG (22.45), K4LJV (00.45) and PY7ALA at 22.30, all at good c.w. strength. Listener **A2498** heard varied s.s.b. from DJ1HP/P (Maritime Mobile in St. Lawrence Seaway) (03.35), HK5JS (04.30), HR3HH (05.25), KG4CG (04.10), PJ2AA (04.50), PJ3CF (05.35), K9PQR/VO2 (04.15), VP7NS (05.10), VP9BN (01.55), YV5ANS (02.15), YV5BPJ (03.00) and ZL2BCG (05.45). The USA also supplied rare states including Alabama, Louisiana, Mississippi, Kentucky, Tennessee and West Virginia.

On **7 Mc/s** DX is still getting through and **G3JAG** (Rochdale, Lancs.) reports VE7BDJ, W6CCP and others from W6, ZL1HY, ZL2BDA, ZL4IE, ZL4CT, ZL4JF (Campbell Is.), LU8DLK, YO3SC/MM (in Cook Strait, NZ), XE1PCL, many VK2s and VK3s, OA4EM and VE8DL, all between 05.00 and 07.00 GMT. At other times were FY7YK (22.25), KV4CI (23.20) and ZE3JO (17.50). **A2498** (Croydon) heard OA4MX (06.35), VK1ATR (07.10), VK3AC/M at 07.10 (stuck in a traffic jam) and VK5RD (07.20). **BRS20317** (Bromley) has been busy erecting a new vertical aerial which gives improved results, although, as to be expected, increased QRN during thundery weather. His usual round-up includes

Europe: Unusual UY5CC (15.50) in Ukraine, and TF6GI (18.00).

Asia: Perhaps the easiest distant Continent to receive, especially 4X4 and UA-UW9s mainly after 16.00 GMT; after this hour UL7/UH8/UJ8 all received very well. More distant UA0AA, UW0AF (16.45/17.30), and in Khaborovsk, Zone 19, UA0GU (18.00/19.00), all rather weak. JA2BTF, JA3DDG, received weak and difficult (17.45/20.30). Better signals came from BY1PK (19.00), 4S7WP (17.50) and MP4BBA (18.00).

Africa: Quite a varied group, with the best signal S8 from 5Z4IV (19.15/20.45); other evenings reception of ZE3JI (17.45), ZE6JE (18.15-30) weak, and CR4AH (18.07). VQ2BC (19.15), CR6DT (23.15), EL2AD and 8X (22.15/23.15); in the morning ZD3A was available looking for VK at 07-08.00. A rather unusual call was FB8/DLH at S6-7, 00.35, c.w. in Madagascar.

Oceania: Excellent signals from VK2 and 3 (07.15-08.15) and evening appearances noted for the first time in April from VK3IT, (21.00-21.15) S6, also VK5NO (20.00-45).

North America: Earliest in April was WA2NKC at 20.45 GMT with K5 and East Coast. West Coast poor, K6TZX (07.10) and North, VE8RX at S6 (07.30). Outstanding East Coast signals were K4POA and VE1ZZ (23.15). Central USA, W9 (early 22.30). DX-wise, KV4CI is available at S8 on most nights at 23.00, and KP4/VP9 is also on at 22.45 at S7.

South America: DX calls were responded to by PZ1CM (21.00 at S6), KZ5AW (S6 at 22.00), and FY7YK (22.30 at S7). Good signals were CP5EZ, CE1EK, HK7BE often S7 at 23.30.

On **14 Mc/s**, DX has continued to appear. **G8JM** observes that the Pacific is appearing in the mornings again but is rather unpredictable. He has worked 5H3JR, 5T5AD, KC4USV, KX6DB, VR2DK, ZC5AM, ZC5AT, KH6GS, ET3AV, YS2SA, HZ2AMS/8Z4, VQ8BFC, 5U7AC, MB4QBF, AP2MI, VQ9HJB, PJ5SA, ZS7R.

A1798 (Winchester) logged much DX including PJ2AA (21.00), YS1O (13.10), VU2NR (13.35), JA1BRK (10.00), KR6GF (13.45), MP4BEM (14.01), ZP5OG (19.52),

9M2CR in Kuala Lumpur uses the Collins S-line. *(Photo by G6LX)*

† Compiled by J. G. Cottrell, G3PSY.

MP4TAV (16.35), HK4EB (19.48), HL9TD (12.55), JA5HT (13.00), FM7WQ (18.00), 9M2CR (16.44), all on s.s.b., whilst on a.m. were 9Q5GE (18.00), and AP2MI (17.30).

A3738 (Leeds) also heard plenty of s.s.b. activity including TI6CAL (20.12), ZS1XB (16.35), KL7BJW (08.34), VS1TR (16.05), VE6, 7 and 8 areas and most other areas noted above. S.s.b. reports have also been received from **A2498** (Croydon) and he adds CP1BH (21.00), CR6BX (20.30), CR9AH (14.25), EP2AU (06.25), HC2JT (21.15), TL8SW (16.25), VS1MB (14.55), ZD6PBD (17.55). Also various African call-areas as well as most of the usual Pacific countries.

On **21 Mc/s G3RMF** (Worcester) has been working DX with VS9ARC (16.22), ZS1AB (17.02), ZE1AV (16.14), 4W1B (12.57), VE5ES (17.25), CR7FB (16.30), 6W8AE (18.05), PY7AEG (18.58), 5N2LJM (15.13) and 9Q5FD (17.58) all on a.m. G3RMF says he has worked many stations including 5A5, VE4 and W/K with only 10 watts. **J. W. Smith** (A3850) says that most continents are now audible at some time of the day, examples are AP2NQ (07.20), VS9OSC (11.00), KR6BF (11.33), VQ8BL (12.30) and TT8AN (14.40). All the usual VS9, 5B4, 5A and MP4s etc., are being heard. The band is now remaining open much later with excellent openings to the Caribbean and South America. Stations heard include VP6JC (20.35) and FG7XL (21.15) both at S9, and many more.

A3738 (Leeds) finds this band temperamental but heard 9G1EC (15.22), 5H3JI (15.25), CR6JL (15.50), 9Q5LK (15.33), PY7EL (15.35), SU1DL (16.05), YV1EM (16.10) and 5N2EG (18.13).

A2498 (Croydon) heard a.m. from PY7AKW on Fernando de Noronha calling and listening for five minutes at 18.20 GMT with no result. PZ1CE (18.45), 5H3JJ (19.00), 5H3JL (18.20), 5N2CKM (18.40), 5X5AU (18.25), 5X5JK (18.55), 9G1EC (18.10), 9L1JR (18.25), 9Q5HF (18.40), and 9U5DL (18.15).

A1798 (Winchester) heard a.m. from PY7ALM (17.40), CR6GO (18.14), 9Q5AR (18.22), SL5DIC/9Q5 (18.22), CR6DL (18.25), CR6BR (18.25), 5X5JK (18.30), 5H3JL (18.35), 9Q5JR (18.43), CR6GQ (18.25), 5N2EGL (17.34), 9Q5PA (17.40), PY2KT (18.52) and s.s.b. from ZS1TZ (14.54), 5H3JR (14.54), 6O6BW (17.45), VQ2AB (17.42).

Finally, no reports for **28 Mc/s**, although openings ought to appear soon.

DX Briefs

In connection with the warnings of geophysical alerts now broadcast by **WWV** and mentioned last month, these are timed for the first half of the 18th minute past each hour and not as previously stated.

The Swiss Broadcasting Corporation will transmit details of sunspot numbers on 42·19 m and 31·04 m at 19.40 GMT on June 6, July 4, August 8 and September 5, 1964. This information is given in English and the transmissions are directed to the UK.

OE3WB, former secretary of the Austrian National Society, OëVSV, who died recently after a long illness, was largely responsible for the preservation of Amateur Radio in Austria after the war and during the occupation period. (G2MI).

5N2RSB has sent out all the QSLs for his TJ8 and TY2 operations and any further requests should be sent to: S/Sgt. R. Briggs, 5 Gough Road, Catterick Camp, Yorks., which address will be good until December, 1964.

G5CP, who runs a KW2000 when mobile in a VW1500 records a two way s.s.b. QSO with ZP7FF on 21 Mc/s.

The **OSCAR** net is held on Fridays at 06.30 on 7015 kc/s with W5ASH as net control. (G3JAG).

W6DFY is a consistent signal on 7 Mc/s whenever there are openings to the West Coast, and this can be explained by his new location which is 3500 ft. a.s.l., where the aerial is a three element beam at 85 ft. (G3JAG).

VS1LX made 1500 QSOs from **VS5LX** in six days, contacting 104 different countries. In the initial six hours of operation from **ZC5AJ**, on the way back to VS1 from VS5, 41 countries were worked in six hours. (G3RWR).

Many thanks to all correspondents and acknowledgement to the West Gulf DX Club *Bulletin* (W5IGJ), the LIDXA *Bulletin* (W2MES), *DX'press* (PA0FX), the *DX'er* (W6HVN) and the *Florida DX Report* (W4HKJ). Please send all items to RSGB Headquarters to arrive not later than **June 9** for the July issue, and **July 17** for the August issue.

REGION 16
OFFICIAL REGIONAL MEETING

The Generating Station, South Denes, Great Yarmouth, Norfolk.

SUNDAY, JUNE 14, 1964

Programme: The event will commence with a mobile rally, followed by the business meeting at 2.45 p.m. After a buffet tea, Major G. F. West, E.R.D., B.Sc., F.R.A.S., will lecture on." Astronomy." There will also be a display of home-constructed apparatus, and a " Raynet " exhibition.

Tickets, which include tea and three raffle tickets, are available price 6s. (YLs, XYLs and Jnr. Ops. 3s.) from the ***Regional Representative,*** *P. J. Naish, G3EIX, 6 Mildmays, Danbury, Chelmsford, Essex, and also from the* ***Deputy Regional Representative,*** *L. A. Jackson, G3HPR, 8 Arnott Avenue, Gorleston, Great Yarmouth, Norfolk.*

The Council will be represented by the Zonal Representative, Mr J. C. Graham, G3TR, the Executive Vice-President, Mr E. W. Yeomanson, and Mr J. C. Foster, G2JF.

Talk-in stations: 2m G3SMP/A
160m G3NTV/A

The ORM site is very suitable for picnics and is set in semi-rural surroundings with gardens and playing fields.

Route signposted by Automobile Association.

The Green and Davis 2M15-20A "Falcon" is a 20 watt input phone and c.w. transmitter for 2m for operation from 230V a.c. or 12V d.c. A switched 250V d.c. supply for an associated receiver is provided. The "Falcon" has also push-to-talk facilities and internal switching and controls for operating an external 70cm tripler/amplifier. Cabinets in the same style can be supplied at £12 each.

Mobile Column

By E. ARNOLD MATTHEWS, G3FZW*

ORGANIZED jointly by Midland ARS and Stoke-on-Trent ARS, and officially opened on Sunday, April 19 by the Lord Mayor of Stoke-on-Trent, Ald. Westwood, the **North Midlands Mobile Rally** was well attended despite appalling weather. Some 2548 people took part in the rally, and the number of cars was slightly greater than last year, for 725 were checked in by the officials at Trentham.

As Trentham is one of those places where vehicles cannot be moved around once they are in the car parks, the organizers concentrated on making the exhibition in the Ballroom the main feature, and this year almost 60 visitors had stands, and showed many and varied things both of a radio nature and of interest to the YLs and XYLs. The rain prevented some of the outside events such as the model aircraft and water ski-ing competitions from being as well attended as was hoped, but most people were content to wander round the Ballroom and watch the static exhibits and meet and chat with old friends. Catering and bars were run by the Trentham authorities as usual, and were very quickly patronised by many who went.

A very elaborate scheme of talk-in stations had been arranged in order to ensure that a relatively clear channel was available most of the time. On 160m the control station G3GBU, operated by G3EHM at Trentham Gardens, was ringed by outstations between 5 and 15 miles away and spaced at 10 kc/s intervals in the band. These were G3HVI, G3COY/A (at Keele University), G3JZB, G3STM, and G3SAJ. Between them these stations made 157 contacts, of which 57 were by G3GBU. On 2m G3MAR, using equipment installed in a caravan by J-Beam Aerials Ltd., made about 20 contacts from Trentham, and G3LLJ, sited on Mow Cop made 40 more at up to 65 miles. G3UD worked 80m s.s.b. and G3JGE/A, assisted by members of 238 Sqn. ATC, worked 80 and 40m.

The most interesting part of the rally was the various stands of local radio societies, the scope of whose exhibits ranged from press cuttings and equipment of historic interest by **Derby and District ARS** to G3DZT's third method s.s.b. transmitter on the **Lichfield ARS** stand. This society also demonstrated oscillograms of valve characteristic curves.

On the **Midland ARS** stand G5PP and some helpers did a roaring trade in a handy little booklet *Aids for the Mobile Operator*. This is a collection of a series of articles published in MARS *Newsletter* some time ago and deals with the construction and use of test equipment. Examples of the equipment were displayed on the stand.

Hardly applicable to amateur radio, but very intriguing was **Slade Radio Society's** equipment for obtaining about 10kV from half a pint of running water. **BATC,** with members from Dudley, Birmingham and Manchester were using 4 vidicon camera units, a telecine unit, and a mobile outside broadcast transmitter to provide a very comprehensive display manned by G3LEE, G3SOB/T, G3RKV/T, G3KBA/T and others. **Dudley ARS,** like most of the club stands, had a display of home constructed equipment.

The Armed Services had several interesting displays. 8 Signals Regt. took much modern army equipment including a six-channel 4000 Mc/s link, and their test equipment was set up to demonstrate i.f. alignment of an AR88. Members of the team included G3UO and G3TPB. The RAF had two exhibits; one by a bomb disposal unit.

Trade stands included J-Beam Aerials; Joseph Lucas, whose stand was manned by G3AYJ; Johnson Matthey, displaying high stability capacitors; and KW Electronics, showing the KW2000 transceiver. Without doubt Rowley Shears, G8KW, could claim to have travelled the furthest to attend this rally, having come over from the Irish Convention at Dundalk. Cabinets were on show by Philpotts Metalworks and Reosound, and Daystrom displayed its range of Heathkits. Various components were to be had from N.W. Electrics and Jack Tweedy.

The Five Towns Aero Model Club gave a fine demonstration of radio controlled model aircraft and also displayed model boats, etc. Members of the Stoke Boating Club put on a show of water ski-ing despite the weather.

Operating Notes

A card from **G3III/M** (Chippenham) gives the line-up of a neat home made mobile station for 160m. The receiver has a 6BA6 r.f. amp., 6BE6 mixer, 6AM6 osc., 6BA6 i.f. amp., OA79 det., OA79 a.v.c., ECC83 a.f. amp., and a 6BW6 output valve. The transmitter has a 6AM6 v.f.o., 6BA6 buffer and 6BW6 p.a. The microphone amplifier is an ECC83 and the modulator is a further 6BW6. The power unit uses OC36s and a home wound toroid, and the aerial is a base loaded whip. At the moment, G3III is designing a transceiver also for 160m.

G3KNB, whose receiver is a KW66 (and not a KW77 as previously reported) has been working on 20m very successfully, having received an RS58 report from WB2AJK. His best DX to date seems to be a /M to /MM QSO with K2WWF/MM aboard the tanker *Monphelia* 51°N, 31°W.

The following information from **G3MKR** should be helpful to anyone seeking a /M licence in EI. Applications should be made to The Department of Posts and Telegraphs, General Post Office, Dublin 1, and the following information should accompany the application. The applicant's licence, including the mobile licence must be sent for inspection; and the dates for which an EI licence is required, the proposed modes of emission and the registration number of the vehicle must be stated. If a licence is required for less than one month there is no fee, but for periods greater than one month a fee of £3 is charged.

All contributions for *Mobile Column* and detailed information on forthcoming mobile rallies should be sent direct to E. A. Matthews, G3FZW. Only brief details of future events for inclusion in *Mobile Rallies* should be sent to Headquarters.

Sixth Convention of Yugoslav Radio Amateurs

The Convention is being held in Novi Sad on June 26, 27 and 28. A comprehensive programme has been planned and foreign amateurs will be welcome to attend. Novi Sad is on the Danube, 80 km northwest of Belgrade.

Further information may be obtained from the SRJ, Belgrade, PB 324, Yugoslavia.

Closing date for the July issue
June 5

Closing date for the August issue
July 10

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

*1 Shortbutts Lane, Lichfield, Staffs. Please send all reports for this column to arrive by June 5 for the July issue, and July 7 for the August issue.

MOBILE RALLIES 1964

June 14 ..... **Hunstanton "Bucket and Spade" Party**

Meet at 9 Lavender House, Seagate Road, Hunstanton, Norfolk

G3ANM/A———1·98 Mc/s } talk-in stations
G3RED/A———145·2 Mc/s }

Organized by the Peterborough Amateur Radio Society

June 21 ..... **Longleat Mobile Rally**

Longleat Park, on the Frome-Warminster road, A362.

Commencing at 10 a.m.

G3JMY/A———1·885 Mc/s } talk-in stations
G3SJI/A———2m, Zone 2 }

Prizes and certificates will be awarded for the longest distance contacts with control stations. There will be a frequency measuring contest, raffle, concours d'elegance, DX balloon race, jnr. treasure hunt, field strength test, and a longest double trip award.

Organized by Bristol RSGB Group

June 28 ..... **RSGB National Mobile Rally**

USAF Station, Wethersfield, near Braintree, Essex

For details see page 391

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 huut 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

RAEN Notes and News

By E. ARNOLD MATTHEWS, G3FZW*

AT the first Committee meeting in 1964, Messrs G. A. Allcock, G3ION, and E. R. L. Bassett, BRS16075, were re-elected Chairman and Honorary Secretary respectively. Mr. Bassett's address is 57 Upper St. Helen's Road, Hedge End, Southampton, Hants.

The new procedure and rules have been printed, and will be issued to all members in the form of a very well produced 32-page booklet entitled *The RAEN Manual*. It also includes a section dealing with administration and field organization.

One of the difficulties facing the Network has always been the problem of maintaining an effective means of internal communication. This column can contain matters of general interest, but space precludes detailed treatment of domestic matters. The Committee therefore proposes to issue to all County and independent Area Controllers a quarterly newsletter to be known as *Network News*, edited by G3FZW.

It is also planned to hold regional meetings, the first of which will cover Sussex, Kent, Hants, Dorset and Wilts., and will either have been held at the end of May, or is due to take place during the early part of this month.

Equipment

Thanks to one of the country's leading manufacturers, a large quantity of surplus business radio equipment is being made available on free loan to the Committee for distribution to members under very reasonable conditions. The only cost to members will be that of carriage. Although the sets remain the property of the manufacturer they can be modified to suit amateurs' requirements. G3ION is at present evolving circuitry required to convert the receiver sections to operate in the 4m band.

Details of the conditions of issue of the equipment, a large quantity of which is already in the possession of RAEN, will be circulated to CCs and ACs very shortly.

Around the Groups

The Norfolk group reports that winning the Raynet Trophy has proved to be a great morale booster, and the high level of activity is being maintained. Although this group has used 160m for many years, work is now being done on 2m and the existing 160m links are being paralleled. The King's Lynn-Norwich link, which has always proved difficult, has been tested on 2m with favourable results.

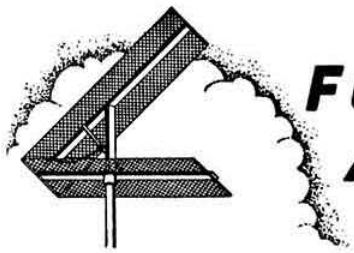
An exercise is being arranged with the county Red Cross branch, and another with Police in July.

The Surrey group continue to hold regular exercises. An enthusiastic, if small, team continues to equip user services HQs with permanent stations. G3MFB has found it necessary to resign the office of Honorary Secretary to the group, and the task of preparing the most interesting and logical newsletters of the group has fallen to the CC, G3VK, whose amusing phraseology ensures that the information sheets are carefully read. Incidentally, the newsletters and information sheets are colour coded and pierced for easy filing, a tip which other groups might well follow.

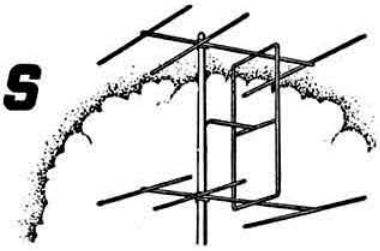
Hampshire group held an exercise in the Fordingbridge area on March 22. The terrain there is difficult and results were not as predicted. Stations expected to be heard were unreadable, and vice versa.

G3NIM has produced an excellent 8mm colour film with sound accompaniment, based on an aircraft crash and shot during the group's participation in a combined exercise with emergency services.

* 1 Shortbutts Lane, Lichfield, Staffs.



FOUR METRES AND DOWN



By F. G. LAMBETH, G2AIW*

FROM Albert Latham of Dublin, one-time G3JLA of Stevenage and now EI6AS, comes a vivid word picture of his activities during the RSGB 144 Mc/s Portable Contest on May 3. In a letter to G5UM (who hopes to be visiting him in early June) Albert writes:

" I left home at 8.30 in the morning complete with an 8-element Yagi and the portable rig and made my way to a site 2450 ft. a.s.l. on which the Telefis Eirean Television mast stands. Although the wind was fairly moderate at about 250 ft. (estimated home height), by the time I reached 2400 ft. the wind was so high that it virtually prevented opening the car door. As for the rain, instead of drops or even bucketfuls, it was in fact like plate glass windows moving diagonally downwards, a fantastic sight.

" I toured around and came down on the other side of the mountain range. Although some good sites are to be had, trying to find a take-off to the east and south-east is a problem. I eventually came down to 800 ft. a.s.l., and fixed up the Yagi, " fixed " being the operative word, for when it was first put up I found I had what we all have been looking for—an omnidirectional aerial system with 14 db gain, wind driven! Unfortunately I did not take sufficient co-ax to make full use of this property.

" After clamping the aerial to the car roof rack in a south-easterly direction I felt sure the car was then turning as well!

" After calling for many hours and hearing GW3KMS/P, GW3PPB/P, GI3GXP/P, GW3OXD, G3DEI/M, G6UQ/P, GW2HIY, GW3MAB, GW3MDK/P, and one or two Gs in the Midlands (including people calling and working G3EDD) I only managed to work GW3RUF/P on Snowdon, coming in ' summit like a local .'

" One lesson I learned: it doesn't matter how good the thought of a mountainside QTH sounds, it is better to have one's feet on the ground—sea level in these parts—and venture to the high spots only when the barometer is well up.

" When I got to the top of Kippure mountain and reached the TV mast there I felt like Captain Scott must have done when he reached the South Pole. I took a photo of the site-board to prove I'd been there, and retreated. "

IQSY News

Owing to the present position of the sunspot cycle, we have heard very little of 50 Mc/s operation, but with IQSY in operation it is not surprising that efforts are being made overseas to check propagation on this band during the period of the experiments. We have had a notice from ZE3JJ (Salisbury S. Rhodesia) describing the installation of a small automatically keyed beacon transmitter which has been sited on a prominent hill about 5000ft. above sea level and approximately 1000ft. above the surrounding terrain, 25 miles North of Salisbury. The transmitter, which is running continuously, is unattended, but frequently monitored in Salisbury for correct operation. The frequency used is 50·046 Mc/s, and Fl keying (f.s.k.) gives an upward shift of approximately 200 c/s on MARK.

The signal sent in Morse is " QRA de ZE1AZC ", and this is repeated continually, with a 36 second break of carrier every six minutes to allow receiving stations to check no-signal conditions, and to adjust automatic recording instruments. R.f. power to the aerial is of the order of 40 watts, the aerial being a quarter-wave ground plane.

The transmitter, which is of unique design in that the r.f. section is built into the aerial itself, is mains operated, and changes over within a few seconds to a petrol-generator supply in the rare event of mains failure.

It is intended to keep this equipment in operation throughout the International Years of the Quiet Sun, and reports of reception in Cyprus, the Republic of South Africa and from various centres of Southern Rhodesia have already been received.

All reception reports on this beacon, which will be appreciated and acknowledged, should be sent to: Ivan Wood, c/o ESC, PO Box 377, Salisbury, S. Rhodesia.

F/EA Crossband Contact

F3SK (Biarritz), with the assistance of **F9BP/P** who permitted the preliminary trials and helped with the installation of a portable station, was able, on April 5, to make an excellent crossband F/EA QSO on 432/144 Mc/s using fully transistorized equipment at both ends. F3SK's Spanish friend used 432 Mc/s equipment lent by F3SK. The QSO was made at a distance of approximately 25 miles (optical path) in terrible weather, with rain, wind and cold. These trials were conducted to demonstrate that with a good receiver one can utilize 70cm without great expense. The transmitter uses an AF102 overtone oscillator at 36·18 Mc/s, AF102 tripler to 108·44 Mc/s, AF102 buffer, AF102 doubler to 216·88 Mc/s, AF139 doubler to 433·76 Mc/s, and an AF139

Four Metre Band Extended

With effect from June 1, 1964, the 70 Mc/s band has been extended to 70·1 to 70·7 Mc/s.

The band is allocated until further notice to stations in the Amateur Service on a secondary basis on condition they do not cause interference to other services. Use of the band is subject to certain other conditions, including one which permits disaster relief operation under Clause 1(1)(c) of the Amateur (Sound) Licence A only on 70·375 Mc/s ± 25 kc/s. Frequencies between 70·1 and 70·3 Mc/s inclusive and 70·5 and 70·7 Mc/s inclusive shall not be used on the North West side of the line Firth of Lorne to the Moray Firth. Use of any frequency in the band must cease immediately on the demand of a Government official.

* 21 Bridge Way, Whitton, Twickenham,, Middlesex. Please send all reports for the July issue to arrive by June 5, and for the August issue by July 10.

p.a. Collector modulation of the p.a. is accomplished with a six-stage 2N525 amplifier driven by a crystal microphone. For phone operation the supply to the p.a. is lowered to 6 volts by a Zener diode, and the supply to the modulator output stage is limited to 12 volts by a further Zener diode. The whole unit is powered by a 12 volt battery. The r.f. power is about 10 mW on c.w., and 3 mW on phone.

To precede the transistor receiver exhibited at the London V.H.F. Convention three years ago F3SK has made a new converter. It has two AF139 r.f. amplifiers for 70cm, and the second amplifier and a filter are used solely to suppress image reception of TV or f.m. harmonics. Next follows an AF139 mixer, AF114 overtone oscillator at 51 Mc/s, three AF102 doublers to 408 Mc/s, and a 408 Mc/s AF139 amplifier. The crystal chain power rail is stabilized at 9 volts by a Zener diode. The u.h.f. circuits employ flat lines and the whole unit is carefully shielded and partitioned.

The 432 Mc/s aerials used for the contact were both five element close-spaced Yagis with baluns, and on 144 Mc/s a dipole was used in Spain and a TW halo at Biarritz.

IARU Region I V.H.F. Contest

Only four British entries (G2JF, G5ZT/P, G5MR and G2DHV/P) appeared in the September 1963 IARU Region I Open Contest. G2JF won Section 1 (and the PZK Trophy) by a handsome margin, scoring 42,756 points, and F8VN came second with 31,774 points. G5ZT/P made a good showing in Section 2, coming tenth with 27,847 points. This section was won by the overall winner, ON4ZN/P with 58,434 points.

The other British scores were, in Section 1, G5MR with 5394 points, and Section 2, G2DHV/P with 2459 points.

Following is a list of leading stations in each section.

Section 1								
1	G2JF	42,756	5	F3XY	26,120	9	SM7BZK/720, 292	
2	F8VN	31,774	6	DL3SPA	25,545	10	DJ3EAA	19,489
3	F9NJ	31,747	7	F3XK	22,462			
4	PA0CML	26,191	8	DM2ADJ	21,107			
Section 2								
1	ON4ZN/P	58,434	5	ON4KJ/A	33,073	9	DL9GS	28,467
2	DJ5FQ/P	46,573	6	OK1KSO/P	30,098	10	G5ZT/P	27,847
3	PA0LX/P	36,285	7	HB1KI	29,190			
4	F2TU/M	33,118	8	OK1DE/P	28,668			
Section 3								
1	PA0EZ	1418	5	I1LOV	982	9	OK1AI	719
2	HB9SV	1271	6	DM2ADJ	761	10	I1PDN	707
3	DL3SPA	1095	7	I1ER	749			
4	I1SVS	993	8	ON4ZK	736			
Section 4								
1	OK1KCU/P	1996	5	OK2BBS/P	1205	9	I1ZER/P	787
2	I1ZEG/P	1925	6	OK1SP/P	962	10	OK2ZB/P	771
3	I1TEX/P	1694	7	OK1VBN/P	827			
4	OK1AMS/P	1601	8	HB1LG	807			
Section 5								
1	DL3YBA	163	5	DL9AR	17			
2	DJ4NG	113						
3	I1ZBS	40						
4	I1LOV	28						
Section 6								
1	DL3EN/P	310	2	I1RBT/P	40	3	I1TEX/P	37

V.H.F. Expeditions

The Radio Club of 92nd Signal Regiment, Army Emergency Reserve, will be operating from Cairn o' Mount, Kincardine, on Sunday, July 19, 1964. Their call-sign **GM3SIG** will be used, and frequencies within the appropriate part of the Band Plan will be adhered to, i.e., 145·8 to 146 Mc/s. Schedules can be arranged by writing to G3LOV, 8 Lipsham Close, Banstead, Surrey. The operating time will be 11.00 to 17.00 GMT.

G2DHV/M will be on holiday in Dorset from July 19 to 25, and will operate on 144·120 or 144·696 Mc/s.

The proposed **GB2GC** expedition to Jersey in August (4m to 23cm) has regrettably been cancelled owing to accommodation difficulties, but the group hopes to visit one of the other Channel Islands during the summer. More details are promised later.

Danish 2m Atmospheric Balloon

We learn from OZ4UB (Secretary of Oscar III and Balloon Committee of Denmark) that a balloon was due for launching on May 24 at 08.30 GMT. The location of the launching was QRA Locator GP12A (Farum, nr. Copenhagen) and the balloon transmitter frequency 144·050 Mc/s at 20 mW. The aerial is omni-directional, and the emission 10ms pulses. Reports are needed of the number of pulses transmitted during periods of 30 seconds, information on any phase modulation of the carrier, and the bearing every 10 minutes (from 08.40 GMT). Reports should be sent to Bjarne E. Uldum, OZ4UB, Hammelstrupvej 7, 2 Th. Copenhagen SV, Denmark.

Moon bounce Tests

From John Beanland, formerly G3BVU, who is now resident in America, comes some intriguing news about a forthcoming Moonbounce experiment. He writes: " During the ARRL V.H.F. contest (June 13-14, 1964) there will be a KP4 on 70cm and 2m at the 1000 ft. radio telescope site in Puerto Rico. Calculations of field strength indicate that Moonbounce contacts should be possible on 432 Mc/s with about 50 watts output and an aerial gain of 13db. This should give loud, clear signals. The operating schedule is as follows:

June 13, 19.00-21.00 GMT on 432·000 Mc/s.
June 14, approx. 11.00-21.00 GMT on 144.000 Mc/s.

These are the moon visibility times at Puerto Rico."

Meteor Scatter on Two Metres

G3LTF (Galleywood) has made the long awaited QSO with UA1DZ and claims a new European Record for 2m at 1280 miles. The QSO took place on May 3 between 05.00 and 07.40 GMT. G3LTF gave UA1DZ a report of S2/3 and received one of S4/9. The best burst heard by G3LTF was 40 seconds peaking at S8. This was at 07.04 GMT and contained all the necessary information. G3LTF used a 4X250B at 400 watts input with an 11 element Yagi (a new design to give low side-lobes) at 50 ft. The receiver was a 417A cascode into an R1475 at 4 to 6 Mc/s. The gear at UA1DZ is not yet known. Heartiest congratulations are offered to both on yet another breakthrough. G5YV also heard the long burst mentioned above.

Austrian v.h.f. amateurs are looking for meteor scatter QSOs with GM, GI, GW and G (presumably also GC and GD) stations. Will interested operators please write to Adolf Kerschbaum, OE5KE, Annenstrasse 6, Graz, Austria.

Two Metre News and Views

G3LTF (Galleywood) reports that on May 2 a number of PAs and ONs were worked in the First 144 Mc/s Portable Contest. Two DLs were heard and called but not raised. QSB was bad but peak signals were around S8. GW3RUF/P (on Snowdon) was worked on c.w., and a loud meteor ping was heard on his signal.

G3MTG (nr. Bridgwater) found April a quiet month with poor conditions. On April 8, however, F9NJ was heard (with QSB) but no QSO was made Contacts were otherwise mainly local, with the exception of G3SHK (Ruislip), G5ZG (Dunmow) and G3PSH and G3SHZ (both Harrow). On April 26 G3XC was heard, and was the first Cornish station received at this QTH. No QSO resulted, however, and it appears that a ridge of hills to the south-west of Bridgwater are proving too great a barrier. However, G3LMG/P (Devon) was worked for the first time during the May contest. Conditions did not seem very good in the Portable Contest, the furthest north station worked being G3NJF/P in Lincolnshire. During April, G2AXI (Basingstoke),

V.H.F./U.H.F. BEACON STATIONS

Call-sign	Location	Nominal Frequency	Emission	Aerial Direction
GB3CTC	Redruth, Cornwall	144.10 Mc/s	A1	North-East
GB3VHF	Wrotham, Kent	144.50 Mc/s	A1	North-West
GB3GEC	Hammersmith, London	431.5 Mc/s	A1	East

RSGB V.H.F. BEACON STATION GB3VHF

The frequency of the Society's v.h.f. beacon transmitter at Wrotham, Kent, when measured by the BBC Frequency Checking Station, was as follows (nominal frequency 144.50 Mc/s):

Date	Time	Error
April 28	... 11.26 GMT	1030 c/s high
May 5	... 13.45 GMT	830 c/s high
May 12	... 11.20 GMT	750 c/s high
May 20	... 15.14 GMT	690 c/s high

G2FKK (Bristol), G3OBD (Poole), and G2BAT (Salisbury) were also worked.

G3JGJ (Moretonhampstead) heard the beacon station GB3CTC at RST559 on April 10, and also G5ZT and G3IEA. On April 12 GC2FZC was heard at RST599+. G6XD (Teignmouth) was worked on April 18 at RS58, whilst GC3OBM was heard faintly during the month. Remember, this is a rather poor QTH.

G3LHA (Coventry) has resumed operation after a lengthy spell of inactivity. Conditions have been very unstable recently, and no DX has been heard. G3LHA/P operated throughout the first 2m Portable Contest on May 3, at a site eight miles east of Rugby (almost impossible to climb), but after 1½ hours, G3KEF's car and G3LHA's van finally made it. Heavy rain during the night gave way to very strong winds and at times the aerial systems (6-over-6 and a three element Yagi) took quite a battering. Conditions were well below average and definitely down on 1963. No DX over 150 miles was worked, the best ones being NW, GW3RUF/P (Snowdon); S, G3GWB/P (I.O.W.); SE, G3JHM/A (Worthing) and NE: G3FFV/P (nr. York). Ninety-five stations were worked this year, as against 90 last year, but distances were below normal. No EI, GI, GM or Continentals were heard. Fixed station activity was very good, as also were operating techniques.

G3LAS (Berkhamsted) will be putting Huntingdonshire on the air on 2m as G3LAS/P during the next portable contest on Sunday, July 5.

Four Metres

G3PHG (Crawley) has been active since last September on 70·281 Mc/s, with 70·21 and 70·34 Mc/s as standby frequencies. The transmitter (6146 p.a., 35 watts input) secured him second place in the Crawley ARC Constructional Contest this year. The receiver is a 6CW4 converter and a G2DAF receiver for c.w., and a BC348N receiver for phone. The aerial is a four element Yagi at 20 ft. As a Crawley club entry, this equipment was used with the RSGB Exhibition station at Seymour Hall in 1963, and it is hoped to use it again this year. Sixty different stations have now been worked from Crawley including 12 counties and two countries. The best DX so far has been G3MYI (Leicestershire), whilst GC3ROP was worked at Easter for an extra country. A B44 Transmitter/Receiver has been acquired for portable/mobile work, and has proved most successful. The frequency used is 70·28 Mc/s and the receiver tunes 70·1/70·7 Mc/s. The aerial is a quarter-wave whip.

G3OUF (Ealing) is now active on the band with 50 watts to a four element Yagi at 35 ft. the converter being of the G3FZL/G3IIR design. GC3ROP (Sark) was worked six times with signal strengths ranging from S7 to 9+. G3GVM (Worthing) can always be worked, and on May 3 G3OHH (Macclesfield) was contacted. About 30 stations have been worked altogether, although only c.w. has been used up to now. Skeds will be welcomed.

G3LHA still has to complete his transmitter, but the receiver is working well. This is self-contained and is a modified 2m mobile receiver. The line up is 6AK5 r.f., 12AT7 mixer/second oscillator. The first i.f. is 10·7 Mc/s, and the second 465 kc/s. The first oscillator is on 20 Mc/s, and the unit is very stable. G3BNL and G3BA have both been heard at S9.

Twenty-three Centimetres

G3NBQ (Coventry) received G3KFD (Kingswinford) on 1298·2 Mc/s at RST339 on April 6. Both aerials were at approximately 400 ft. a.s.l., but hills rose to 700 ft. in between. This is not thought to be an opening as the signals have been heard many times since, and there is no variation in signal strength. Also heard were G3KPT (Great Barr, 1298·1 Mc/s) on many occasions at RST569 and G2CIW (1298·25 Mc/s) who is also regularly active.

G3KEF has completed a 2C39A tripler, and, using a trough aerial at 11 ft., he was received by G3NBQ at RST569 on 1297·3 Mc/s. This makes a total of six stations heard, which are G3MAR/P, G2CIW, G3RYB/T, G3KPT, G3KFD and G3KEF, with one (G2CIW) worked.

Miscellaneous Reports

The Coventry V.H.F./U.H.F. Group again went to Meriden Hill (6 miles NW of Coventry), 620 ft. a.s.l., on the morning of Sunday, April 12, with equipment for 4m, 2m, 70cm and 23cm, but unfortunately only two stations were contacted: G3KFD and G3KPT on 70cm and 23cm. Lack of activity seemed responsible for the lack of QSOs.

On April 29, the Coventry Group held an informal meeting at the " Hawthorn Tree " and about 25 v.h.f. enthusiasts from various parts of the Midlands discussed many topics over refreshments, and also heard a talk by G3CCA on " Parametric Amplifiers.". Other meetings are envisaged, and all those interested are asked to approach the organizers, G3KEF, G3NBQ, G3LHA and G3RYB/T, in order that they may be placed on the mailing list.

Contest Reminders

The Contests Committee draws attention to the 70 Mc/s Contest taking place on June 20, the 1250 Mc/s Tests on June 27 and the Second 144 Mc/s Portable Contest on July 4. It is hoped that many will support these contests in order to make them resounding successes.

TT21 Linear Amplifier

A suitable type of rectifier for use in the power supply circuit on page 290 of last month's BULLETIN is the GEC SX638, an 800V 500-600 mA silicon junction diode.

In the address of the suppliers of the cooling fan, Maidenhead was incorrectly stated to be in Buckinghamshire, it is of course in Berkshire.

LONDON U.H.F. GROUP

will meet at the

Bull and Mouth Tavern

corner of Bloomsbury Way and Bury Place, London, W.C.1,

at 7.30 p.m. on Thursday, June 4, and July 2, 1964

All v.h.f. and u.h.f. enthusiasts welcome

"Tenth Annual"

Another Successful V.H.F. Convention

ALTHOUGH the Society's International V.H.F. Convention has now developed into a broad pattern of morning exhibition, afternoon tech.-talks and evening banquet, nobody could accuse it of being stereotyped. Its variety year by year is as infinite as the v.h.f. world itself. And so it was at London's Kingsley Hotel on Whit Saturday when once again an attractive programme provided not only the faithful who go year after year, but a goodly contingent of newcomers who went along to see what all this v.h.f. business was all about.

They were not disappointed. The diversified technical symposium in the afternoon offered enough material for discussion for the rest of the year. Starting with "Moonbounce on 441 Mc/s," by G3LTF and G3CCH it continued with a top notch amateur made film about the Port of London Electronic Aids, skilfully explained on the sound track by the familiar voice of G3BPT.

After the tea break, "Sideband on V.H.F.," enthusiastically put over by G3BA and G3MED provoked a lively debate notable for the contribution by PA0LQ that won a round of applause for its lucidity and perfect technical English in which it was put.

Finally up came pictures on a couple of TV monitor screens of two-hop amateur television relayed from G3NDT/T at Harrow to G3OUO/T at Wembley and thence to the rooftop aerial at the Kingsley. The modest description given to the audience by G3NDT/T himself of how it all worked belied the immense feat of organization behind it.

And so to the dining and wining that evening, with special reference in the speeches to the fact that this popular convention had now reached double figures (this was the tenth such), and a comment by President, Geoff Stone, G3FZL, that there ought in all other areas of amateur radio activity to be co-fraternities similar to the v.h.f. one, and he would do all he could to sponsor them.

The President was able to give the good news that the extension of the 70 Mc/s band would take effect on June 1.

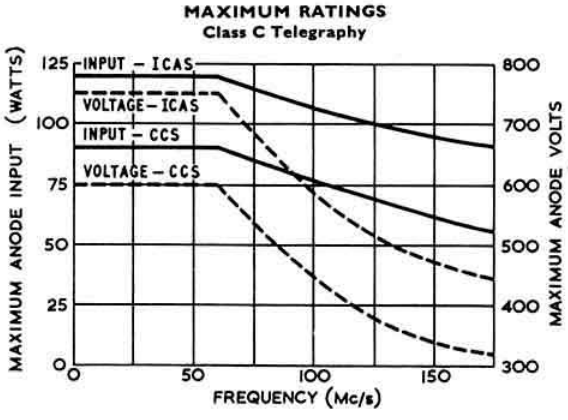
And this is all that there is time and space for this month friends, the rest in pictures next month.

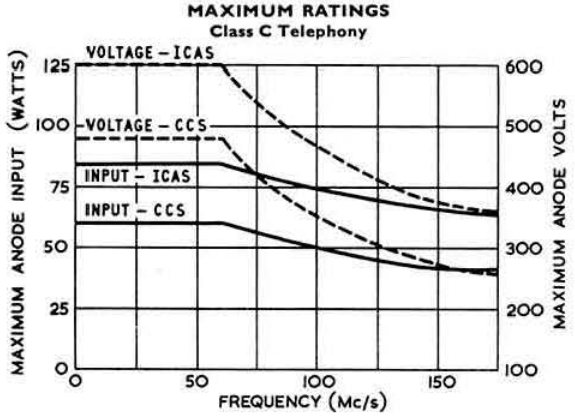
Uncle Mike.

RCA 6146B/8298A Beam Power Tetrode

This new valve is a direct plug-in replacement for the 6146 or 6146A, and with a slight increase in screen volts will give a worthwhile increase in power output, provided, of course, that the power supply has the additional capacity. Controlled zero-bias anode current is available in the 6146B to ensure more dependable performance as a class AB1 linear r.f. amplifier in s.s.b. applications. The new design also features a heater designed to operate over a voltage range of 6·0 to 7·5 volts, and which will accommodate variations in battery voltage between 5 and 8 volts. The RCA "Dark Heater" functions efficiently at operating temperatures well below those of conventional valve types, and offers the advantages of stable heater current characteristics and the reduced possibility of heater damage and shorts.

The 6146B has a maximum anode dissipation of 35 watts compared with 25 watts for the 6146, but heater requirements (6·3V at 1·125 amps), maximum frequency for full ratings (60 Mc/s) and input and output capacities are all identical in both types. A comparison of the typical operation figures at ICAS ratings derived from the manufacturer's figures (Figs. 1 and 2) for the 6146 against the 6146B is shown in Table 1.





From the figures given it will be seen that an increase in power input of up to one-third of the 90 watts of the original 6146 can be obtained by substitution of the new type, or alternatively, replacement without alteration of the electrode voltages should lead to greater reliability and a longer valve life.

TABLE I

Application	6146 Operating Conditions	6146B/8298A Operating Conditions
Power amplifier Class C telegraphy	750V 120mA (90 watts input)	750V 160mA (120 watts input)
Power amplifier, anode modulated. Class C telegraphy	600V 112 mA	600V 140 mA
Power amplifier, linear class AB1 two-tone modulation	750V 12 mA (zero signal) to 110 mA.	750V 25 to 125 mA

The class C figures assume a maximum screen voltage of 250, whilst the AB1 rating calls for a regulated screen voltage of 200.

The Dundalk Convention

SATURDAY, April 18, 1964, will long be remembered in the annals of Amateur Radio History in Ireland. This date marked the first EI/GI convention organized by the Belfast Group of the Society in conjunction with the Irish Radio Transmitters' Society.

The venue was Ballymascanlan Hotel, near Dundalk, Co. Louth, Eire, and the bright sunny weather set the tone for the day's proceedings. From all over Ireland, EI and GI cars converged on the convention bringing some 240 amateurs, their womenfolk and friends.

Mr. Ambrose MacNamara, EI8A, President of the IRTS welcomed the assembly most cordially and formally opened the convention.

The 70 ladies then departed to another room for their own afternoon programme—first a talk on " Beauty Treatment " by Miss Conroy of Revlon Ltd., followed by afternoon tea. Then a talk on " Indoor Plant Culture " was given by J. McGlashan, Head Gardner at Powerscourt Demesne. A programme which all agreed was most interesting and informative.

Meanwhile, the men were given a demonstration and lecture on " Transmitting Aerials " by H. V. Sims, Head of Engineering Maintenance, BBC Evesham, and what a fascinating lecture this was. Mr. Sims effectively combined the use of blackboard and a live demonstration. The aerials discussed and demonstrated ranged from dipoles and verticals to stacked beam arrays and skeleton slots. Feeders, radiation patterns, loading and current points were all covered most comprehensively and were vividly illustrated with the aid of neon tubes and torch bulbs. When forced by time to call a halt, one felt that Mr. Sims could have gone on for hours, so vast is his knowledge of this subject.

During the interval for tea a Joystick aerial donated by Partridge Electronics was raffled, the proceeds from which will be forwarded to the Radio Amateur Bedfast Club. This raffle realized nearly £15.

After tea Mr. Sims answered questions for half an hour. He was accorded a standing ovation for what (surely) must have been the finest lecture on the subject ever given to amateurs in Ireland. Dr. Bill Kerr, GI2KR, proposed the formal vote of thanks, which was seconded by Mr. Leo Purcell, EI6D. To the obvious delight of the Four Metre boys, Eric Yeomanson, G3IIR, Executive Vice-President of RSGB announced the extension of the 70 Mc/s Band.

Some of those attending the convention are, from left to right' GI3OFT, GI3IWD, GI3NUM, H. V. Sims, GI3KYP, EI8A, EI2I, G3IIR, EI9U, GI3GAL and W. G. Dickson.
(Photo by Terry Walsh)

During the dinner on April 18, Eric Yeomanson, G3IIR, Executive Vice-President of the RSGB replied on behalf of the guests to toasts proposed by GI2KR, EI8A and GI3IWD. Seated on the right of G3IIR is Ambrose MacNamara, EI8A, President of IRTS, and on his left is Mrs. A. D. Patterson, wife of GI3KYP, the Zonal Representative for Northern Ireland.
(Photo by Terry Walsh)

Everyone present was most disappointed when Leo Purcell, EI6D, who had prepared a short talk with slide illustrations on the Oscar Project, found that the ambient light level was too high for slide viewing, in spite of drawn curtains. However, Leo gave a most interesting summary of Oscar I and II and of the plans for Oscar III.

At 6 p.m., the afternoon session ended and there was a rush to see the static display of modern amateur radio equipment. Rowley Shears, G8KW, gave a live demonstration of his KW2000 transceiver. One of his contacts was with John Clarricoats, G6CL, who sent his best wishes to all present. A homebuilt 20m s.s.b. transceiver and 500 watt linear amplifier by Ian McKinley, and a G2DAF Receiver by Peter Bower, GI3OFT, were greatly admired by all present.

Dinner

Approximately 200 sat down for dinner at 7.30 p.m. The toasts were IRTS, RSGB, and guests. These were taken care of by Dr. Bill Kerr, GI2KR, Ambrose MacNamara, EI8A, Bill Douglas, GI3IWD, the Representative for Region 15. Eric Yeomanson, G3IIR, replied on behalf of the guests. Tribute was paid to the organizers whom all agreed had done a magnificent job, and hopes were expressed that a joint convention would become an annual event.

After dinner, the floor was cleared for dancing and a large number of prizes in the Bumper Raffle were distributed, including some on the spot raffle donations: an Avo Multiminor by Avo Ltd; £5 worth of KW Equipment by G8KW; £5 by Mr. T. McDonald of the " Ham Shop," Belfast; £1 worth RSGB publications by G3IIR; a Dow-Key Co-axial Relay by Les Lyske, GI3CDF.

Guests

Among the guests we were pleased to welcome Eric Yeomanson, Executive Vice-President of RSGB; T. D. McEwan, Head of Engineering, BBC Northern Ireland; P. Parker, Head of Engineering, Telefis Eireann; Mr. Holmes, Technical Supervisor of Ulster Television; Joe Campbell, EI4B, the oldest licensed Irish Amateur; Bertie Martin, GI5HV, Vice-President of RSGB; Sim Farrelly, EI9Y; Bob Barr, GI5UR, winner of the ROTAB Trophy, 1963; and Harry Wilson, EI2W, to mention but a few.

On Monday April 20, Syd Foster, GI3GAL, who is the Belfast GB2RS News Reader, was interviewed by the BBC on a new programme called " Ulster Review." Part of the News Bulletin of April 12 was used as an introduction, and Syd closed the programme by sending 73 to all listeners.

Retirement of John Clarricoats, O.B.E., G6CL

ON December 31, 1963, we said good-bye to " Clarry " as the leader of the Society's Headquarters Staff when he retired after 32 years as full-time Secretary.

His connection with telecommunications goes back to January, 1912, when he joined the Telephone Inspection Department of the old Western Electric Co., now Standard Telephones and Cables Ltd., at North Woolwich.

The sinking of the liner *Titanic* in April, 1912, and the use of wireless to save many lives from the disaster first focused his interest in the radio field, and so, when he was old enough to do so, he joined the Royal Flying Corps as a Wireless Operator in January, 1917, seeing active service in both Belgium and Northern France for two years. Despite the effects of gas and shell-shock—he was literally blown up by an explosion from which he was almost the sole survivor—he was able to return to the Western Electric Co. in March, 1919.

In 1920, he took charge of the Wireless Inspection Department and was responsible for the quality control of much early equipment such as crystal sets, the first valve sets, " peanut " valves, and the wonderful coffin-like early super-hets.

From about 1921 until he obtained his own call-sign in May, 1926, he operated the Company's station, using the call-sign 2YZ, carrying out test transmissions from various locations. He also had permission to use this call from his private address.

In June, 1926, he joined the RSGB as a Corporate Member, and became its North London Representative in April, 1927. He became a member of the T & R General Committee during that year and was actively concerned in the re-organization of the Society into the pattern which we know today.

In July, 1928, he was co-opted to the Council as its Social Manager and was elected to the Council in the following January when he became Acting Honorary Secretary. In January, 1930, G6CL was elected as Honorary Secretary. It was largely by his efforts that the Society was rescued from a very shaky financial position and from a membership of 990 at this date, began the great stumping-the-country crusade by this energetic and single-minded enthusiast which steadily built up the membership figures over the ensuing years.

In December, 1932, with the membership at 1715, the Council appointed John Clarricoats as full-time Secretary of the Society and in 1937 he became Editor of the *T & R Bulletin*, a job which he had done in an acting capacity since 1934.

From 1932 until the war years, it is doubtful if G6CL had more than half a dozen weekends at home during the course of a year. He attended and spoke at countless meetings all over the country; he could always be relied upon to turn up at a couple of dozen NFD stations and even when at home, 16 Ashridge Gardens became open-house to radio amateurs from far and wide.

While he was Chairman of the RSGB Social Committee from 1927-1930 he organized the famous hamfests at Pinoli's Restaurant and was the driving force behind the Society's Annual Conventions and the stand at the Radio-Olympia Shows. No Convention was complete without the famous draw for free prizes, known affectionately as " Clarry's Swindle," an entirely one-man show apart from assistance from Miss Gadsden.

During the years before the war, he helped to form the Royal Naval Wireless Auxilary Reserve in 1932, and in 1938 the RAF Civilian Wireless Reserve.

From September, 1939 to July, 1943, the Society's administration was conducted from his home in Palmers Green with the help of Miss Gadsden and the loyal co-operation of Mrs. Clarricoats. It is a remarkable tribute to the work done at this time, particularly the monthly BULLETIN feature " Khaki and Blue " written by G6CL, which not only kept serving members in touch but effected an increase in membership, between the time of Dunkirk (May, 1940) and July, 1943, from 2,500 to 6,000.

Due to the remarkable sales of the *Handbook*, handled entirely from his home, Clarry was able to see the Society's assets increase from £990 in 1939 to over £9,000 in 1943.

He was the Editor of all the pre-war publications which included *A Guide to Amateur Radio* (sales 50,000 plus), the *Handbook* (sales close to 200,000) and the *Handbook* Supplement (sales 150,000).

During the war he also held a commission in the RAF and was on special duties connected with the training of RAF personnel in radio communications. He even found time to write and publish a technical manual on this subject.

Many a serving member, during the war, found himself suddenly pulled out of his unit, transferred to other duties without even knowing how it was done. The secret lay in the vast knowledge of almost every individual member and his potentialities contained in that phenomenal memory in Ashridge Gardens, and the reliance placed in it by many people in high places.

After the war, the task of administering a Society of some 13,000 members with no radio frequencies to use became the main preoccupation of the RSGB. It is largely due to the work done by G6CL and others behind the scenes during the war, which enabled British amateurs to reactivate in early 1946.

The maintenance of these frequencies has been one of G6CL's over-riding interests ever since. In 1947, with S. K. Lewer, G6LJ, he attended the Atlantic City Radio Conference and in 1950 with a number of Senior Members of the Council, he went to the IARU 25th Anniversary in Paris. This meeting resulted in the Region I Division of IARU, one of the many ideas which originated in his fertile mind.

Also in 1950, he and G2MI became the Founder Members of the London Members' Luncheon Club and in 1958 the Radio Amateur Old Timers' Association, with both of which he is still actively associated.

The work done by John Clarricoats at the Geneva Radio Conference in 1959 and the Space Conference in 1963 have been chronicled in detail. He became Secretary of the Region I Committee in 1958 and still holds this post today.

As a member of the Postmaster General's Frequency Advisory Committee, the UK CCIR General Purposes Committee and the City and Guilds RAE Committee he has and continues to exert great influence for our welfare and enjoys the respect and confidence of Amateur and Professional in the field of world-wide communications.

In 1945, he became a member of Southgate Borough Council and an Alderman in 1954. He served as Mayor of his Borough in 1955/56 and is a Governor of Southgate and Enfield Technical Colleges.

On January 1, 1955, came the announcement of his admission to the Most Noble Order of the British Empire. The award of his OBE gave great pleasure to his friends and colleagues as a mark of recognition of many years of service

both in the sphere of radio and in his own community.

Apart from this, however, it is doubtful if anything has given him more personal pleasure than when the Council of the RSGB elected him an Honorary Member of the Society in December, 1963. This is the highest honour the Society can give and there are now only nine. The first was Sir Oliver Lodge and the second Marconi.

It would be an empty phrase to wish him a happy retirement in the accepted sense of someone quietly rusticating in idleness. We do wish him a Happy Retirement, however, in the full knowledge that his dynamic energy and agile mind will be keeping him as busy as ever. The best we could offer is the sincere hope that he will maintain good health to enable him to carry through the many tasks which he has no doubt set himself and to wish him many happy years to carry them out. Recently, the Council has appointed him the Society's Honorary Official Historian.

It is often said that every successful man owes much of his success to his wife. No account, however short and inadequate, of the life work of John Clarricoats would be complete without a tribute to Mrs. Clarricoats. To keep this human dynamo running at full output for so many years has been no mean feat and " Cissie " merits the grateful thanks of us all.

British Institution of Radio Engineers Changes Title

The Queen was pleased, at a Privy Council held by Her Majesty on February 26, 1964, to make an Order in Council allowing amendments to the Charter of the British Institution of Radio Engineers changing its name to The Institution of Electronic and Radio Engineers.

The Royal Charter of Incorporation granted on August 2, 1961 states that the objects of the Institution include advancement of the theory, science, practice and engineering of electronics. At a Special General Meeting held in November, 1963 the title The Institution of Electronic and Radio Engineers was adopted as more aptly describing the scope of the Institution's work and the professional activities of its members.

In accordance with the amended Charter, every Corporate Member is entitled to describe himself as " Chartered Electronic and Radio Engineer."

The Institution was formed at a meeting held in London on October 31, 1925. There was, however, considerable discussion about title and the term " electronic " was advocated for inclusion in the name of the Institution. This discussion was revived in 1944 when the Institution's Post-War Development Report defined electronics as " the radio valve or kindred devices at work in ways other than direct aural or visual communication." In the last 20 years such work has achieved increasing prominence in the learned society activities of the Institution as well as in the professional occupations of its members.

Silent Keys

We record with sorrow the passing of the following amateurs:

A. W. James, G2ALB, of Poole, Dorset.
K. H. Smith, G2ATP, of Epping, Essex.
M. R. Jenkins, G3EIM, of Whetstone, London, N.20.
Enid Bottomley, G3OHB, of Long Rock, Penzance, Cornwall.
A. Day, G3PVO, of Sheffield, Yorks.
R. Sturman, BCRS701, of Bulawayo, Southern Rhodesia.
G. Strachan, GM2CJR, of Braemar, Aberdeen.

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.

V.H.F. National Field Day, 1964

With reference to the rules for V.H.F. National Field Day, 1964, published in the May, 1964, issue of the RSGB BULLETIN, Rule 7 should be amended to permit contacts in the new 70 Mc/s band (70·1-70·7 Mc/s).

LETTER TO THE EDITOR

Generators for NFD

DEAR SIR,—While not wishing to disagree with Mr Tomalin's illuminating article I would, however, like to add a few tips gleaned from some years of experience with small petrol sets. Most engine failures can, I think, be traced to overheating; this shows itself in many ways—erratic running, valve sticking (usually exhaust), pre-ignition, loss of power, or seizure in very bad cases. I feel that three points could be amplified, as follows.

Inherent Cooling. It is of the utmost importance that an exposed site be found for the engine, preferably on a small mound, and careful attention to wind direction is essential, so that air is blown into the cooling fan in order to increase its efficiency. This is most important during the day when surface temperatures are higher. At night wind levels tend to decrease anyway, but this is offset by lower air temperatures. Also check that the cylinder cooling fins are not clogged up—it is worth five minutes cleaning out the fried wasps before you start!

Air Filters. Generally these are of the steel wool type and are usually much too small for NFD work, as the engine, being in the open, is exposed to dusty air, particularly if the weather has been dry for some days. You can either dispense with this type of air filter, or let it clog up with dust and suffer erratic running and difficult starting, especially when the engine is hot, e.g. after refuelling. Alternatively, you can fit a filter of adequate size—at least four times that supplied to allow for dust clogging, or a system I have used very successfully over many years on a model 4B J.A.P. engine—remove the air filter, and arrange for a right angle entry into the carburettor via a 6 in. length of pipe. This is positioned to look away from the engine cooling air intake to get what shelter is possible under windy conditions. The right angle bend and vertical feed up to the carburettor trap dust without restricting the air flow.

Lubrication. Oil changing as distinct from topping-up cannot be overstressed—for 24 hours continuous running the oil should be changed at the halfway point for the following reasons.

(i) Because the valve and tappet system (usually side-valve on stationary engines) has to rely on splash feed, there being no oil pump and filter to remove the carbon particles.
(ii) As stationary engines run hotter than car or motor-cycle the actual oil lubricating quality tends to drop off quicker, with a net result of further heating. This vaporises the oil which now gets past the piston rings and carbons these up with loss of compression and fouling of the spark-plug. Also sticky exhaust valves cause sudden stoppages, the fault disappearing almost at once, enabling the engine to be re-started, only to stop once more after a short period.

As G3PTB states, " fault-finding is only a matter of logic and patience," perhaps I could add " fault prevention is mainly ' Keep Cool '."

Yours faithfully,
C. E. NEWTON, G2FKZ

Society News

London Lecture Meeting

Mr H. V. Sims, of the BBC, gave a lecture on " Aerials " at a meeting of the Society held at the Institution of Electrical Engineers on May 1. A very considerable field of aerial theory was covered in an extremely interesting and lucid manner and was backed up by demonstrations, all of which worked in a manner which left no doubt about the point being made by the lecturer.

It may be of some comfort to amateurs that even an organization like the BBC is not without its problems, electrical, mechanical, and financial, when it comes to aerials.

Following the lecture, Mr Sims answered questions from the audience, and the meeting would no doubt have lasted well into the night but for the time limit imposed.

The chair was taken by the President, Mr G. M. C. Stone, G3FZL, who had the support of the Executive Vice-President, Mr E. W. Yeomanson, G3IIR, Mr R. F. Stevens, G2BVN, and Mr J. W. Swinnerton, G2YS.

A vote of thanks to the lecturer was proposed by Mr G. R. M. Garrett, G5CS.

Mr Clarricoats appointed Honorary Official Historian

Mr John Clarricoats, O.B.E., G6CL, has been appointed the Society's Honorary Official Historian by the Council.

An appreciation of Mr Clarricoats' work for the Society is given on page 389.

Delivery of the RSGB Bulletin

From time to time complaints are received from members that their copy of the RSGB BULLETIN has arrived late.

The BULLETIN is now published on the first Wednesday in each month, posting of copies to all members taking place on the previous day and copies should be delivered to addresses in the United Kingdom within 48 hours. Members whose copies regularly arrive late are asked to mark the wrapper with the date and time of delivery and return it to Headquarters so that the matter may be taken up with the Post Office.

Bulletin Articles

Apropos the statement headed " Bulletin Contributors and the Copyright Position " on page 322 of the May issue of the RSGB BULLETIN, the Editor wishes to make it clear that members of the Council receive no payment for articles by them in the RSGB BULLETIN or other Society publications. Paragraph 4 of the Societys' Memorandum of Association expressly forbids any payments, other than out-of-pocket expenses, to Council members.

No Increase in Subscription Rates

A number of members have written to Headquarters regarding subscription rates under the proposed new Articles of Association circulated to members on May 6, 1964.

Article 20 in the proposed Articles of Association is in fact merely an amalgamation of Articles 19 and 20 in the current Articles which set the *maximum* subscription at "£2.10.0. for Corporate Members and £1.5.0. for Associates or such lesser sums as the Council may decide from time to time." This has been so since December 18, 1953.

There is no intention at the present time to raise the subscription rates of £1.15.0. for Corporate Members and 15/- for Associates which have been in force since July, 1962.

RSGB Approved for Purposes of Section 16 Finance Act, 1958

Members may like to be reminded that the Commissioners of Inland Revenue have approved the Society for the purposes of Section 16, Finance Act, 1958.

The circumstances and manner in which members may make claims to income tax relief are as follows:

A member who is assessable to income tax under Schedule E in respect of the emoluments of an office or employment is entitled to a deduction from those emoluments of the whole of the annual subscription which is due and payable by him to the Society in the income tax year provided that:

(a) *the subscription is defrayed out of the emoluments of the office or employment, and,*

(b) *the activities of the society so far as they are directed to all or any of the following objects:*

(i) *the advancement or spreading of knowledge (whether generally or among persons belonging to the same or similar professions or occupying the same or similar professions).*

(ii) *the maintenance or improvement of standards of conduct and competence among the members of any profession.*

(iii) *the indemnification or protection of members of any profession against claims in respect of liabilities incurred by them in the exercise of their profession ;*

are relevant to the office or employment, that is to say, the performance of the duties of the office or employment is directly affected by the knowledge concerned or involves the exercise of the profession concerned.

A member of the Society who is entitled to the relief should apply to his tax office for Form P.358 on which to make a claim for adjustment of his PAYE coding.

Held Over

Due to pressure on space, several articles and features, including *Technical Topics*, *QUA Associates*, *Letters to the Editor* and a report on the RAOTA Reunion, have been held over to the July issue.

Amateur Licences

At April 30, 1964, 10,657 Amateur (Sound) Licences and 1542 Amateur (Sound Mobile) Licences were current. In addition 159 Amateur (Television) Licences were in force.

RSGB National Mobile Rally

United States Air Force Base,
Wethersfield, near Braintree, Essex

Sunday, June 28, 1964

Commencing at 11 a.m.

Talk-in stations from 10 a.m.:
GB3RS on 1·8 and 144 Mc/s.

The proposed programme includes:

mobile installation competition, trade exhibition, grand raffle, exhibition station, static aircraft display, RTTY display, band programme, fire-fighting display, Go-Karts, and PT display. For the children there will be a cinema programme and a lucky dip.

Further information will be broadcast in GB2RS News Bulletins.

Refreshment stalls will be available, and there will be about two acres under cover. Car-parking facilities have been improved.

Organized by the Radio Society of Great Britain

Society Affairs

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

THE March meeting of the Council was held on March 16, 1964, and was attended by Messrs. G. M. C. Stone (President), N. Caws, J. C. Foster, L. N. Goldsborough, 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, L. Varney, E. W. Yeomanson (Members of the Council), John A. Rouse (General Manager and Secretary) and P. C. M. Smee (Headquarters staff).

Zone A Representative

The President reported that Mr L. N. Goldsbrough had been elected unopposed to fill the vacant office of Zone A Representative. Mr Goldsbrough then entered the meeting.

Membership

The Council approved 164 applications for membership (117 Corporate and 47 Associate). In addition, 13 applications for transfer from Associate to Corporate grade were accepted.

The Council granted affiliation to Ariel Radio Group, Caversham, Sunderland Technical College Radio Society, Trent College Radio Club, Unst Radio Club, 257 Signal Squadron Amateur Radio Club.

Articles of Association

It was reported that the Board of Trade had approved the draft of the new Articles of Association and it was therefore agreed (i) to send a copy of the proposed new Articles of Association to all members as a pull-out supplement to the May issue of the RSGB BULLETIN, with some explanatory notes on the reasons for the changes, (ii) to arrange an Extraordinary General Meeting for the afternoon of Saturday, June 27, 1964, in the Hall of the Royal Society of Arts for the purpose of voting upon the special resolution relative thereto.

Council Members' Typing Expenses

Consideration was given to a quotation from a typing agency for the preparation of manuscripts and to a suggestion that the Society should pay typing expenses incurred by Council members in preparing BULLETIN articles. On being put to the vote, the motion putting the latter suggestion formally was lost by eight votes to four. (Paragraph 4 of the Society's Memorandum of Association precludes any payment to members of the Council for BULLETIN articles.—ED.)

Glasgow RSGB Group and Radio Club of Scotland

The Council considered a report, prepared by the President, on the annual general meeting of the Glasgow RSGB Group on February 21, and on an informal meeting with officers of the Radio Club of Scotland held on February 22. It was agreed to circulate the minutes of the AGM of the Glasgow Group to members in the area and also a report of the meeting with officers of the RCS provided that they raised no objection.

National Field Day

The contents of a letter dated February 17, 1964, regarding scoring in NFD from Mr Patterson to the Chairman of the Contests Committee (a copy of which had been sent to all members of the Council) was discussed. Arising from the discussion it was agreed to await the Contests Committee's comments on Mr Patterson's suggestions. (The letter was published in the May issue of the BULLETIN.—ED.)

Mullard Award 1963

It was agreed that three members of the Council should meet to consider nominations received for the Mullard Award 1963.

Advertising in the RSGB Bulletin

Arising from consideration of a report on BULLETIN advertising prepared by Mr Stevens, it was agreed that Mr Stevens should be given special responsibility to advise the Council on advertising.

V.H.F. Translator Station

It was agreed to write to the Post Office to ask whether an application for a licence for a v.h.f. translator station could be considered.

Reports of Committees

The Scientific Studies Committee met on February 10 to discuss a further article in the *V.H.F. Weather* series and two future articles on auroral propagation, current tropospheric propagation studies, the enrolment of IQSY observers and matters relating to *OSCAR III* and *Echo II*.

The TVI/BCI Committee on February 12 discussed problems arising from relay television systems in Scotland, Peterborough and Crawley. Consideration was also given to members' TVI difficulties and problems relating to planning permission for aerial masts.

The Technical Committee discussed articles for the RSGB BULLETIN, a proposed survey of members' interests, new publications and the purchase of test gear for use in preparing reviews of equipment at the meeting held on February 13.

The Finance and Staff Committee discussed staff matters, office furniture and equipment, office cleaning and the Society's insurances at its meeting on February 16.

Arrangements for the rallies at Texas Instruments Ltd. and the USAF Air Force Base, RAF Wethersfield, were discussed by the Mobile Committee on February 19.

The Contests Committee met on February 20 to discuss correspondence from members, rules for the First 420 Mc/s Contest 1964, First 70 Mc/s Contest 1964 and the RSGB 1250 Mc/s Tests 1964, the results of the RSGB 21/28 Mc/s Telephony Contest 1963, and QRA Locator Maps.

The V.H.F. Committee continued the planning of the International V.H.F./U.H.F. Convention to be held in London, when it met on February 24. The Committee also dealt with applications for v.h.f. operating awards, matters relating to the Society's beacon stations, the preparation of a paper for presentation at the New York V.H.F. Convention, band planning, a suggestion regarding a ground based v.h.f. translator station and plans for a European Amateur Radio satellite.

The RAEN Committee, at its meeting on February 29, discussed the production of a new *RAEN Manual*, liaison with hospital management boards, projected activities during 1964 and arrangements for the distribution of equipment loaned by a commercial organization.

* * *

The Council was in session for four hours.

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.

CONTEST NEWS

RESULTS — REPORTS — RULES

144 Mc/s Open Contest 1964

The 144 Mc/s Open Contest, held on March 7 and 8, coincided with very poor propagation conditions, but in spite of this handicap 63 stations sent in entries, representing an increase of nine entrants over the 1963 event, which is very pleasing. Comments have been made expressing favour of the points per mile method of calculating scores, and therefore this particular aspect will receive serious consideration by the Contests Committee in due course.

The leading contestant was A. D. Naylor, G3GHI, to whom congratulations are extended for a very praiseworthy effort. A recommendation will be made to Council for the presentation of the Mitchell-Milling Trophy to him. G3GHI was second in this event last year. Second and third places were very creditably filled by G3RMJ and G3GOZ respectively, to whom certificates of merit will be presented.

Although not eligible for entry, the multi-operator station GW3RUF/P representing Midland Radio Contest Club calls for special notice if only for their keenness in scaling the mountain (Waun Fach) 2660 ft. a.s.l., and for staying there all through the night in wind and freezing temperatures. Another entry of considerable interest is from C. M. Winton, GM6XW/P, who operated from Tomtain Hill near Stirling (this could easily be another mountain by English standards). GM6XW/P had five contacts over 200 miles and 15 over 100 miles, and he also recorded the best DX of the contest with G3BA (Sutton Coldfield) and G5JU (Birmingham). His most northerly contact was with GM3JFG of Invergordon, in the county of Ross-shire.

Comments

G2WS (Coventry) stresses the efficiency of c.w. as a reliable means of communication under such adverse propagation conditions, and he quotes G6GN, G3FNM and G3KEU/A who were well rewarded for their efforts using this mode. He is one of the many who consider the scoring system to be unsatisfactory.

A special welcome to **G5BB** who records his first contest in 30 years, he has a warm word to say about the courteous attitude and standard of operation which generally appeared to prevail amongst the v.h.f. fraternity.

GW3MFY considers that the present scoring system is fair to the GW stations and deplores the infrequent use of c.w.

G3JYP (Appleby, Westmorland) has no complaints apart from the weather.

G3FNM (Sale, Cheshire) would like more details of stations and locations in the results table.

G3GOZ (Croxley Green, Herts.) states that he is still not absolutely clear on the rules, although his log indicates otherwise.

G6GN (Bristol) is another of the many entrants who favours a change to points per mile, as also does **G3MTG** (Bridgwater, Somerset) who reports poor conditions.

G3EDD (Cambridge) deplores propagation conditions and likewise the scoring system but still is a dedicated contestant.

Check logs from GM2UU, G2BQ, G2HIF, G3SJI, G3OHC, G3EHR, G3BDS and G2DHV are gratefully acknowledged.

144 Mc/s Open Contest 1964 Results

Position	Call-sign	Points	Position	Call-sign	Points
*	GW3RUF/P	3425	27	G3KWH	950
1	G3GHI	2090	28	GW3MFY	920
2	G3RMJ	1955	29	G3PTB	880
3	G3GOZ	1920	30	GW2HIN/P	875
4	G6GN	1905	31	G5DW	865
5	G3LLJ/A	1850	32	G3JYP	845
	G3SHK	1850	33	G2BLA	820
6	G3NUE	1840	34	G3FNM	760
7	G5MA	1750	35	GM3EGW	745
8	G3MDH/P	1745	36	G5RP	705
9	G3PTM	1725	37	G2CDX	695
10	G3MTG	1455	†	GM3FYB	685
11	G3PNA	1425	38	G3AGN	685
12	G3EDD	1375	39	G3LDY	600
13	GM6XW/P	1295	40	G3RTJ	590
14	G3KEU/A	1265	41	G2BJY	575
15	G3AHB	1255	42	G3YH	570
16	G2AUD	1205	43	G2BHN	560
	G3REI/A	1205		GW2CBY	560
17	G5DF	1186	44	G3RQZ	535
18	G3BOC	1170	45	G3OZH	530
	G3ORL	1170	46	G2WS	485
19	G2RD	1155	47	G3EKP	475
20	G3LAS	1140		G3SLF	475
*	G3OJE	1125	48	G3JKY	370
21	G3HRH	1105	49	GM3RCS/P	350
22	G6UT	1060	50	G5BB	300
23	G5DS	1050	51	GM3LCP	190
24	G3PXZ	1040		GM3PSP	190
25	G3KWK	1000			
†	GW3MDK	980			
26	G3HWR	955			
	G5JU	955			

* Multi operated station.
† Late entry.

R. A. Fuller, BRS25985, operating during the V.H.F. Listeners' Contest on March 7 and 8.

V.H.F. Listeners' Contest 1964

The leading station in this contest, held on March 7 and 8, was R. A. Fuller, BRS25985, who, incidentally, came third in the 1963 event. Second place was filled by A. W. Blandford, BRS18572, who occupied the leading position in 1963, whilst W. A. Parmenter, BRS22445, came third.

With regard to propagation during the event, the receiving contestants generally agree with their transmitting counterparts that conditions were very poor indeed. It is with pleasure that the Contests Committee note a sharp upward trend in the number of contestants. This year 19 listeners submitted logs as against 11 in 1963.

The leading station, R. A. Fuller, BRS25985, submitted a photograph of his station which is reproduced here. He requests more listener contests. A. W. Blandford BRS18572 reports hearing only two A1 signals. G. Rolland, A3766, made his debut in this contest and is to be congratulated on attaining fifth position. G. Swan submitted a model entry

V.H.F. Listeners' Contest Results

Position	Name		Contacts	Points
1	R. A. Fuller	BRS25985	101	1595
2	A. W. Blandford	BRS18572	90	1300
3	W. A. Parmenter	BRS22445	89	1225
4	R. W. F. Thomas	BRS15822	77	1130
5	G. Rolland	A3766	78	1055
6	G. Swan	A3696	64	1005
7	R. A. Ham	BRS15744	66	975
8	M. Harrison	BRS24733	44	925
9	J. K. Harvey	BRS19682	40	795
10	E. R. Crane	BRS13336	58	790
11	D. S. Kendall	BRS24643	48	740
12	J. R. Gazeley	BRS20533	56	735
13	J. B. Letts	A3359	41	710
14	P. F. Widger	A3517	22	690
15	G. de Cramayel	HE9RAP	35	645
16	J. A. Wardle	A3321	25	535
17	A. R. Bradford	BRS22081	25	425
18	J. Davis	A2861	18	330
19	C. J. Langley	A3016	6	160

and he too did exceptionally well by reaching sixth place with his first entry. M. Harrison, BRS24733, has no adverse comments to make on the contest which, needless to say, the Contest Committee is glad to hear for a change, but deprecates the scarcity of AI signals. Of special interest is the entry from G. de Cramayel, HE9RAP, who records many HB and F prefixes. Apparently conditions in Switzerland were also very poor. C. J. Longley, A3016, is another entrant who expresses pleasure in taking part, although he did not spend more than a few hours on the band.

First 1·8 Mc/s Contest 1964

The First 1·8 Mc/s Contest of 1964, held on March 14-15, resulted in a clear win for Frank A. Robb, GI6TK with a lead of 21 points, a very fine win from one of the more remote corners of the British Isles. Second place is taken by H. J. M. Box, G6BQ, in Kent, by only one point from I. T. Cashmore, G3BMY, operating in Shropshire, while in fourth place is another Kentish station, G3MXJ, operated by D. J. Andrews. D. G. Alexander, G3KLH, who has been placed third in this contest for each of the past three years, this time has to be content with fifth place, only a further two points behind.

The Maitland trophy this year has been won for the first time by Walter A. F. Davidson, GM3NYY, who had a convincing 336 point lead over James Christie, GM3FXM.

Conditions

Conditions appear to have been fairly good, although variable, for inter G working, but very poor for DX working. The only non-G stations recorded in the logs were five OKs, OH3NY (worked by 16 stations) and a PX1CR worked by G3RBP. GI6TK reports that after midnight signals faded out completely at times, except for the local Belfast stations. Although the number of entries is slightly down on last year's event, activity would seem to have been higher resulting in better scores. This year 17 stations scored over 500 points compared with only eight in 1963. It is interesting to note that it is not only the people with a chance of making the top three who last out until 3 a.m. Of the 84 entries, no less than 75 logs cover the whole six hour period. For a station near the bottom of the table this may mean an average of only 3 to 4 contacts per hour, showing a perseverance for which the top stations should be forever grateful since it is the QSOs with these stations which decide the positions at the top.

Aerials

As it seems to be the aerial that counts in these contests, a few facts from the logs are given here. GI6TK used an " inverted V " with the centre 80 ft. high; G3RBP a 275 ft. semi-vertical; G3IGW and GM3NYY 200 ft. end feds; G6BQ, G3MXJ, G3JML, G3OSW and G2MJ used centre

First 1·8 Mc/s Contest 1964 Results

Position	Call-sign	County	Contacts 3 pts	Contacts 5 pts	Points
1	GI6TK	DW	4	137	692
2	G6BQ	KT	51	104	671
3	G3BMY	SE	10	129	670
4	G3MXJ	KT	52	102	660
5	G3KLH	OX	14	124	658
6	G3RBP	BE	26	115	653
7	G3IGW	YS	24	110	620
8	GM3NYY	AY	4	115	582
9	G3FM	SY	54	83	577
10	G3JML	YS	26	99	572
11	G3RQX	SD	11	107	568
12	G3JEQ	SY	54	76	542
13	G3GVA	WK	12	100	533
14	G3OSW	ND	1	106	531
15	G2MJ	LE	16	96	527
16	G3NHE	YS	25	87	509
17	GW3ITZ	FT	4	99	507
18	G3KBC	CE	19	87	491
19	G3SWE	LD	48	69	489
20	G8AB/A	EX	37	74	481
	G3LHJ	DN	12	89	481
22	GM3AVA	SG	3	93	474
23	G3BFP	SY	54	59	457
24	G3PEO	GR	16	78	438
25	G3BIK	ND	3	86	436
26	G3RKA	WK	11	79	428
27	G3PYI	GR	13	78	427
28	G3JVJ	SX	22	71	421
29	GI3NZZ	DW	2	83	419
30	GM3FXM	FE	2	81	409
31	G3JFY	ST	6	72	378
32	GW3LEW/A	GN	1	74	373
33	G3GFG	HE	14	65	367
34	G3RCY	SY	40	48	360
35	G3LHZ	SX	29	53	352
36	G3CBW	HF	19	58	343
	G3NNW/A	LE	11	62	343
38	G3NKS	SY	39	44	337
39	G3PVK	SY	40	43	335
40	G3RSD	LN	16	55	323
41	GM3KMR	MN	3	60	309
42	G3JKY	KT	40	38	307
43	G3MCX	SY	38	37	299
44	G3OZM	NM	13	51	291
45	G2BTO	LE	10	52	290
*	G3AHB	BS	28	41	289
46	G3BZG	HF	18	44	273
47	G3DDM	HE	12	46	262
48	G3JSK	SD	5	48	255
49	G3KAY	NK	5	48	251
50	G3PIA	BE	17	40	250
51	G2GM	HE	13	42	249
52	G3HBR	MX	33	29	244
	G3RXX	SF	4	47	244
54	G3NKX	EX	42	23	241
55	G3SFR	HE	21	34	233
56	G3LLM	ST	7	42	231
57	G3HIW	EX	30	28	230
58	G3RFT	LE	13	38	227
59	G3PJB	LD	26	27	213
60	G3MWZ	LN	13	33	204
61	G3RCQ	EX	36	19	203
62	G3KPU	NM	9	35	202
63	G3JJZ	KT	22	26	196
64	G3SPJ	LD	38	18	191
65	G3RYJ	NM	8	33	189
66	GM3OGJ	DU	3	33	174
67	G3OYU	KT	21	22	173
68	G3PWU	BE	12	25	160
69	G8BN	BS	21	18	153
70	G3JWB	LD	36	8	148
71	G3NQT	EX	28	8	122
72	G3CEU	HF	9	17	112
73	G3PYC	SX	11	15	108
74	G3SDX	EX	17	11	103
75	G2HR	LD	23	6	99
76	G3PED/A	EX	26	3	92
†	G3SUY	EX	20	6	90
77	G3SMF	EX	24	3	87
78	G2HBA	LD	19	5	82
79	G3ITF	HE	2	14	76
80	G3EUE	SY	20	3	74
81	G6OO	LN	3	9	54
82	G3JNJ	MX	14	1	47

* No declaration
† No county codes logged

fed half-wave aerials; and the remaining 13 of the first 22 stations used end fed half-wave aerials. The next four stations all used quarter-wave aerials and thereafter down the list it is a mixed bag ranging down to a 30 ft. loaded wire at G3NKX. It would seem that 200 ft. and more is almost essential if you are to make the top twenty!

Logs

Logs were of a high standard but there is evidence that not all duplicate and partially completed contacts are being recorded. This can result in stations losing points that they would otherwise be entitled to claim. On the subject of duplicate contacts, G3FM raises the point that valuable

Maitland Trophy

Position	Call-sign	Score		Points
		Nov. 1963	Mar. 1964	
1	GM3NYY	664	582	1246
2	GM3FXM	501	409	910
3	GM3KMR	234	309	543
4	GM3AVA	—	474	474
5	GM2HCZ/A	—	338	338
6	GM3OGJ	—	174	174

time is often wasted in arguing over second contacts. When making what is believed to be a repeat QSO a second serial number should be exchanged without question and the contact marked in the log as a duplicate. It may be that the first QSO was lost as far as the second station was concerned, in which case no points could be given to either station without the repeat.

Comments

A number of competitors commented on the scoring system, and all suggestions will be carefully considered when formulating the rules for the next contests. Typical of the opposing views are these: " . . . . . this scoring system is grossly unfair. It is extremely disheartening to know, before one starts, that whatever one does it is just not possible to win this contest," G3JEQ, Surrey; " the best points system we have had yet—GMs take note, and ' get in there.' It's about time that trophy was coming North," GM3KMR, Ayrshire; while from G3NHE, Yorkshire, " . . . . . I would be interested to hear of any other suggestions for modification of the ' equalising ' scoring system, but I doubt whether we can do much better . . . . . "

* * *

Useful check logs were submitted by four listener members A3247, A3331, A3867 and BRS24733. The Contests Committee will award certificates of merit to Martin Harrison, BRS24733, and P. G. Smith, A3331. The Committee also wishes to thank the following stations for their check logs: G2BLA, G2VV, G3BTU, G3HBW/A, G4VF, GM3AWF, GW3ROG and OH3NY.

Rugby D/F Qualifying Event

The first RSGB D/F Qualifying Event of the season was run by the Amateur Radio Section of the AEI Rugby Recreation Club on April 12. Eighteen teams were present at the start; a grassy plot by a canal about 2 miles north-west of Rugby. A combination of local QRM and some transmitter trouble delayed the start, but five teams were able to locate both transmitters before 4.30 p.m.

Station A was located 11 miles north-east of the start on a road which had been closed owing to work on the M1 motorway extension, but could be easily reached from one direction. Most competitors, however, chose the difficult way across a pile of rubble.

Station B, hidden in a disused gravel pit about 13 miles south-east of the start, was found with less trouble although some teams arrived by way of a rather deep ford.

Rugby D/F Qualifying Event Results

Position	Name	Club	Times of Arrival (GMT) Station A	Station B
1	E. L. Mollart	Oxford	13.53	14.51
2	G. Taylor	Rugby	14.00	15.15
3	G. Nicholson	Slade	14.08	15.16
4	P. M. Williams	Slade	14.05	15.16½
5	A. Hitchcock	Derby	14.01	15.17
6	O. L. Harding	Rugby	14.26	15.43
7	T. C. Reynolds	Rugby	14.05	—
8	F. Allsopp	Derby	14.25	—
9	E. W. Bristow	Oxford	14.29	—
10	R. J. Parsons	Oxford	14.32	—
11	J. Andrews	Rugby	14.40	—
12	G. T. Peck	High Wycombe	—	14.49
13	J. J. Grant	Rugby	—	14.53
14	A. D. Bristow	Derby	14.58	—
15	M. P. Hawkins	Oxford	—	15.10

Oxford D/F Qualifying Event

Seventeen teams assembled at Shotover Plain, a local beauty spot three miles east of Oxford for the start of the Oxford event, held on April 26.

The organizers, through a well-known guardian angel, had ordered wet weather during the previous week and perfect spring weather on the day. Their ambition was to make the bridle path leading to transmitter A impassable, even to a Rugby-based Land Rover. Transmitter A, G3OOZ/P, was hidden in dense undergrowth on an overgrown footpath near South Leigh, 11 miles west of the start. Transmitter B, G2DU/P, was well hidden in a large area of gorse a quarter of a mile from the start.

To encourage competitors to get well away from the start for the second transmission, the organizers published details of new roads and bridges in the area. All but one fell into the trap; the exception was Alan Hitchcock from Derby, who oblivious to pain and covered with gorse prickles reached transmitter B at 13.02 GMT. Eleven very muddy teams unearthed transmitter A and five transmitter B. Only three teams located both transmitters. They were:

Position	Name	Club	Arrival (GMT)
1	A. Hitchcock	Derby	14.26
2	I. Jackson	Rugby	15.10
3	G. Taylor	Rugby	15.26

Thus Messrs Hitchcock and Jackson qualify for the National Final, Mr G. Taylor having previously qualified.

After tea at the Victoria Arms on the bank of the River Cherwell, three prizes donated by the O & DARS were presented to the winners.

John Graham, G3TR, representing the Contests Committee of the RSGB, presented the 1963 National Final Trophy to A. Hitchcock, the 1963 winner. Mr Graham, who was attending his first D/F contest, expressed the opinion that more publicity should be given to D/F activities and more SWLs encouraged to participate.

The event was organized by M. P. Hawkins and E. L. Mellart on behalf of the Oxford and District Amateur Radio Society.

D/F Qualifying Events

Details of the High Wycombe Qualifying Event are as follows:
Sunday, June 14, 1964.
Organizer: G. T. Peck, BRS15402, Dell Cottage, Horseleys Green, Stokenchurch, Bucks.
Frequencies: 1898 and 1874 kc/s.
Call-signs: G8VZ/P and G3OUV/P.
Map: Ordnance Survey, New Popular Edition, Sheet No. 159, Chilterns.

Assembly Point: Winter Hill, 1½ miles east of Marlow, NGR 75864

Assembly Time: 13.00 BST.

Entries and Tea: Intending competitors should notify the Organizer by June 7, stating the number in their party requiring tea.

* * *

Details of the Derby Qualifying Event are as follows:

Sunday, June 28, 1964.

Organizers: F. Allsopp, G3IFA, and A. Hitchcock, G3ESB, 38 West Road, Spondon, Derbyshire.

Frequencies and Call-signs: G3IFA/P, G3RTG/P. Frequencies to be announced at the start.

Map: Ordnance Survey, New Popular Edition, Sheet 121.

Assembly Point: Side of the River Trent at Swarkestone, NGR 368283.

Assembly Time: 13.00 BST.

Entries and Tea: Intending competitors should notify the organizers by June 21 stating the number in their party requiring rea. Tea rendezvous will be supplied at the start.

RSGB 70 Mc/s Contest 1964

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.

When: From 17.00 to 23.59 GMT on June 20 and from 07.00 to 19.00 GMT on June 21, 1964.

Locations: Stations, fixed and portable, must be operated from the same site throughout the contest.

Eligible Entrants: Only fully paid-up Corporate Members of the RSGB resident in Europe. Multiple-operator entries will be accepted provided only one call-sign is used (see RSGB General Rules for Contests, Rule 6).

Contacts: The entrant may transmit only on his licensed frequencies between 70 and 73 Mc/s. Contacts may be made on A1, A3, A3a or F3.

Scoring: Will be on the basis of one point per mile.

Contest Exchanges: RST (RS) reports followed by the contact number (starting with 001) followed by the location (e.g., RST579001 3 miles NE Oxford).

Entries: (a) The cover sheet must be made out in accordance with RSGB Contests Rule 4 and the declaration signed. **The NGR of the site must be stated.** The location transmitted for each contact must be given on the Cover Sheet. (This location must be identifiable on the Ordnance Survey 10 mile to the inch map. See also comments on QTH for London, Birmingham, etc., given in the report on 70 Mc/s C.W. Contest in the March, 1964, issue of the RSGB BULLETIN).

(b) Logs must be tabulated in columns headed (in this order) (i) Date/Time (GMT); (ii) Call-sign of station worked; (iii) My report on his signals and serial number sent; (iv) His report on my signals and serial number received; (v) Location of station as received; (vi) Points claimed.

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

Awards: At the discretion of the Council, a certificate of merit will be awarded to the winner and runner-up. A certificate of merit may also be awarded to the non-transmitting member submitting the best check log in the opinion of the Contests Committee.

Second 144 Mc/s Portable Contest 1964

RSGB members throughout Europe are again invited to take part in this contest, details of which are as shown below. Contestants are strongly recommended to operate in accordance with the British Isles Two Metre Band Plan.

1. **When:** 10.00 GMT to 19.00 GMT, on Sunday, July 5, 1964.

2. 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.

3. **Eligible Entrants:** All fully paid-up members of the RSGB resident in Europe. Multi-operator entries will be accepted provided only one call-sign is used.

4. **Power Supplies:** Power for any part of the station shall not be derived from supply mains, and the input must not exceed 25 watts in any stage in the transmitter.

5. **Contacts:** May be made on either A1, A3, A3a or F3, in the 144-146 Mc/s band.

6. **Scoring:** Points will be scored on a basis of one point per mile for contacts with fixed stations and two points per mile for contacts with other portables or mobiles.

7. **Contest Exchanges:** RST or RS reports followed by the contact number and location (e.g. RST559001, 5NE Luton). This location must be identifiable on the 10 mile to the inch Ordnance Survey Map. Five figure QRA locator details may be exchanged with continental stations. It is the responsibility of the receiving operator to obtain the information he requires to calculate distances correctly.

8. **Logs:** (a) Must be tabulated in columns headed (in this order) " Date/Time (GMT)," " Call-sign of station contacted," " My report on his signal and serial number sent," " His report on my signal and serial number received," " Location of station contacted as received," " Distance in miles," " Points claimed."

(b) The cover sheet must be made out in accordance with RSGB Contests Rule 5 and the declaration signed. Multi-operator entries must be marked on the cover sheet. The QTH as sent and National Grid Reference (full six figure grid reference) must be recorded on the cover sheet for entries from G, GD, GM and GW. In all other cases, entrants must show latitude and longitude.

(c) Entries must be postmarked not later than **Tuesday, July 21, 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 and to the non-transmitting member submitting the best check log in the opinion of the Contests Committee.

Grafton Top Band Contest

The Grafton Top Band Contest for the G2AAN Cup took place on March 14 (c.w.) and March 21 (phone). The results of this contest were as follows:

Members' Section		Open Section	
Position	Call-sign	Position	Call-sign
1	G3RPB	1	G3RJH
2	G3PRK	2	G3ERN
3	G3RJN	3	G3IGW
4	G3SDK	4	G3JML

Stolen Radio Equipment

D. C. Chapman, G3NGK/M, reports the theft of a 4m transmitter-receiver from his car while parked in Bromley on May 2. The equipment is a Pye " Reporter " radiotelephone with fist microphone. The original frequencies of 72·325 Mc/s (transmitter) and 85·825 Mc/s (receiver) are marked on the side of the case. Apart from internal modifications to crystal sockets, a trimmer is mounted on the front panel in place of the Pye badge.

CONTESTS DIARY

June 6-7	- National Field Day (see page 381, December, 1963.)
June 14	- D/F Qualifying Event (High Wycombe) (see page 395).
June 20-21	- 70 Mc/s Contest (see page 396).
June 27-28	- RSGB 1250 Mc/s Tests (see page 258, April, 1964).
June 28	- D/F Qualifying Event (Derby) (see page 396).
*July 5	- Second 144 Mc/s Portable Contest (see page 396).
July 12	- D/F Qualifying Event.
July 19	- D/F Qualifying Event (Wirral).
July 26	- D/F Qualifying Event.
August 8-9	— WAEDC (C.W.) Contest.
August 15-16	— WAEDC (Phone) Contest.
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	— IARU V.H.F. Contest.
September 12-13	— Labre (Phone) Contest.
September 13	— D/F National Final.
September 20	— Low Power Field Day.
October 3-4	— RAEN Rally.
October 17-18	— Second 420 Mc/s Contest.
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

News from the newsletters

The Southampton Group *QUA* prints its second article on transistor theory and contains some slightly terrifying mathematics. This newsletter is also delving into the controversial subject of whether Morse is " farcical " or not. The South London Mobile Club's *G3SLM Newsletter* gives the circuit and constructional details of a *Z* match aerial coupler with built-in s.w.r. indicator and dummy load. The Medway *MARTS Newsletter* carries an introduction to satellite listening. The South Shields *Spectrum* gives the circuit of a highly successful three band three stage transmitter. *Radial*, journal of the Radio Amateur Invalid and Bedfast Club, prints the fourth of its series on " Possum," in this case it is the control system capable of operating a typewriter at 100 w.p.m. The AERE (Harwell) *QAV* Technical Supplement No. 11 describes a gamma match incorporating a tunnel diode which results in a 15db gain. The Wolverhampton *Newsletter* gives some useful information on aligning the HRO-5 receiver. The Echelford *Newsletter* gives financial advice and encouragement to the newcomer: vast sums of money are not essential. The Wirral *Newsletter* deals with some of the more theoretical aspects of radio propagation and whether a capacitor can, in theory, ever be fully charged. The Loughton and District *Newsletter* gives the first of its series on simple test gear, a sensitive absorption wavemeter.

Club Reports

Basingstoke ARC. The next meeting will be held at the Emanuell Hall, Wote Street, Basingstoke, on June 13, and will be devoted to beginners. The subjects to be discussed include receivers, aerials, and construction. All enquiries should be addressed to the Honorary Secretary, P. Jackson, G3ADV, 11 Oaklands Way, Winklebury, Basingstoke, Hants.

Bristol Group. There was an interesting meeting on April 24 at which M. Dransfield, 5N2JKO, was a visitor, and G. A. Bird, G4ZU, gave a talk on aerials. Members and visitors from outside Bristol are welcome at all meetings.

Burslem ARS. Since moving to temporary quarters at the Drill Hall, Cross Heath, Newcastle-under-Lyme, the society has had two very interesting talks. On April 2, A. J. Hodgkinson, G3LLJ, spoke on " Getting started on 2m," and on May 7, D. Poole, G3AQW, spoke on " 19 Set Modifications." The society supported the Stoke-on-Trent RS at the recent Trentham Gardens Mobile Rally by providing two Top Band out-stations, G3HVI and G3SAJ. The next meeting will be at Cross Heath on Thursday, June 4, when club organization and lecture programmes preparatory to moving into new quarters at the Moorland Junior High School, Burslem, in September, will be discussed. The exact date will be announced later. Honorary Secretary: J. R. Sherratt, G3SAJ, 23 Ash Way, Ash Bank, Bucknall, Stoke-on-Trent.

The Annual Constructional Competition of the Chester and District ARS. Prizewinners and judges, left to right, are A. Warne (first and third Junior), D. Grieg (second Junior), D. Wardle, G3EWZ (second Senior), B. Poole, G3JAZ (first Senior), K. Birch, G2FOS (Judge), and B. Evans (Judge). The winning entry in the junior section was a 50 watt audio amplifier, and in the senior section a G2DAF-type receiver.

Cambridge & District ARC. Meetings are well attended and membership is steadily increasing. The club will be taking part in NFD, and also hope to run a station at the Bottisham Church Fete on Saturday, July 11. At a recent meeting, Mr J. J. Butterfield spoke on " The Early Days of Wireless " when as a pioneer, at the turn of the century, he really had to " roll his own."

Chester & District ARS. The Annual Constructional Competition recently took place: among the entries was an electronic organ. Information about meetings may be obtained from the Honorary (Press) Secretary, P. J. Holland, Field House, 19 Kingsley Road, Gt. Boughton, Chester.

Civil Service Radio Society. The meeting on April 20 was a dismal evening when Battersea Power Station went QRT, so there was not much activity from GB2SM. The film show on May 4 included " The John Glenn Story " loaned by the US Embassy. The RSGB tape recorded lecture by the late C. H. L. Edwards on " Hints on Mobile Operation " will be heard on June 15, and GB2SM will be on all bands. As always, visitors are welcome and are asked to contact G. Lloyd Dalton, BAYswater 3456, ext. 364, or H. Reeve, G3JXZ, on TERminus 8811.

Crawley ARC. Recent events have included a first class demonstration of stereo reproduction by G3FZL and G3IIR. Preparations are now well in hand for NFD, and much constructional work is also going on in anticipation of the v.h.f. event in September when the club will again be operating " 16 km N. of Bognor Regis." For the June meeting, the now customary " Members' Evening " has been arranged, when club members take along equipment, films, and other items of interest. Visitors to the town are always assured of a warm welcome. For details they should contact the Honorary Secretary, R. G. B. Vaughan, G3FRV, 9 Hawkins Road, Tilgate, Crawley, Sussex.

Durham City ARS. The society was formed in January and has proved very popular with an attendance of about 30 at each meeting. The following committee has been elected: Chairman, A. Smith; Vice-Chairman and Publicity Officer, P. G. Martin, G3PDM; Honorary Secretary, E. D. Watson, G3SHE; Honorary Treasurer, R. G. Cary, G3DYY; Junior Representative, J. Pounder; Ordinary Member, J. Hogg, G3NUA. Meetings are held on alternate Thursdays at 7.30 p.m. at the " Bridge Hotel," North Road, Durham. The Constructional Competition will be judged on June 4, and the first AGM will be held on June 18. Arrangements are being made for NFD. The society's station, G3TAK, will soon be operational. New members, whether licensed or not, are always welcome, and further details may be obtained from the Honorary Secretary whose address is 5 Park House Road, Nevilles Cross, Durham.

Ex-G RC. The club would like to make it clear that they not only issue certificates for working Ex-G Club members, but a special one for SWLs and full particulars may be obtained by sending s.a.e. to G4MJ (not G4MY as quoted in last month's report). The club meets on the air at 19.00 GMT every Sunday on 14,345 kc/s when calls from the UK will be particularly welcome. A c.w. net is held at 21.00 GMT on Saturdays on 14,065 kc/s.

Grafton RS. Grafton plan to hold their Annual Field Day on Sunday, June 14, and have invited Paddington to join them. This will enable two stations to operate from their site at Parliament Hill Fields. A mobile gathering will not be possible as LCC regulations prohibit motor vehicles entering the area, but the Honorary Secretary is arranging to prepare detailed maps of the area showing parking facilities and footpaths. Copies will be

sent to intending visitors upon receipt of s.a.e. Honorary Secretary: A. E. Bristow, 37 Tyndale Mansions, Upper Street, London, N.1.

Halifax & District ARS. At a meeting on April 28, B. Crisp, G3LHQ gave an interesting talk entitled " First Impressions of Two Metres." On Tuesday, June 30, D. Millard, G3OGV, will talk on mobile transceivers. Meetings are held at the " Beehive and Crosskeys Hotel " at 7 p.m.

Haverhill & District ARC. An inaugural meeting was held at the Haverhill Secondary Modern School on Monday, April 27, when G5BQ, G2CDX and G3IIT went over from Cambridge to assist in getting the club started. There is already a very keen nucleus of members. A programme is being arranged, and meetings will be held on Mondays at 7.30 p.m. The club is fortunate in having an excellent room, and anyone interested is invited to contact the Chairman, A. Bowden, 9 Chestnut Close, Haverhill, for further particulars.

Heanor & District RS. The society now holds the call-sign G3TCH. On Tuesday, June 9, there will be a surplus sale at 7.30 p.m. at the Club Rooms, Heanor Technical College, Ilkeston Road, Heanor, Derbyshire. On Tuesday, June 16, there will be a visit to the TV transmitter at Hints, near Tamworth. Details of meetings may be obtained from the Honorary Secretary, R. Harrod, G3RWN, 36 Lodge Road, Newthorpe, Notts.

Lichfield ARS. Meetings continue to be well attended and recently included a film show on " Electronics in Industry " by H. Saunders, G3CRH. RAE classes continue, and four members were due to sit in May. Honorary Secretary: A. Russell, G3OMT, 75 Beacon Street, Lichfield, Staffs.

Lothians RS. At one of the April meetings, GM3CIG talked about his own experiences of mobile operation. In May, Mr Cook, of Coastal Radio Ltd., demonstrated some of the communications equipment available for use on small ships.

Loughton & District RS. The meeting on Friday June 19, is reserved for preliminary arrangements of the GB3LOU installation which is to be operated on all bands from 160m to 2m during Debden Fair Week, July 11 to 18. For this event other features will include a display of equipment constructed by members, and the closed-circuit TV installation of G3MJZ/T. On July 18, the society's first mobile rally will take place with talk-in stations on 160m and 2m: NGR TQ 438965. A varied programme is being arranged to entertain visitors and a large attendance is envisaged. Meetings are held at Loughton Hall, Debden Community Centre, Rectory Lane, Loughton, Essex. Honorary Secretary: A. W. Sheppard, G3JBS, 11 Barfields, Loughton, Essex.

Northern Heights ARS. At the recent AGM the retiring Chairman reported a successful year with an increase in membership, and the Honorary Treasurer was able to report that the society's funds were in a very healthy state. Meetings will continue to be held at the Sportsman Inn, Ogden. The society will be taking part in NFD on June 6, and on the same day will be operating a demonstration station at the Halifax Charity Gala under the call-sign G3OMM/A. On June 17 there will be a visit to the BBC transmitting station at Moorside Edge, Huddersfield, and on June 24 there will be a visit to the Wharfedale Loudspeaker Factory in Bradford. On June 27 a demonstration station (G3OMM/A) will be operated at the Forest Cottage Gala, Halifax. July 1 is booked for a visit to the Bradford Fire Brigade HQ. Honorary Secretary: A. Robinson, G3MDW, Candy Cabin, Ogden, Halifax, Yorks.

Peterborough ARS. Spark transmitters and vintage valve receivers from the early 1920's were demonstrated by the RR, F. C. Ward, G2CVV, when he spoke on " Fifty Years of Amateur Radio " at the meeting held in Peterborough Technical College on May 1. Honorary Secretary: D. Byrne, G3KPO, Jersey House, Eye, Peterborough.

Reading ARC. The next meeting will be held at the Palmer Hall, West Street, Reading, at 7.30 p.m. on June 27, when G. Preston, G3OLA, will speak on " Receiver Alignment." The first of the Mobile Picnics will be held on July 12 in conjunction with the Mortimer and District Cycle Club's Scramble which will take place at Padworth Common, just off the A4 at Aldermaston. Talk-in stations will be operating. Windscreen stickers, which will ease the parking problem, are available from the Honorary Secretary. Police will control the entrances, and a charge will be made for admission. The meeting on July 25 will be devoted to " Simple S.S.B. Gear." Honorary Secretary: R. G. Nash, G3EJA, 9 Holybrook Road, Reading.

G3RIX, who passed his RAE at the age of 14½, operating the Scarborough ARS Station, G4BP, with the President, G3KS, keeping a watchful eye on the proceedings.

(Photo by G3JBR)

Reigate Amateur Transmitting Society. The change of clubroom to the " George and Dragon," Redhill, has proved a popular move. Two members of the local North Downs Cine Society kindly assisted with the film show at the April meeting when a selection of films from the Electrical Development Association were screened. Their Chairman and the RATS Secretary exchanged interesting and illuminating ideas on club organization. The meeting on June 20, at 7.30 p.m., will include a review of NFD arrangements. Honorary Secretary: F. D. Thom, G3NKT, 12 Willow Road, Redhill, Surrey.

Royal Naval ARS. Members and non-members can try for the Mercury Award Certificate. The award is issued in three classes: Class I (UK) 20 points, Class II (Europe) 10 points, and Class III (DX) 5 points. Contacts with a member count as one point per band and contacts with HQ Station, G3BZU, count two points per band. Claims, together with QSL cards and 1s. 6d. (or equivalent) should be forwarded. Further information about the society may be obtained from the Honorary Secretary, RNARS, HMS *Mercury*, Petersfield, Hants.

South Dorset RS. The May meeting held in Dorchester was devoted to the showing of films kindly loaned by Mullard Ltd.: " From Us to View " and " Mirror in the Sky." This was followed by a discussion on NFD gear and aerials. A visit to Dorchester Brewery took place on April 28. A visit to the Bournemouth Automatic Telephone Exchange has been arranged for Friday, June 26. Honorary Secretary: C. E. Biggs, G2TZ, 54 Prince of Wales Road, Dorchester, Dorset.

Southgate, Finchley & District Group. On April 9, a representative of Cosmocord Ltd. described in detail the manufacture of crystals for use in microphones and pick-ups. On April 23, a " second meeting " was held for the benefit of SWLs when G3RPN and G3PKZ demonstrated the converting of a broadcast receiver for Top Band use, and G3PID set up a Top Band station. On July 11 there will be a talk and demonstration of amateur TV given by members of the British Amateur Television Club. Another " second meeting " will be held on June 25. Meetings are held at Atlasta Lodge, Tottenhall Road, Palmers Green, London, N.13, at 7.30 for 8 p.m. The Honorary Secretary is R. Wilkinson, 33 Amberley Road, London, N.13.

Spen Valley ARS. The Annual Dinner was held on April 25 at the Park Cafe, Batley, when 72 members and friends attended. The guest speaker was Mr E. Barber, Head of the Heckmondwike Grammar School Evening Classes. The Swindon Cup, awarded for the best constructed piece of radio equipment, was won by two junior members, D. Illingworth and J. Clarke. The entries were judged by Mr M. Taylor of Baird Television and J. Spivey, G2HHV, the Vice-President.

Surrey Radio Contact Club. At the AGM held on April 14, the following committee was elected: Chairman, G. Wynn, G8TB; Vice-Chairman, T. Naylor, G3GHI; Honorary Secretary, S. Morley, G3FWR; Honorary Treasurer, J. North; R. Dabbs, G2RD; K. Drummond; R. Field, G3ODY; R. Morrison, G3KGA. On April 26, a party of club members visited the observatory of Mr Frank Hyde, the radio astronomer. On June 9, there will be a talk, illustrated with slides, about the new Post Office Radio Tower. On June 24, the annual popular social event, the Club Treasure Hunt, is to be held. Details of meetings may be obtained from the Honorary Secretary at 22 Old Farleigh Road, Selsdon, South Croydon, Surrey.

Yeovil ARC. One of the two RSGB Tape Lectures heard during the April meetings was " My Golden Jubilee Year " by John Clarricoats, O.B.E., G6CL. On April 22, the club was honoured with a visit by Dr M. Dransfield, 5N2JKO, who lectured on Amateur Radio in Nigeria and then showed slides of Northern Nigeria.

Wimbledon & District RS. The Constructional Contest held on April 10 was won by R. Baker, G6QN. The second and third prizes were won by SWLs R. Morgan and P. White. The judges were G3PGA and G3LXN of the South London Mobile Club. The second Decca lecture and film show given by Mr P. Jones on May 8 was well attended. On June 12, G. F. Gearing, G3JJG, will give a talk on s.s.b. Meetings are held on the second Friday of each month at the Community Centre, 28 St. George's Road, Wimbledon, London, S.W.19. Honorary Secretary: E. N. Hurle, G3RZN, 156 Monkleigh Road, Morden, Surrey.

Club of the Month

SCARBOROUGH AMATEUR RADIO SOCIETY

This society was founded in 1933 by several old-timers from the North East Coast town of Bridlington, among whom were G6OO, G6UJ and G5VO. The Honorary Secretary, soon to become BRS1321, was present at the inaugural meeting and throughout the years has taken a keen interest in this fascinating and absorbing hobby. His enthusiasm has inspired a number of potential amateurs in the area.

Over the years the society has seen difficult periods, but has managed to survive. It has now quite a healthy membership in spite of the fact that the town itself has less than 50,000 inhabitants.

The society caters for all branches of membership alike, whether listeners, novices, or old-timers. The committee arranges a full programme of events to cover each meeting throughout the year, which in itself can be quite a problem. These include lectures, demonstrations, home-made equipment evenings, station visits, quizzes, film shows, a monthly junk sale and any subject that may be of interest to amateurs.

On the competitive side, NFD is a " must " and it is usually possible to man two stations. The society has also taken part in several other contests. Every member has had a hand in the establishment of the society's station, G4BP.

Visitors are always welcome.

Under a development plan for a new ring road, the society will unfortunately have to vacate its present premises and efforts are being made to find new headquarters in the very near future. In spite of difficulties, the continued long life of the society is assured by a hard working committee backed by an enthusiastic membership.

Port Talbot Club Annual " Get-Together."

On Tuesday, April 7, the Port Talbot Club held its annual " get-together " when it acted as host to clubs and groups from a wide area. This year the event had a special significance, for one of its objects was to celebrate the success of Port Talbot and Cardiff in coming first and second respectively in National Field Day, 1963. The display of trophies and replicas was a memorable sight, and one which rewarded the winners for many years of effort.

Mr Arthur Williams, GW5VX, the Club Chairman, welcomed Zonal and Regional Representatives, and members from Cardiff, Carmarthen, Swansea and Rhondda clubs and, in reply to the many congratulations, made the point that such an occasion would probably never be repeated.

As usual, the excellent surroundings and lavish scale of hospitality made the evening another outstanding event in the calendar of Region 10, and the Secretary, GW4CG, is to be congratulated on the organization.

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).—June 10 (NFD Inquest), June 24, 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).—June 9 ("Junk Sale"), 8 p.m., Knowsley Hotel, Kay Gardens.
Chester (C & DRS).—June 9 (NFD Inquest), June 16 (RSGB Recorded Lecture), June 23 ("Receiver Alignment," by P. White), June 30 (Surplus Equipment Sale), 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.—June 9, 23, July 7, 42 Jordongate.
Manchester (M & DARS).—Wednesdays, 7.30 p.m., 203 Droylsden Road, Newton Heath, Manchester 10.
Manchester (SMRC).—Fridays, 7.45 p.m., Rackhouse Community Centre, Daine Avenue, Northenden.
Morecambe.—June 3, July 1, 125 Regent Road.
Preston.—June 9, 23, July 7 (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.—June 3, 17, July 1, The Blossoms Hotel, Buxton Road, Stockport.
Wirral.—June 3, 17, July 1, 7.45 p.m., Harding House, Park Road West, Claughton, Birkenhead.

REGION 2

Barnsley.—June 12 (Ladies' Outing). Meetings at King George Hotel, Peel Street.
Bradford.—June 9 (NFD Inquest), June 23 ("Happy Hamming", a pot-pourri of ham radio by M. G. Whitaker, G3IGW), 7.30 p.m., 66 Little Horton Lane.
Catterick.—Tuesdays and Thursdays, 7.30 p.m., Club Room, Vimy Road.
Halifax.—("Mobile Transceivers", by D. Millard, G3OGV), Beehive & Cross Keys Hotel, King Cross Lane.
Northern Heights.—June 10 (Visit to Manchester Radio Society), June 24 (Ragchew), 7.30 p.m., Sportsman Inn, Ogden.
Scarborough (SARS).—June 4 (Preparation for NFD), June 11 (NFD Post-mortem), June 18 ("Pre-selectors," by G8KU), June 25 ("Amateur Radio in Austria"), 7.30 p.m., Chapman's Yard, North Street, Scarborough.
South Yorkshire (SYARS).—Thursdays, 7.30 p.m., The Stag Hotel, Dockin Hill, Doncaster.
Spen Valley.—June 3 (Visit to Meteorological Office, Church Fenton), June 11 (Open and Final Meeting), June 25 (AGM), 7.15 p.m., Heckmondwike Grammar School.
York.—Thursdays, 8 p.m., British Legion Club, 61 Micklegate.

LOOKING AHEAD

June 14.—Hunstanton "Bucket and Spade Party."
June 21.—Inter-Club Picnic and Rally, Houghton Mill, nr. St. Ives, Hunts.
June 27.—RSGB Extraordinary General Meeting.
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.

REGION 3

Birmingham (MARS).—June 16 ("Aerials," H. V. Sims), 7.30 p.m., Midland Institute, Paradise Street, Birmingham. **(MRCC).**—June 5, 7.30 p.m., Windmill House, Weatheroak, Wythall, Birmingham. **(South).**—June 18, 7.30 p.m., Friends Meeting House, Balsall Heath.
Cannock (CCARS).—June 4, The George Inn, Walsall Road, Cannock.
Coventry (CARS).—Mondays, 8 p.m., Westfield House, Radford Road, Coventry.
East Worcestershire Group.—June 11, 8 p.m., Old People's Centre, Redditch.
University of Keele (U of KRS).—Mondays (during term), 7.30 p.m., Room 5, Sneyd Annexe.
Mid-Warwickshire (ARS).—June 15 (Surplus Equipment Sale), June 29 (Open Meeting), 7.30 p.m., Civil Defence Training School, Harrington House, Newbold Terrace, Leamington Spa.
Stratford (ARS).—Fridays, 7.30 p.m., Flat 1. Bird's Commercial Motors, Stratford-upon-Avon.
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).—June 3, 7.30 p.m., Newbold Observatory, Newbold Road, Chesterfield.
Derby (D & DARS).—June 3 (Surplus Sale), June 10 (Film Show), June 17 (D/F Practice), June 24 (Juniors' Discussion), June 28 (D/F Qualifying Event), July 1 (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).—Mondays, 7.45 p.m., Club Rooms, rear of Manners Arms Hotel, London Road, Grantham.
Grimsby (ARS).—June 4, June 18, 8 p.m., Grimsby Model Engineers Club Rooms, Fletchers Yard, Wellowgate, Grimsby.
Heanor (H & DARS).—June 9 (Surplus Sale), June 16 (Visit to TV Transmitter), June 23 (Films), June 30 ("Transmitter construction," by B. Sandall, G3LGK), 7.30 p.m., Room No. 5, Heanor Technical College, Ilkeston Road, Heanor.
Leicester (LRS).—Mondays, 7.30 p.m., Club Room, Old Hall Farm, Braunstone Lane, Leicester.
Lincoln (SWC).—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 to 9 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.
Peterborough (P & DARS).—June 5 (NFD), June 14 (Bucket and Spade Party at Hunstanton), meetings in Room 13, 7 p.m., Electronics Block, Peterborough Technical College, Eastfield Road.

REGION 5

Cambridge (C & DARC).—June 5 (NFD Preparations), June 6-7 (NFD Station, c/o Mr. Banks, Wood Farm, Knapwell), June 12 (Activity Night), June 16 (Coach visit to Luton Club), June 19 (Informal), June 23 (Inter-Club Picnic Rally, Houghton Mill, St. Ives, Hunts.), June 26 (Activity Night), July 3 (Junk Sale), 7.30 p.m., Club Headquarters, Corporation Yard, Victoria Road, Cambridge.
Haverhill (H & DARC).—Mondays, 7.30 p.m., Club Headquarters, Secondary Modern School, Haverhill.
Luton (L & DARS).—June 9 (NFD Inquest), June 16 (Quiz, with members of Cambridge Club), June 23 (Talk on TVI by G3HVA), June 30 (Informal at "The Local"), 8 p.m., ATC Headquarters, Crescent Road, Luton.
March (M & DRAS).—Tuesdays, 7.30 p.m., rear of Police Headquarters, High Street, March.
Royston (R & DARC).—June 17 (Visit to Baldock Radio Station), Wednesdays, 8 p.m., Manor House Social Club, Melbourn Street, Royston.
Shefford (S & DARS).—June 4 (NFD Preparations), June 11 (NFD Post-mortem), Sunday, June 21 (Inter-Club Picnic, Houghton Mill, St. Ives, Hunts.), 7.45 p.m., Digswell House, Hitchin Road, Shefford.

REGION 6

Oxford.—Second and Fourth Wednesdays in each month, 7.30 p.m. (RAE Classes at 7.15 p.m.), Cherwell Hotel, Water Eaton Road, N. Oxford.

REGION 7

Acton, Brentford & Chiswick (ABCRC).—June 9 ("NFD Inquest"), 7.30 p.m., AEU Club, 66 High Road, Chiswick.
Bexley Heath (NKRS).—June 11, 25, 7.30 p.m., Congregational Hall, Chapel Road, Bexley Heath.
Barnet (BRC).—May 26, 8 p.m., Red Lion Hotel, Barnet.
Chingford (Group).—June 12 at G3NQT, June 26 at G4GH, July 10 at G3YF. Contact the Honorary Secretary, Loughton 2397.
Chingford (SRC).—Fridays (except first), 8 p.m., Friday Hill House, Simmons Lane.
Croydon (SRCC).—June 9, 7.30 p.m., Blacksmith's Arms, South End, Croydon
Dorking (D & DRS).—June 9, 8 p.m., "Wheatsheaf," Dorking, June 23, 8 p.m., "Star & Garter," Dorking.
East Ham.—June 16 (Tuesdays fortnightly), 7.30 p.m., 12 Leigh Road, East Ham.
East Molesey (TVARTS).—June 3, Carnarvon Castle Hotel, Hampton Court.
Edgware & Hendon (EARDS).—June 8, 22, 8 p.m., John Keble Hall, Church Close, Deans Lane, Edgware.
Enfield.—June 18, 7.30 p.m., George Spicer School, Southbury Road, Enfield.
Gravesend (GRS).—June 17, 7.30 p.m., RAFA Club, 17 Overcliffe, Gravesend.
Guildford (G & DRS).—Second and fourth Fridays in each month, 8 p.m., City Cafe, Onslow Street, Guildford.
Harlow.—Tuesdays, 7.30 p.m., Rear of G3ERN (G. E. Read), High Street, Marlow.
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 & Wednesdays, 7 p.m., (RAE and Morse), Fridays (Club), 7.30 p.m., Montem School, Hornsey, N.7.
Hounslow (HADRS).—Mondays fortnightly, June 15, 29, 7.30 p.m., Canteen, Mogden Main Drainage Dept., Mogden Works, Isleworth.
Ilford.—Thursdays, 8 p.m., 579 High Road, Ilford (Nr. Seven Kings Station).
Kingston.—June 11, 8 p.m., YMCA, Eden Street,

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, June 19, and July 17, 1964
Telephone table reservations to HOL 7373 prior to day of luncheon. Visiting amateurs especially welcome.

Kingston. Fridays—weekly morse classes at 2 Sunray Avenue, Tolworth.

Leyton & Walthamstow.—June 23, 7.30 p.m., Leyton Senior Institute, Essex Road, E.10. Interested new members contact A. Rix, 17 Forest Drive East, E.11.

Loughton.—June 5, 19, 7.30 p.m., Loughton Hall (Nr. Debden Station).

Mitcham (M & DRS).—June 12, 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).—June 20 ("Direction Finding," by A. J. Gould, G3JKY), 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).—June 19, 8 p.m., Railwaymen's Hall (Side Entrance), Whytecliffe Road, Purley.

Reigate (RATS).—June 20 (Club Night), 7.30 p.m., George & Dragon, Cromwell Road, Redhill.

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

Science Museum (CSRS).—June 1, 6.30 p.m.

Sidcup (CVRS).—June 4, 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 & District.—June 11, (Talk & Demonstration by BATC), 7.30 p.m., June 25 (Talk on Technical TX Matters with demonstration), 7.30 p.m., Atlasta Lodge, Tottenhall Road, N.13.

St. Albans (Verulam ARC).—June 17, 8 p.m., Hedley Road, St. Albans.

Sutton & Cheam (SCRS).—June 16, 7.30 p.m., The Harrow, High Street, Cheam.

Uxbridge.—June 16, 8 p.m., St. Andrews Church, Scout Hut, Uxbridge Road.

Welwyn Garden City.—June 11 (Visit to Crystal Palace TV Transmitting Station).

Wimbledon (W & DRS).—June 12, 8 p.m., Community Centre, St. Georges Road, Wimbledon, S.W.19.

REGION 8

Crawley (CARC)—June 10 (Informal, for details contact G3FRV), June 24, 8 p.m. (Members' Evening), Trinity Congregational Church, Ifield.

Thanet (TRS).—Fridays, 8 p.m., Hilderstone House, Broadstairs.

Tunbridge Wells (WKARS).—June 12 (Competition of equipment constructed by members during the past year). June 26 ("Aerials," RSGB tape recorded lecture by F. J. H. Charman, G6CJ), second and fourth Fridays in each month, except during August, 7.30 p.m., Culverden House, Culverden Park Road, St. Johns, Tunbridge Wells.

REGION 9

Bath.—June 10, 7.30 p.m., Assembly Room, Technical College, Lower Borough Walls, Bath.

Bristol.—June 26 ("The GPO and the Radio Amateur"), 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.—June 8, 7.30 p.m., TA Centre, Park Street, Cardiff.

REGION 12

Aberdeen (AARS).—June 5 (NFD Preparations), June 12 (NFD Post-Mortem), June 19 (Junk Sale), June 26 (Technical "Tit Bits"), 7.45 p.m., 6 Blenheim Lane, Aberdeen.

REGION 13

Edinburgh (LRS).—June 11 (Constructional Competition), June 25 (AGM), 7.30 p.m., YMCA, South St. Andrew Street, Edinburgh.

REGION 16

Basildon (BDARS).—Details of meetings from G3IJB, Milestone Cottage, London Road, Wickford.

Chelmsford (CARS).—First Tuesday in each month, 7.30 p.m., Marconi College, Arbour Lane, Chelmsford.

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.

Norwich (Norfolk ARC).—Meetings in new premises. Details from G3NJQ.

Southend (SDARS).—Fridays fortnightly, the Executives' Canteen, E. K. Cole Ltd., Priory Crescent, Southend-on-Sea.

Amateur Television Convention

The British Amateur Television Club is arranging a Convention to be held on September 12, 1964, from 10.30 a.m. to 6 p.m. in the ITA Conference Suite, Knightsbridge, London, S.W.1. Further information may be obtained from John Tanner, G3NDT/T, 1 Radnor Avenue, Harrow, Middlesex.

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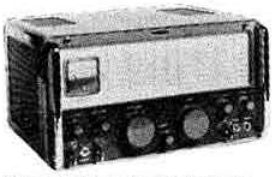

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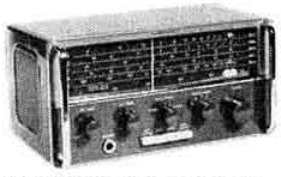

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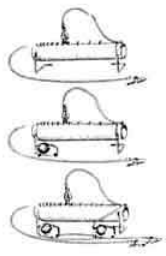

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