RSGB

BULLETIN

MAY 1966
VOL. 42, No. 5

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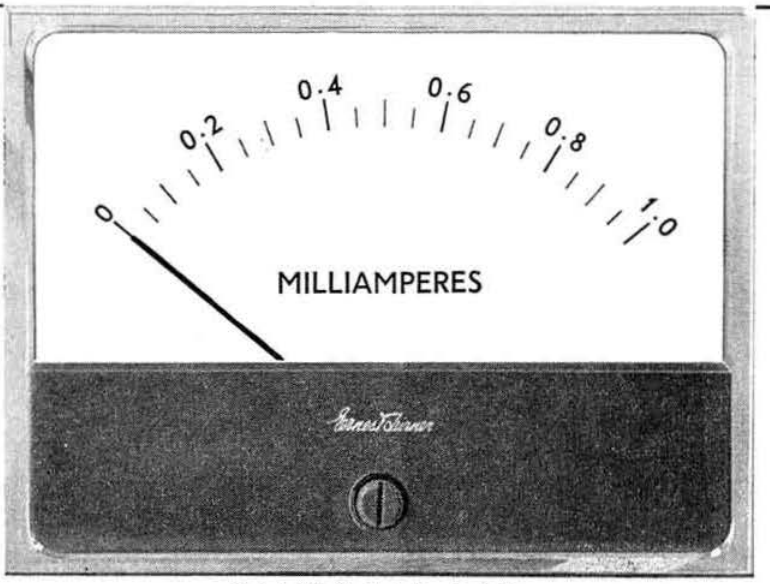
JOURNAL OF THE RADIO SOCIETY OF GREAT BRITAIN



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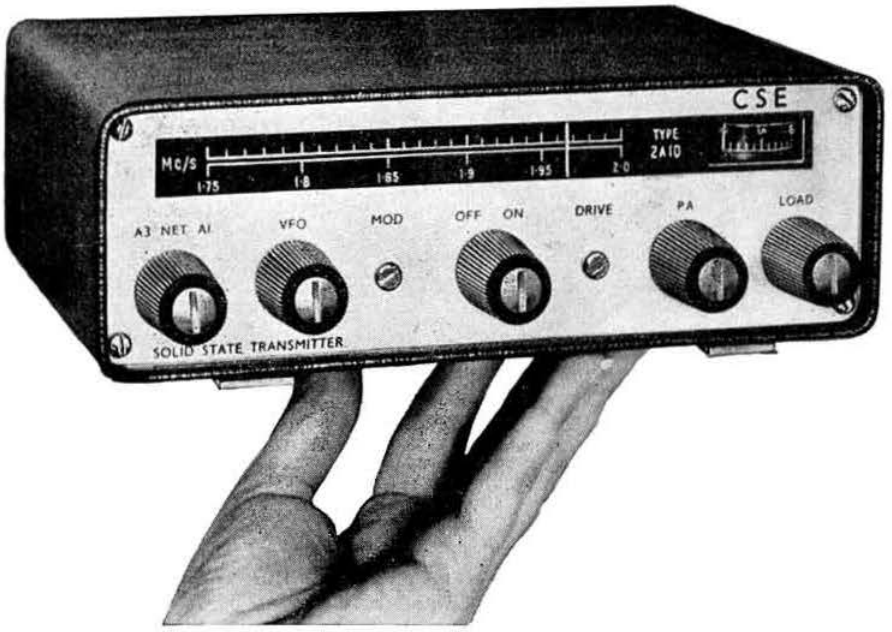

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Volume 42 No. 5

May 1966

4/- Monthly

RSGB BULLETIN

CONTENTS

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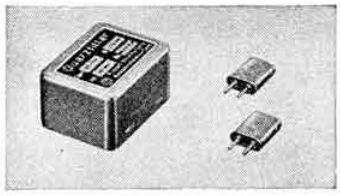
The RSGB Bulletin is published on the first Wednesday in each month by the Radio Society of Great Britain as its official journal and sent to all members. The closing date for copy for the June issue is 6 May.

SUPERPIGMYFILTEROLOGY

or how to get yourself a good miniature crystal filter)

At last a miniature crystal filter of outstanding specifications to fit your available space without emptying your pocket.



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Application notes supplied with each unit
Price (including 2 subminiature carrier crystals and sockets)
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Joymatch type 5 tuner for transmitting £1.17.6.

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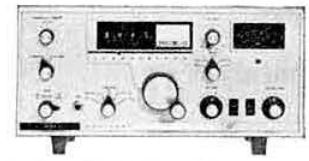

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* 200 watts PEP SSB/CW, 100 watts AM.
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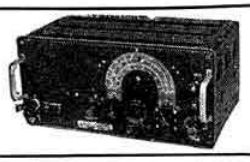
P.C.R.3 RECEIVERS



Absolutely brand new, 3 wavebands, 190-550 metres and 2.2-23 Mc/s. With circuit. **£8.19.6.** Carr. 10/6. Plug in power supply 12v. D.C. 19/6; 230v. A.C., 35/-.

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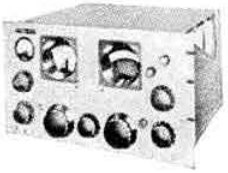

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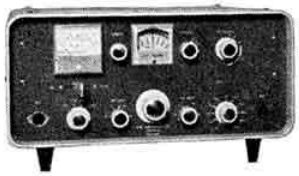

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Discounts for quantities. Post extra.

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50μA ..	.. 32/6	5mA ..	.. 22/6
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200μA ..	.. 27/6	10mA ..	.. 22/6
500μA ..	.. 25/-	20V. DC ..	.. 22/6
50-0-50μA ..	.. 29/6	20mA ..	.. 22/6
100-0-100μA	.. 27/6	50V. DC ..	.. 22/6
500-0-500μA	.. 29/6	50mA ..	.. 22/6
1mA ..	.. 22/6	100V. DC ..	.. 22/6
		100mA ..	.. 22/6
		150V. DC ..	.. 22/6
		150mA ..	.. 22/6
		300V. DC ..	.. 22/6
		200mA ..	.. 22/6
		500V. DC ..	.. 22/6
		300mA ..	.. 22/6
		500mA ..	.. 22/6
		15V. AC ..	.. 22/6
		750mA ..	.. 22/6
		50V. AC ..	.. 22/6
		1-0-1mA ..	.. 22/6
		150V. AC ..	.. 22/6
		1A. DC ..	.. 22/6
		300V. AC ..	.. 22/6
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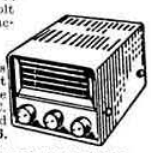

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A. O. Milne, G2MI, 29 Kechill Gardens, Bromley, Kent

Current Comment

discusses topics of the day

Opatija Ahead

THE 50-mile-long bay that comprises the south-eastern coast of Yugoslavia's Istrian Peninsular is full of small, attractive little seaside resorts that have grown up because of the excellence of the bathing and the pleasantnesss of the climate. Towards the top of this delightful bay—the Bay of Kvarner—lies Opatija, best-known of all the holiday resorts on the Yugoslav side of the Adriatic. Here, during the last week in May, delegates from the National Amateur Radio Societies of Austria (OeVSV), Belgium (UBA), Finland (SRAL), France (REF), Germany (DARC), Italy (ARI), Luxembourg (RL), the Netherlands (VERON), Nigeria (NARS), Norway (NRRL), Poland (PZK), the Soviet Union (RSF of USSR), Sweden (SSA), Switzerland (USKA), the United Kingdom (RSGB) and Yugoslavia (SRJ) will meet at a Triennial Conference of the International Amateur Radio Union Region I (Europe and Africa) Division but if the length, depth and breadth of the agendas of business are anything to go by no one will be able to spare much time for sea-bathing!

Committee A, with more than 60 matters of an administrative and operational character to examine, appears to be facing a task of herculean proportions but fortunately many of the delegates due to represent their society at Opatija are men with wide experience of international conferences who should be able quickly to bring the business under control.

In an agenda which has been telescoped to produce 30 major items for discussion, the one relating to the action necessary for the defence of the amateur bands, including preparations for the next world or regional conference (to be introduced by RSGB, UBA, and VERON) must rank of prime importance. Proposals to amend the European Band Plan will be put forward by SRAL, OeVSV, and UBA and a paper concerning the future organization of the secretarial work of IARU Region I Division will be submitted by the Chairman and Vice-Chairman of the Executive Committee. Both subjects are likely to lead to a good deal of discussion.

In the purely technical field two papers prepared by VERON will undoubtedly arouse interest. The first asks the Conference to consider what steps can be taken to obtain a decrease of detection of unwanted signals in electronic entertainment equipment; the second asks the Conference to consider how to avoid the inclusion in Amateur Radio regulations of severe national standards on spurious emissions intended for professional equipment. RTTY standards and frequencies are also to be considered.

Committee B—with a slightly shorter agenda, on paper—will probably find itself heavily pressed for time towards the end of the Conference if full and detailed consideration has been given to such intriguing subjects as the European *OSCAR* Project, s.h.f. band planning and space communication by amateurs.

In both Committees the Society will be represented by Council Members with previous experience of IARU Region I procedure. To assist them in their task of representing the Society effectively at Opatija they will submit a number of papers on work done by RSGB Committees. The Scientific Studies Committee, for example, are reporting on work done by Society members during the International Quiet Sun Year. Experience gained by both the H.F. Contests and the V.H.F. Contests Committees is being passed on to the other societies through conference documents while the Mobile Committee are submitting information about Mobile Rallies in the United Kingdom. The Society, through its President, will propose, by means of a Conference paper, that an IARU Region I Operating Certificate should be made available to amateurs.

The Society's V.H.F. Committee will submit, via the Society's V.H.F. Manager, a number of proposals for consideration by Committee B. These will include a proposal that harmonically related frequencies should be used for s.h.f. working and that authority should be sought for amateurs to use the amateur u.h.f. and s.h.f. bands for space communication.

It is too early yet to hazard a guess as to how far the Conference will contribute to world issues but if signs and portents are heeded it seems certain that many of the decisions reached in Opatija later this month will lead to far-reaching results in the wider spheres of Amateur Radio. Of particular significance is the fact that the African continent will be represented by Dr Michael Dransfield, a delegate from the Nigerian Amateur Radio Society (recently elected to membership of IARU and now a Subscribing Member Society of IARU Region I Division) who expects to hold proxy votes on behalf of one or two other African Member Societies. The fact that the Administrative and Operational Committee is to consider suggestions for introducing Amateur Radio into under-developed and less favoured countries is evidence of the desire on the part of the European societies to face up to a major problem in the African part of the Region.

From the time the Region I organization was formed (as IARU Region I Bureau) in April, 1950 RSGB has played a prominent part both in the administration of the work of the Division and at each succeeding Conference. The contribution to be made at Opatija will be no less significant. J.C.

PROFILE

JOHN SWINNERTON G2YS

BORN at Coventry 50 years ago into an old Staffordshire family of Norman origin, G2YS " found " Amateur Radio through the kindness of a cousin who put down the " necessary " for a home-built short-wave radio at a time when schoolboys' pocket money was measured in coppers: even this set worked only when the valves and battery of the domestic radio were " borrowed " for the purpose. Enthusiasm was fostered by G5GR and a fellow listener—later to become G2LU—with whom he jointly founded what is now the Coventry Amateur Radio Society, and later became its secretary. In April 1933 he became the proud possessor of an " Artificial Aerial " non-radiating licence and the call-sign 2AIF—as it happened just relinquished by the now G2MI. On 12 October, 1934, following a successful Morse test at the local GPO (after school on Saturday morning) the call G2YS was received. His first contact on 40m was *without* an aerial over two or three miles with the now-famous G5PP—using an input of 2 watts!

G2YS was commissioned in 1938 into the Royal Corps of Signals TA at Hall Green, Birmingham—the Unit of " Shack " G6SN—and later joined G8TO and G4FP in manipulating Wireless Set No. 1.

G2YS went to France in 1940, where his first Adjutant was SU1EC, later to become G2EC, and he came out again in undignified style from the Dunkirk beaches. Later John served as Liaison Officer with the French Army in Tunisia and with the Italian Army Mission in Rome, after learning the ropes under G5TV as a Staff Officer, and picking up lasting friends G6LL, G6HB and G2IO in " off-beat " jobs.

After demob G2YS returned to Coventry, but developed a wanderlust and moved around the country, finding time to become active in local clubs in Chester and Scarborough. During this time he helped G3DQ as reserve Northern News Reader.

John is an Incorporated Linguist and graduated from London University with Honours in Sociology and Economics to find a niche in the professional administrative aspects of the education service. He currently works and lives in south-west Hertfordshire with his wife. He married in 1942 and has a son and daughter.

When time permits, G2YS is active on all bands from 160m to 10m, chiefly on c.w. but with occasional excursions on s.s.b. using a KW2000A transceiver and open wire aerials. John's greatest interests are contests, DX, chatting to anyone not in too much of a hurry and Top Band mobile (although he is not a grandad yet!). He says his greatest satisfactions were working his first W, his confirmed 80m WAC and a number of Amateur Radio friendships that have continued for more than 30 years. He was elected to the Society's Council in 1962 where he continues to serve Amateur Radio.

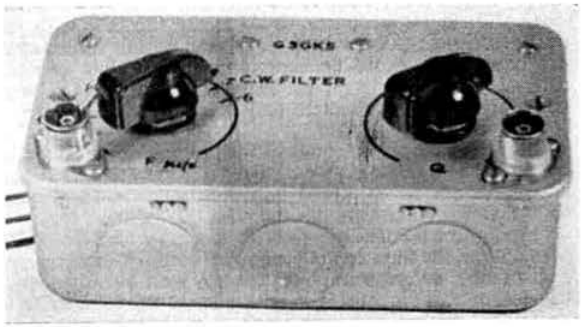
Other interests are specialist philately (Palestine and Israel), heraldry, lawn tennis (plays throughout the year) and music (Bach to Beatles) especially the organ—he is at present helping to re-instal the Wurlitzer from the Empire, Leicester Square, in a private house! John says his greatest ambition is to live to the year 2000.

Region II will be represented at Opatija Conference

Mr Noel Eaton, VE3CJ, Canadian Director of the ARRL and Honorary Treasurer of the IARU Region II organization has been nominated to represent that organization as an observer at the Region I conference in Opatija. Mr John Huntoon, W1LVQ will be in attendance as Secretary of IARU and as an observer from ARRL. G6CL

RSGB MOBILE SAFETY RECOMMENDATIONS

1. All equipment should be so constructed and installed that in the event of accident or sudden braking it cannot injure the occupants of the car.
2. Mobile aerials should be soundly constructed, taking into account flexing at speed and possible danger to other vehicles or pedestrians. The maximum height must not exceed 14 ft. above ground.
3. Wiring should not constitute a hazard, either electrical or mechanical, to driver or passengers.
4. All equipment should be adequately fused and a battery isolation switch is desirable.
5. The transmit/receive switch should be within easy access of the operator and one changeover switch should perform all functions.
6. The microphone should be attached to the vehicle so that it does not impair the vision or movement of the driver.
7. A driver/operator should not use a hand microphone or double headphone.
8. All major adjustments, e.g. band change by a driver/operator, should be carried out whilst the vehicle is stationary.
9. Essential equipment controls should be adequately illuminated during the hours of darkness.
10. Logging must not be attempted by the driver whilst the vehicle is in motion.
11. All equipment must be switched off when fuelling and when in close proximity to petrol tanks.
12. A suitable fire extinguisher should be carried and be readily accessible.



AN AUDIO C.W. FILTER

A versatile design featuring variable frequency and selectivity

By R. G. CHRISTIAN, AMIEE, AMIERE, G3GKS*

FOR the optimum reception of c.w., most receivers require some means of increasing their selectivity above that normally available. While several methods are possible, one of the most popular with serious c.w. operators is the inclusion of a tuned audio filter in the a.f. section of the receiver.

The disadvantage of this system is the operator fatigue which can occur. This may be reduced by arranging the frequency characteristic of the filter to have a sharp upper cut-off frequency, and a gradual low frequency attenuation. [1].

It was also considered that additional reduction in fatigue could be secured by making the filter frequency variable and that tuning could also be made easier by having the selectivity, or Q factor, variable.

In the unit to be described in this article all these features are provided.

Principle of Operation

The principle of operation is the same as that given in Reference: 1, (which, incidentally, contains an excellent general discussion of the problem), in that a frequency

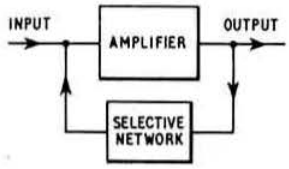


Fig. 1. The basic block diagram of a feedback filter.

dependent feedback amplifier is employed, in other words, the proportion of the output which is fed back in opposition to the input varies with frequency. Since the gain of the amplifier is reduced by negative feedback, the gain/frequency characteristic may be arranged in any desired manner.

For an amplifier to be selective at one frequency, it is necessary that at this frequency the feedback is at a *minimum* and that at all other frequencies, the feedback is large. Such a system requires a null network in the feedback circuit, and the frequency of this null network will correspond to the tuned frequency of the amplifier. Fig. 1 shows the block diagram of the system in which the feedback network may take one of many possible forms.

Since it is desired to vary the frequency of the amplifier the type of network preferred in this case is one in which a wide tuning range can be secured by varying one element, if possible a resistor. Several such networks exist and have been discussed by Hall [2] who was responsible for the network shown in Fig. 2. This network was chosen for use in the filter because of its simplicity and convenience.

The selectivity of the filter is easily made variable by making the feedback variable, maximum Q being obtained with maximum feedback, and a flat response with zero

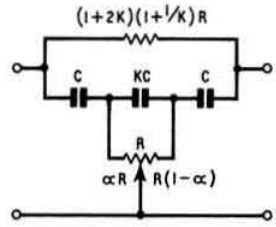


Fig. 2. A resistance-capacitance audio filter, developed by Hall, which is employed as the feedback element in the practical filter of Fig. 3.

feedback. It is therefore unnecessary to switch this filter into the receiver in the usual manner for, to bring the filter into use, all that is needed is to turn up the Q control. It may therefore be included as a permanent a.f. stage handling both c.w. and phone signals.

Circuit Arrangement

The circuit of the filter unit is shown in Fig. 3 in which an EF86 acts as a normal pentode a.f. amplifier with RC coupling. The output from the anode is taken via C4 and VR1 to a Hall network. VR1 allows the amount of feedback to be adjusted, and hence the Q.

In this circuit preferred value 10 per cent resistors can be used for R6 and R7. The capacitor elements, C6, C7 and C8 are 1 per cent mica types. The use of capacitors with a tolerance greater than 1 per cent would lower the maximum Q to some extent, while conversely, the use of 1 per cent resistors for R6 and R7 would increase the Q slightly.

Rapid attenuation of the high frequencies is obtained by

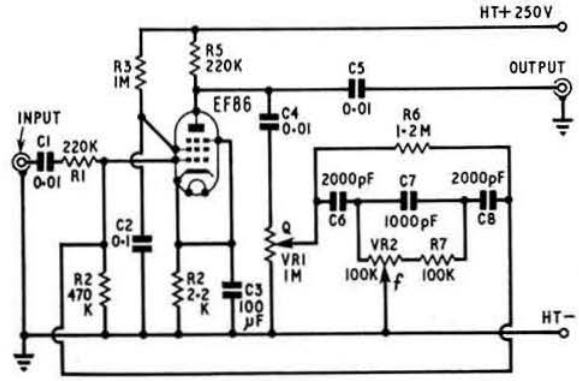


Fig. 3. The complete filter, which can be continuously tuned from 540 c/s to 3600 c/s. VR1 controls the circuit Q, and the frequency of the peak is set by VR2.

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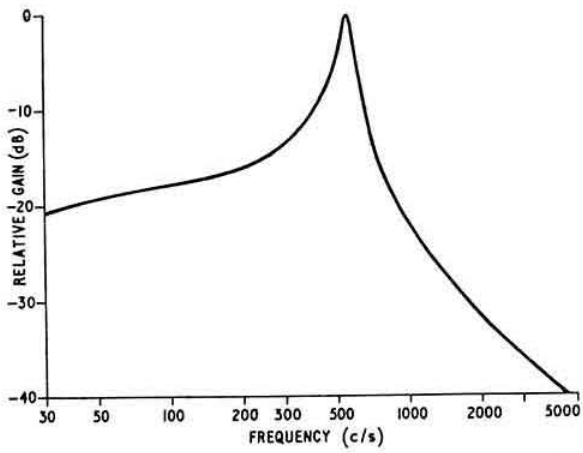


Fig. 4. The response curve of the audio filter plotted at the lowest frequency to which it can tune. The Q falls quite rapidly as the frequency is raised.

means of the potential divider action of R1 and R2, the latter being shunted by the feedback network which provides parallel negative feedback. A characteristic of this type of feedback is that the input impedance to the stage is decreased as the frequency is increased although this will be so for all frequencies. However, since the feedback network is in parallel with R2, and since its own impedance will decrease with frequency, additional attenuation will occur at high frequencies. A gradual attenuation characteristic thus occurs below the tuned frequency, and a rapid attenuation above.

The unit was constructed in a MK switch case measuring 5⅜ in. × 3 in. × 1⅝ in. An Eddystone die-cast box could be substituted if preferred. The photographs show both internal and external views from which the general order will be apparent.

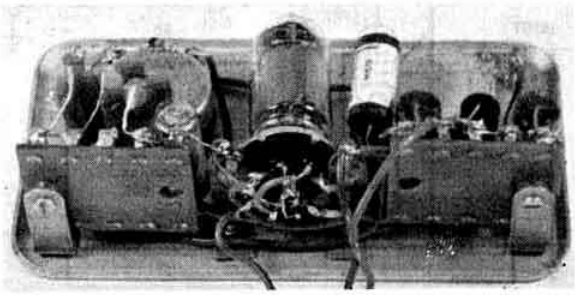
Performance and Applications

The filter tuned down to about 540 c/s and up to 3600 c/s. It was noted however that the *Q* falls to a very low value at the higher frequency.

The response curve is shown in Fig. 4 and was plotted at the lowest frequency of the unit. The *Q* obtained has a value of about 9, the gain being some 32db into an infinite load. The 3db bandwidth is of the order of 60 c/s.

The frequency scale of the writer's model was calibrated by means of an audio signal generator, but except for certain applications, this is a refinement.

Hall has stated [2] that for a constant *Q* over a wide tuning range, it is necessary to feed and load the Hall network with low impedances. Such is not the case with the unit described in which both input and output impedances are high. This could be overcome by including cathode followers or, better still, by using transistors. This latter course is being investigated, and it is hoped to describe a transistorized version shortly.



The filter constructed by G3GKS is housed in an electrical distribution box, the component layout shown in the photograph proving quite straightforward.

Insofar as the performance of the unit under arduous c.w. conditions is concerned, the writer, with the greatest reluctance, has to admit that he is no judge, and thus would be pleased to receive the comments of others on this point.

It should be pointed out that, in view of its high frequency attenuation, the filter has other applications. It may be used as a tunable detector-amplifier for use with a.f. impedance bridges, and will increase the sensitivity of the bridge due to its harmonic rejection properties since one of the limits of the sensitivity of such a bridge is the presence of audible harmonics from the source used to drive it. Another application is as a wave analyser for the determination of the individual harmonic content of an audio signal—as in the output from an amplifier for example.

In both of the applications mentioned, it may be necessary to increase the *Q* factor considerably. This could be achieved by using two similar stages in tandem, or alternatively by employing one null network over a three stage amplifier. In the latter case however, there would be the possibility of self-oscillation.

It is hoped that this article will encourage c.w. operators to experiment with the Hall circuit and, in broad terms, will create interest in other applications of this arrangement.

References

[1] *RSGB Amateur Radio Handbook*, Third Edition, 1961, p.96.

[2] " Single-Component-Controlled *RC* Null Circuits," P. Hall, *General Radio Experimenter*, July, 1961.

Lightning Strike

The dangers of an Amateur Radio station being struck by lightning were rather sharply brought home to an operator in the South of England recently.

The aerials at the station were a 500 ft. centre fed, 45 ft. high, with an open wire feeder, and a G5RV at 52 ft. It was the long wire that was struck, and at the time the two feeder wires were strapped together inside the house and connected to earth, the lead of which ran through the window frame from the inside. The a.t.u. was left connected to the incoming feeder terminals and both the transmitter and receiver were connected to the a.t.u. (a valve TR switch was used in the transmitter.

The operator was in the shack at the time of the strike. He was thrown violently across the room, but apart from a ringing in the ears lasting several hours, suffered no personal hurt.

Damage to the equipment, however, was serious; the a.t.u. was wrecked and the early stages of the receiver suffered considerable damage. Most of the ferrous tools in the shack were magnetized and a number of reels of recording tape were partially erased. A number of fuses in the house were blown, and a telephone junction box was destroyed.

The G5RV and the 500 ft. wire remained undamaged, but the open wire feeders finished up in a heap on the ground.

Corrections

Corrections to the parts list for the *Power Supply for Experimental Transistorized Equipment* described in the February RSGB BULLETIN.

R1, 390 ohms ½W, R12, 100 ohms ½W, R18, 1 K ohms ½W.

THE SOCIETY'S IGY AURORA PROGRAMME—PART I

The IGY Plans : Solar Wind and Activity Centres : The Earth's Magnetic Field : Z-D-H : The Mystery of "K" : Dancing Particles : Angle of Dip : The Problems of Worthing

By CHARLES NEWTON, G2FKZ*

THE Society's Aurora Programme, planned for the IGY period 1957-58, has, in fact, continued up to the present time, and it is envisaged that it will go on until a full sunspot cycle of 22 years (not 11 as many people think) has been completed. This will enable patterns and types of radio aurora to be plotted, together with associated solar geophysical and magnetic activity in relation to the United Kingdom over the full 22 year cycle.

The planned IGY programme was in two parts as follows:—

East/West H.F. Communications—Trans-Atlantic

It was hoped to ascertain what difficulties, if any, *F1-F2* layer propagation would have at an oblique angle to the maximum auroral zone region. This was observed by recording the signal-level of WWV (Washington, USA) on 5, 10, 15, 20, 25, 30 Mc/s once a day. This station was chosen for its reliability of transmission. Furthermore the UK-Washington path runs close to the maximum auroral zone region.

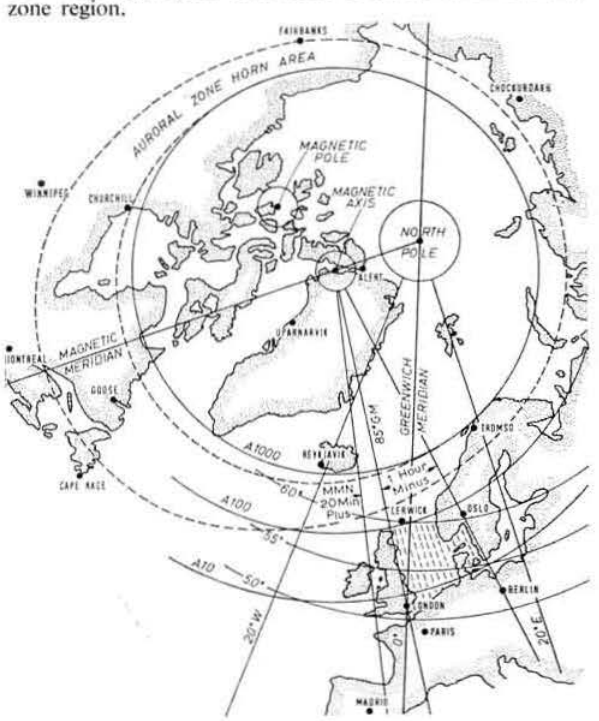


Fig. 1. The northern hemisphere auroral zone. A10-A100-A1000 are the approximate number of visual aurorae per year at sunspot maximum. The extent of "Magnetic Midnight" is shown as a difference to London. The North Sea area shown with dashes is where most amateur radio auroral reflections occur.

* 61 Merriman Road, Blackheath, London, SE3.

Programme participants also arranged h.f. band schedules with UK and Canadian amateur stations, through the auroral zone. (See Fig. 1, Northern Hemisphere). The WWV project proved reasonably reliable, enough observers reporting for the results to be analysed with some confidence, but the UK-Canadian schedules were not reliable because insufficient contacts were possible over long periods of time for any conclusions to be drawn, apart from the obvious one that such schedules are difficult to maintain although many h.f. operators argue that this is not so.

Radio Reflection of V.H.F. Signals by Back Scatter Auroral Propagation

The 144 Mc/s band was used in the main with some special work done by a few observers on 436 Mc/s and 45-100 Mc/s. It was hoped that by plotting auroral echoes on the " Gee " navigational equipment (70 Mc/s) some idea of the reflection point in space (geographical position) could have been obtained. A report of this work will be given in Part II.

Before consideration can be given to an analysis of auroral results, and in order to appreciate more fully the meaning of those results, an understanding of the basic physical phenomena is desirable. It cannot, however, be stressed too strongly that certain aspects of the basic theories are in dispute by many workers in this field of investigation and especially in the realms of magnetism; much more needs to be done before clearer pictures of the phenomena involved become available. In this respect satellite research is proving invaluable. For example the proposed plotting of the Earth's space magnetic field as part of a joint US-USSR satellite programme will be of considerable importance. It has been estimated that it will take a number of satellites working continuously for about 25 years to complete the survey.

If we consider the chain of events which can lead up to an auroral occurrence our starting point must be inside the Sun—exactly *where* we do not know, it is there that something happens to cause a solar flare (eruption) to take place somewhere on the disc. The ultra-violet light-rays, X-rays, etc., which are emitted, result in a considerable increase of ionization in the Earth's ionized layers. In fact the lower layers are so heavily affected that long distance communication becomes impossible; absorption and relatively low-level reflection being so severe. At about the same time the solar eruption causes particles to be blown out from the Sun's interior due to very strong magnetic fields being created. These particles result in the phenomenon now termed the " solar wind." The Sun's normal magnetic field can also be disturbed, and it is believed that very large electric currents flowing across the sunspot, i.e. eruption hole, result in local magnetic disturbances, which cause the emitted particles to have spiralling trajectories. These become trapped in a magnetic cone, which reaches out into space, sweeping round with the Sun's rotation until this catches up the Earth, and literally sprays it with the emitted particles. The result is an aurora.

The position of a sunspot in relation to the Earth is a

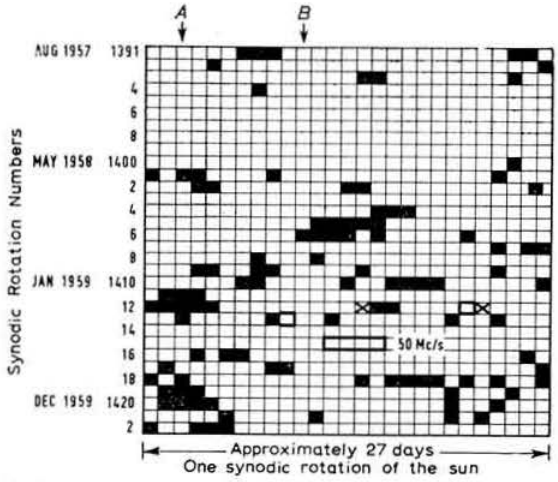


Fig. 2. A synodic plot, which shows the considerable difference in auroral occurrences in relation to the position of the Sun's disc. Note the frequency (line A) rotation 1411-1420 in contrast to line B where no repeats occurred. Point A on the Solar disc is most likely an activity region.

most important factor influencing auroral and associated effects. If a flare occurs near the Sun's central meridian, at a point looking at us, this *can* cause far greater disturbance than one, say, nearer the polar latitudes, out on the westerly limb (disc edge) which is rotating away from us.

It is useful to remember that not all solar flares and associated eruptions disturb the Earth's magnetic field, in fact, many flares which are responsible for short-wave " Dellinger " type fade-outs never cause aurorae at all.*

It appears to be important for auroral effects that the solar flare be in certain areas, usually denoted " M " regions, meaning " magnetic disturbance region " or " activity centres." Very good radio aurora can also occur without any noticeable solar flare (as it is possible for the flare to occur unobserved on the far side of the Sun) and the auroral particle stream sweeps round with the solar rotation until it catches up the Earth.

The surface of the Sun has no features which enable us to fix positions and, being gas, it rotates at different speeds at different latitudes. An average of its rotation viewed from the Earth is termed a " synodic period," meaning that looking from the Earth the same part of the Sun looks at us once per synodal rotation (27 days approximately), so the same eruption hole, if still active, can repeat auroral disturbances for a number of synodal rotations. This has been plotted in the Synodic Plot for 1957-59 (Fig. 2), which tends to show that some parts of the Sun's surface are more prone than others to cause auroral disturbance. It should be noted that the plots are not *sun spots* but " auroral occurrences."

Now, a sunspot cycle is measured not only by the number of spots appearing in a given time, but also by their position on the disc and their magnetic polarity. Sunspots start in the higher latitudes, about 30° North and South, and slowly appear in lower latitudes as the solar cycle proceeds, ending in the equatorial regions about 7° North and South. As it takes about two years for an old cycle to end, after a new one has started, at sunspot minimum the new reversed magnetic polarity spots occur at about 30° North and South together with old cycle spots at about 7° North and South. During sunspot maxima the concentrations are about 13° North and South. There is also a tendency for the maximum number of eruptions to occur in the Sun's northern hemisphere during one 11-year cycle, and in the southern hemisphere during the next 11-year cycle, the spot magnetic polarity also changes. This really means there is a 22-year cycle.

It is interesting to note that ever since the days of the earliest astronomical records, right up to the present time, large spots hardly ever occur within a small band centred on the Sun's Equator. This is due to the magnetic polarity changing at this point.

The " Solar Wind "

This is a term used to describe the constant outflow of ionized gas thrown-out by the Sun. During solar outbursts (flares or spots) the " solar wind " can increase from a gentle breeze to become more like a raging hurricane, when giant streams of strongly ionized very hot gas are shot out like jets from a hose pipe. In terms of speed the ionized gas travels fast (about 20-24 hours for the Sun/Earth transit), but it is slow compared with the ultra-violet, X-ray, radiation and cosmic particle times of about 8-15 minutes for the 93-million mile journey. This is due to the ionized gas spiralling, because the Sun's normal magnetic field is very distorted near its sunspots where usually an extremely strong magnetic longitudinal field exists. This grows out into a kind of cone around which the ionized gas spirals resulting in a slow forward velocity.

As the Sun rotates, the magnetically-trapped ionized gas streams sweep up to and engulf the Earth. However, auroral occurrence is much more likely during Spring and Autumn periods (Fig. 3). This is because the Earth's magnetic field is coupled to the solar wind and the Sun's magnetic field more effectively at these times, due to the tilting of the Sun's axis, i.e. it is rather like mutual coupling between coils.

There is considerable evidence to support the contention that the " axial " times are best, i.e. the periods when the Sun's North or South Pole (rotational axis) is tilted towards the Earth. This reaches a peak twice a year, first on 10 April and again on 10 October. During the " Epochs " in early December and June from Earth the Solar Equator is seen with the Poles at the limbs. This is generally a very quiet auroral period.

In order to appreciate the cycle more easily, if we consider a point at the centre of the sphere as being stationary, then a line from that point to, say, the North rotational axis will describe an oval around which the rotational axis moves during the year. The solar equator is inclined to the " ecliptic," i.e. plane of the Earth's orbit at about 7°. The combined effect is therefore that when a disturbance occurs in the hemisphere which " looks at us " its effect is much greater. This will be during April or October which are, in fact, the peak times. The solar wind can affect the Earth's magnetic field, and in order to appreciate this fact we must first understand just how the field comes about.

The Earth's Magnetic Field

Many believe the Earth's magnetic field is due to a large mass of iron at the centre of the Earth which somehow or other became magnetized. This is far from the truth, in fact, it is doubtful whether it is possible to magnetize the Earth's core at all because it is certainly above the Curie temperature of iron and could only be para-magnetic (very weak). A more reasonable explanation, and one which as will be seen later, fits the aurora case well, is that large electric currents flow in the ionized layers (particularly the *E* region) and set-up magnetic fields (the auroral and equatorial jets). The total effect is known in scientific circles as the " ring current " magnetic theory. There is also the " dynamo " theory which is used to explain the production of the Earth's stable background magnetic field—so called because it requires the Earth's rotation for its existence—and circulating

* In the 1930s Dr Dellinger showed that there was a correlation between the occurrence of solar flares and very sudden fade-outs of long distance short-wave communication due to very considerable ionization in the lower layers.

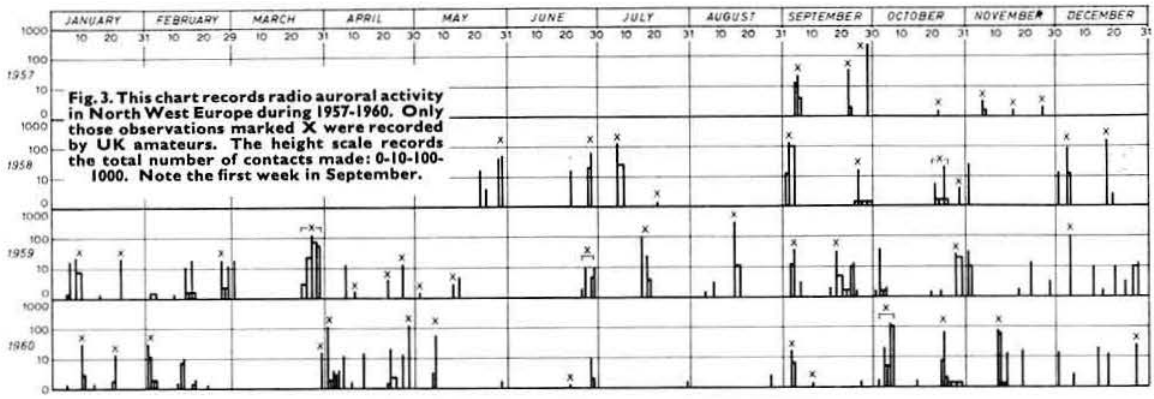


Fig. 3. This chart records radio auroral activity in North West Europe during 1957-1960. Only those observations marked X were recorded by UK amateurs. The height scale records the total number of contacts made: 0-10-100-1000. Note the first week in September.

currents in the crust. There is also the effect of surface magnetism in rocks, etc., but for all practical purposes this can be ignored. Fig. 6(a) illustrates the Earth's magnetic field in space as the field angle of dip.

In order to measure magnetic force, a system of " absolute units " was introduced by Gauss at his laboratory in Göttingen during 1832.* This, expressed in terms of " unit length, mass and time," gives the basic magnetic unit—the gamma—10^5 gammas = 1 c.g.s. (centimetre, gram, second) unit. Any point on the Earth may thus be measured in terms of the magnetic force and is directly comparable to the basic unit laid down by Gauss.

The stable background magnetic force is listed for any recording station as a *mean* reading, e.g. for Lerwick in 1960 the " horizontal force " was 14,000 gammas (0·14 c.g.s. units), and " vertical force " 47,000 gammas (0·47 c.g.s. units). All the variations are relative to these basic " means." Due to the " secular " (long period) magnetic changes these " mean " values vary slowly, e.g. for Lerwick the 1960 horizontal force increased by 15 gammas and the vertical force by 28 gammas over the 1959 " means." The range between the extreme values recorded during 1960 were—" H " force 3283 gammas, " Z " force 1151 gammas. The " declination " (difference between geographic and magnetic North) at London in the year 1815 was 24° West, whereas at the present time it is only 10° West. So secular changes are caused by the Earth's internal background magnetic field changing slowly with time. The precise reason for this is, at present, not fully known.

The Earth's total magnetic field (internal plus external) is measured in three directions, usually referred to as " vertical " (Z), " declination " (D) (this being the angle between the magnetic North Pole and the geographic North Pole), and " horizontal " (H). The curves shown in Fig. 4 illustrate the daily magnetic departures from the mean variations of D-H-Z meaned for the year 1959 for Eskdalemuir, Scotland. Magnetic effects are recorded for quiet and stormy days. It is interesting to note that Z, H, and D swing about a mean in relation to time, e.g. in relation to the Sun's position relative to a fixed point on Earth. This tends to show that the electrical conductivity of the Ionosphere and associated electric currents vary also, and that the daily *variations* in the Earth's surface magnetic field are mainly due to *external* causes. It should also be noted that under magnetic storm conditions it is the *extent* of variations that changes, not so much general character. Here then is the clue to auroral activity—large surface magnetic *changes* are the result of large ionospheric electric currents, mainly in the *E* region. This means that strong ionization must be present to carry the current, many charged particles (e.g. electrons and protons) must be available to supply the driving power, and the Sun must be able to supply the particles.

All magnetic variations at a station can be compared by a coefficient *K*, which is a measure of any range of variation out of Z, D and H added over and above the particular station's

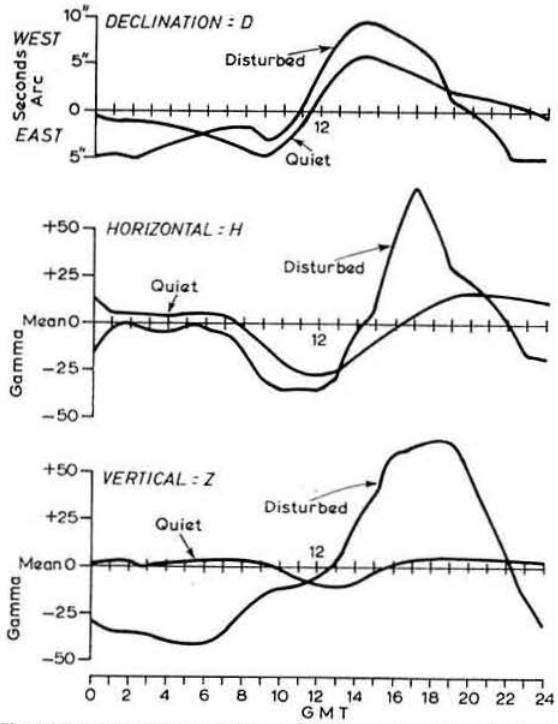


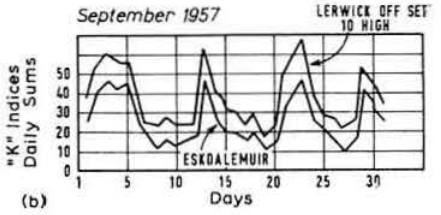
Fig. 4. This illustrates the daily magnetic departures from the basi c mean of changes in D-H-Z for the year 1959 at Eskdalemuir (Scotland) showing means of both " quiet " and " disturbed " days. Note that it is the extent of change which varies with disturbed conditions, and not so much the general character.

* For a full description of the c.g.s. system in relation to absolute units readers are referred to *A Text Book of Physics* by W. Watson.

"K" INDICES	0	1	2	3	4	5	6	7	8	9
Lerwick, Shetland	0	10	20	40	80	140	240	400	660	1000
Eskdalemuir, Scotland	0	8	15	30	60	105	180	300	500	750
College, Alaska in Auroral Zone	0	25	50	100	200	350	600	1000	1650	2500
Kuyper, Sumatra on Equator	0	3	6	12	24	40	70	120	200	300

Gamma

(a)



(b)

Fig. 5. (a) shows the comparability of *K* indices for different magnetic observatories. A lower limit of Gamma variation in either D, H, or Z for any three-hour period (00.00-03.00, 03.00-06.00 GMT etc.) will give the appropriate *K* indices for the station. (b) shows the comparability of *K* indices for observatories in a given region. For the sake of clarity the charts have been displaced although they are to the same scale and show the total for each day of September 1957. This is the basis of the *Kp* figure. For example, 12 observatories in a region are "meaned" to give the "planetary" (Kp) figure—an indication of the magnetic activity for the region.

normal variation, the extent of *K* being defined for the particular station. This means that any figure for *K* 1-9 is comparable station-to-station in terms of magnetic variation from normal, even though the exact individual variables are different. This point is explained in the table shown in Fig. 5(a) which lists Lerwick (Shetland), Eskdalemuir (Scotland), College (Alaska) (a station situated right in the Auroral Zone) and Kuyper (Sumatra) (almost at the Equator). The *K* indices are the range of the most disturbed element D, H or Z, taken over a three-hour interval. As a rough guide, to increase *K* by one means that the gamma variation is about doubled. Eight *K* figures are issued each day starting at 00.00-03.00, 03.00-06.00 GMT, etc.

The importance of *K* indices is that they are a direct measure of the Earth's magnetic field *variation* and, indirectly, an inference of auroral (*E* layer electric current) ionization conditions. As a matter of interest, during magnetic storm conditions the total auroral electric currents can reach a figure of 180,000 amps. This flows as a sheet current at around the 110 kilometre height (lower *E* layer) where, as will be seen later, back scatter radio aurora ionization occurs. If the *K* indices from a number of suitable placed observatories are compared, then the K_p figure can be deduced. This is a measure of the "planetary" magnetic activity.

As the solar wind or, to be more precise, the spiralling stream of ionized particles, approaches the Earth, it gets trapped by the radiation belts. These can be considered in two parts, outer auroral, and inner equatorial. The inner belt (see Fig. 6(b)) has little to do with auroral effects and is composed generally of high energy cosmic ray debris; it is believed to remain reasonably stable. The outer, auroral, belts must closely follow the Earth's magnetic field pattern, so there comes a point (well out in space) where the individual charged particles become influenced by the Earth's magnetic field which causes them to be deflected, spiralling round to the Earth's *night* side.

As the location of the surface magnetic poles is known it can be assumed that the strongest fields will be near to these points. In practice, however, it is not a point but rather a ring around the magnetic poles in geomagnetic latitude 67°. These are usually referred to now as the "radiation horns" or "auroral zone horns." As the ionized particles get nearer, and so become influenced by a stronger magnetic field, the rate of deflection increases, until, finally, the particles are spiralling into the magnetic polar rings or auroral zone horns. The protons and electrons separate in much the same manner as Fleming's right or left hand rule applies to electro-magnetic theory. The Earth's outer radiation belts (Van Allen) now become filled with spiralling charged particles which are trapped. If the magnetic field strength is increased enough, a point is reached when a given particle charge, velocity and spiral thread pitch, will be compressed so that the forward movement is halted, reversed and then spiralled-out along a line of magnetic force (Fig. 7). The spiralling direction remains the same but the particles shunt to and fro between the Earth's magnetic polar rings with such velocity that they make a round trip in only hundredths of a second. A see-saw spiralling "dance" of the trapped particles then begins. Some particles may carry on the "dance" for millenia of time but for others a chance collision, deflection of the magnetic field, insufficient energy, etc., can cause a particle's end, or, to be more specific, a change of state.

Due to the spiralling, particles tend to drift eastwards or

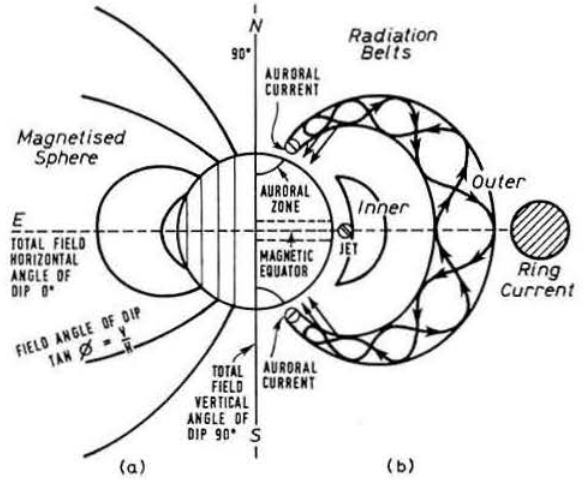


Fig. 6(a). Illustrates the Earth's magnetic field in space as the field angle of dip. (b) shows the relationship of the radiation belts. The outer belts, mostly charged particles, are responsible for auroral effects. The inner zone consists of cosmic rays, X-rays etc. ionizing radiation type particles, e.g. pro-neutrons (protons which have lost their charge or broken protons). It is most likely that this is the ionizing source for trans-equatorial propagation.

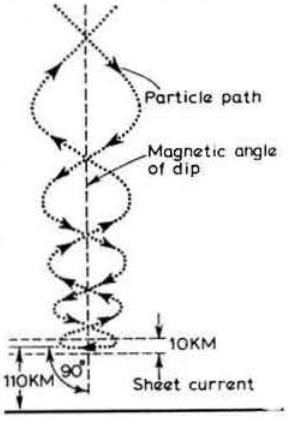


Fig. 7. This diagram shows a typical auroral radiation belt particle path which is shunting to and fro between the northern and southern auroral zone horns. Particles reverse when the spiral is at 90° to the magnetic angle of dip irrespective of height.

westwards, depending on the particle charge. Because the spiral is not circular, due to the magnetic field at the top of the spiral being weaker than at the bottom (nearer the Earth at equatorial transit), this total progress tends to separate the different energy (particle) levels into layers (or shells as they are called), which encircle the Earth. The USA Argos and Rainbow bomb tests were carried out partly to find out more about this process, known as the " onion skin " theory. The increase in low level *E* region ionization (due to the electron shells) causes low frequencies to be trapped, resulting in considerable signal increase of 10 kc/s to 500 kc/s signals and also atmospheric static noise. At the same time galactic noise tends to be reduced as the electron shells tend to shut it out. This effect is most noticeable over the range 20 Mc/s-40 Mc/s in the higher latitudes.

The light of auroral features has been and still is spectro-analysed very thoroughly, and the result indicates that the protons play a very major part. While spiralling down through the upper atmosphere, collisions occur that slow the protons down until a point has been reached when they are travelling slowly enough to capture an electron and, in the process, light is emitted (an electron " pops-in " and a photon of light " pops-out"), the spectrum of light showing the nature of the particle. Of course, many particles are secondary (having been excited or ionized by collisions) and emit light, or, more precisely, electro-magnetic radiation (radio noise, etc.) due to the change of electron energy level. This possibly explains why the peak times of visual and radio aurora differ—the high-electron ionization required by the radio is reduced by the visual (electron capturing and energy changing process).

The importance of " optimum height " to radio aurorae must not be forgotten. This is the point where the greatest ionization and sheet current takes place, e.g. if a particle is slowed down by collision, its ability to cause ionization gets progressively less, but when penetrating into the denser atmospheric gases the chances of a collision are greater. Our best radio reflection point will, therefore be where the highest level of ionization occurs, for good radio aurorae large quantities of particles or masses of electrons are required, and in practice this occurs only in a narrow band about 100-120 km in height, where the auroral sheet currents are flowing (*E* layer), virtually at the top of the atmosphere. However, before it is possible to obtain back-scatter radio signals from this area, certain conditions must be met. The most essential requirement is that the Earth's magnetic field (angle of dip) must be at or very near right angles (90°) to the transmitted and received wave front, at the point where the ionization is taking place. Dr G. Lange Hesse, of the Max Planck Institute, West Germany (who amongst others has done work on this point by analysing a considerable number of European IGY—period amateur 144 Mc/s auroral results) concludes that the limit is about ± 3° at 144 Mc/s for usable ionization. However, other workers, notably Dr Kaiser of Sheffield, UK, using lower frequencies (17 to 25 Mc/s), and the Canadian Defence Research Board, Northern Canada using 40 Mc/s have given deviations up to 10°. The actual area of sky from which useable ionization can be obtained is a function of frequency and location but the peak or highest signal area will always be at the point where the wave-front is at right angles to the magnetic field at the optimum height. (Note the use of the term " magnetic field "—this is deliberate in order to take account of vertical and horizontal components.)

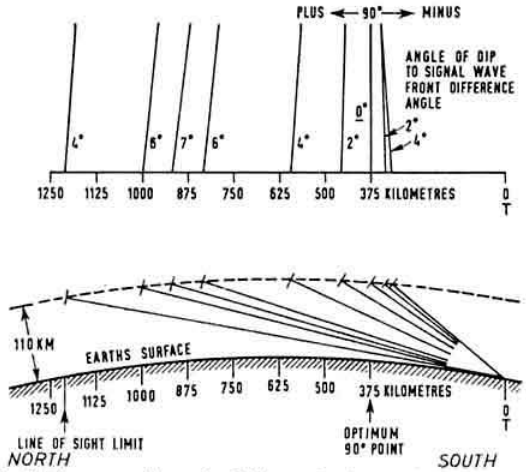


Fig. 8. The magnetic angle of dip to signal wave front shown as a " difference angle " for a transmitted wave from point T along a geomagnetic meridian looking north, as the wave crosses the 110 km height point. Point T has been taken as London.

The Field Angle of Dip

At the magnetic Equator all the field is horizontal; at magnetic North or South Poles it is all vertical. At any point in between it is a resultant of the vertical and horizontal amounts. This is called the " angle of dip " and can be written as $\tan \phi = \frac{Z}{H}$. This is about 67° at London at the present time whereas at Lerwick, where the mean horizontal force is 14,000 gamma and the vertical force 47,000 gamma, it is 72° 53′. It is this " angle of dip " down which the spiralling particles are coming that our transmitted and received wave-fronts must cross at right angles at the optimum height namely 100-120 km. This is where the greatest level of ionization will occur. Fig. 8 illustrates the importance of this point. There are definite limits imposed (for any station) where the required 90° optimum limit will occur, both in the north/south and east/west directions. It will be shown in Part II how this criterion has influenced all the Amateur Radio auroral results.

If consideration is given to the effect of firing a signal up, say, a geomagnetic meridian to the North then it will be found that at a point about 375 km distant the signal would be crossing the 100-120 km height auroral sheet-current high-ionization point at about 90° to the field angle of dip. This will give a good reflection but as we progress farther north we shall find that the resultant angle deteriorates so that the best bistatic results will be when both stations are positioned so that they are able to use the 90° position. In practice, this means separation—east/west is preferable to north/south. If the north/south component is interposed then for one or other station the 90° angle requirement cannot be met, with resulting deterioration of signal level.

The exact shape of the volume of sky which reflects radio signals depends on frequency (level of ionization required) and on the relative geographical positions of the stations concerned relative to the reflection point. This is best shown on the map in Fig. 9.

Consider a station at Worthing, Sussex, looking North. It should be relatively easy to contact The Hague because point C is about the optimum reflection angle 90° (angle of dip to wave front) for both stations. It is possible to get signals reflected at least as far north as point B for both stations, so in fact all the area of sky (shown shaded) between C and B can be used—a very large area. It is not possible to say just how far east/west the area would extend but under contact conditions such as this one, most operators report that it is a broad region with hardly any noticeable peak for

beam directions north to north-east. In contrast, the area ABE is a relatively small area of sky and although the reflection angle is good for the Glasgow station, it is bad for the Worthing station making this type of contact rather difficult. The area D can give auroral signals but, in practice, very seldom does, mainly because, in particular, the more northerly stations fire easterly as the lure of continental DX dictates this course.

The best positions are therefore those where each station can use the ionization which is at or near right angles to their respective wave fronts, e.g. they are separated east/west in preference to north/south. It is not strictly correct to say east/west because there appears to be a fair amount of evidence to show that if the easterly station is somewhat slightly more southerly this is an advantage. It has previously been mentioned that most visual aurora rays and arcs lie along a NNE to SSW line over Europe and it seems that a right-angle to this line is best for the radio base line, e.g. WNW to ESE, in fact, most of the outstanding DX has this base-line angle. It is not only just because the DX stations concerned happen to be in that position, but rather that aurorae tend to move along the magnetic latitudes coming from the East (due to Earth's rotation). As almost everyone in the UK "fires" his aerial system east of north for auroral contacts it would appear that the mechanism which holds the visual rays and arcs along the NNE-SSW line also holds the depth of auroral ionization. This could account for some operators maintaining that there sometimes appears to be two positions from which signals arrive.

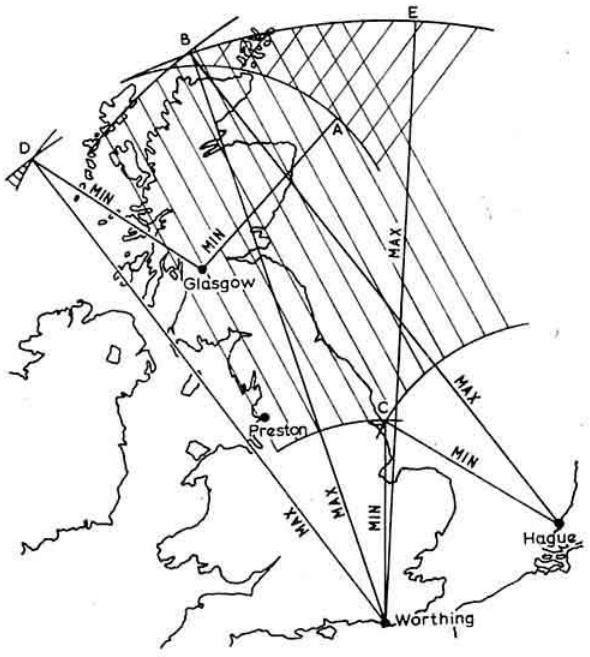


Fig. 9. The maximum and minimum range arcs marked A-B-C-D-E show the approximate areas in space from where ionized reflection can occur. A-B-E is Worthing to Glasgow and B-C is Worthing to Hague. D is usually unobserved as the lure of Continental DX dictates the NE direction. This illustrates the point that east/west contacts are easier than north/south. It should be noted that no account of the Earth's magnetic field is considered here. The relationship between maximum and minimum ranges and the angle of dip (Fig. 8) will be clarified in Part II.

This then, is a very rough sketch of what may be termed the basic theory of bistatic radio aurorae. The author is very conscious of the vast amount of material left out of this article, and in particular the theories concerning sunspots and why they occur at all, but the Bibliography may be helpful to those who wish to study the subject in greater detail.

In Part II actual results, will be examined, with particular reference to the IGY period.

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Honorary Member of IEE

Sir Harold Bishop, C.B.E., B.Sc(Eng.), F.C.G.I., M.I.E.E., director of engineering of the BBC from 1952 until his retirement in 1963 has been elected an honorary member of the Institution of Electrical Engineers " for his contributions to the science and art of sound and television broadcasting and their application both at home and overseas." Sir Harold joined Marconi's in 1922 and was concerned with the setting-up of the London 2LO station in Marconi House. Sir Harold frequently attended Society functions in past years.

Metric Standards

In preparation for the adoption of the metric system in the United Kingdom the British Standards Institution has just published a 580 page handbook *Metric Standards for Engineering* (BS18), copies of which are available from BSI Sales Dept. 2 Park Street, London, W1 price 60s. (3s. postage extra to non-subscribers).

SAID LONG AGO

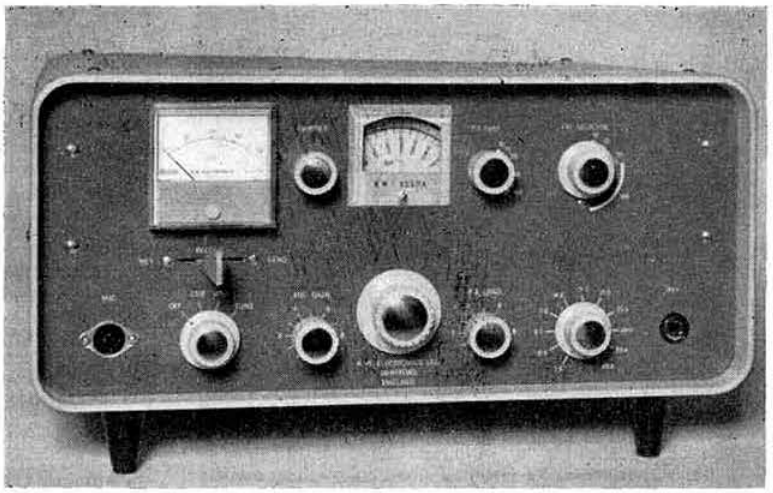
" With regard to the transmitting amateur there is just one danger which I would refer to. Many of us, I fear, have settled down to mere DX hunting and the accumulation of QSL cards. This in itself is pleasing and it is fascinating to receive reports of our signals from distant parts of the world. We do not, however, want to become mere amateur telegraphists. Remember we are experimenters and that we have new fields before us to conquer. The Society has been wise to organize tests with low power and on the higher frequencies because they encourage original work and lead to the utmost efficiency."

Henry Bevan Swift, G2TI. (President, 1931-33)
Presidential Address to Members,
30 January, 1931.

Review

THE KW ELECTRONICS VESPA S.S.B. TRANSMITTER

Reviewed by B. D. A. Armstrong, G3EDD*



KW Electronics Ltd. is a company which has gained recognition in a world Amateur Radio market. Its products can be heard on the air on all the h.f. bands.

A new equipment recently announced by KW Electronics is the Vespa s.s.b. transmitter and one has been loaned to the Society by the manufacturer for review. The Vespa is similar to the transmitter portion of the KW2000 transceiver and at a cursory glance could be mistaken for it. The front panel layout is in fact almost identical to the KW2000.

A block diagram of the Vespa is shown in Fig. 1. The 455 kc/s filter is a mechanical type manufactured by Kokusai.

The circuit of the Vespa is of the double mixing type in which the s.s.b. signal at 455 kc/s is first mixed with a 2·5-2·7 Mc/s signal from the v.f.o. and then with the output of a crystal controlled oscillator to produce the correct carrier frequency. Since only 200 kc/s segments are covered, a number of crystals are required to give full coverage of all the amateur bands. KW Electronics have decided to limit themselves to 11 second oscillator crystals, with the result that portions of the 15 and 10m bands are not covered.

Mechanically, the Vespa is lightweight and almost entirely of aluminium. The power supply unit is separate and is enclosed in what is termed on the leaflet as a light weight cover. The cover of the unit submitted for review was in fact thick cardboard which looked most out of place. The leaflet, perhaps sensing this, suggests that the power unit can be kept out of sight under the operating table. There are only two catches to this. First, the interconnecting cable is very short, and secondly the low power switch for legal operation on 160m is mounted on the power unit.

Unfortunately KW were not able to supply a proper handbook at the time. In lieu of this, provisional operating instructions, a sales leaflet and a circuit were supplied. The technical information was thus embryonic to say the least. A note in the provisional instructions did promise the proper handbook when available.

The circuit was inaccurate and had no component values. There was no circuit for the power unit. It would not be easy to fault-find and it is to be hoped that KW issue a good handbook without delay.

After this review was written, the proper handbook was sent by KW. The new handbook contains plenty of information so servicing and alignment should now present no problem. Values have now been added to almost all components on the circuit, but again no power supply diagram was included. Most of the circuit errors have been removed.

The handbook text is presented on duplicated sheets and the layout diagrams are crude. However, technically, the handbook is good.

The heater circuit, no doubt with mobile operation and voltage drop in mind, is arranged for 12 volts. Examination of the heater network showed that in theory there was slight unbalance and the two dial lights were used in parallel to assist balance. This is bad practice since the life of a dial light is notoriously bad.

Neither the main unit nor the power unit had any component identification on the chassis. This made it very difficult to follow the already unhelpful circuit. None of the fuses on the power unit are marked with function or value and the correct position of the low power switch for 160m operation had to be found by experiment.

The main dial and band change were marked in frequency but the drive and p.a. tuning controls were marked in wavelength.

The operating instructions quite rightly recommend that the main unit is soundly connected to ground. There

* Member of RSGB Technical Committee

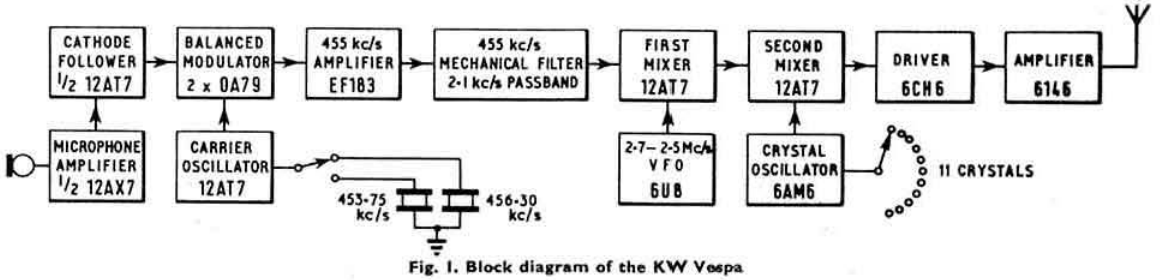


Fig. 1. Block diagram of the KW Vespa

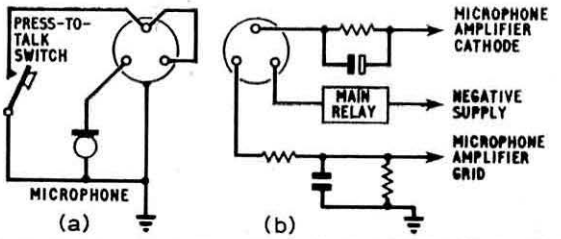


Fig. 2. The transmit-receive switching in the KW2000 makes special provision for avoiding feedback while netting. When the press-to-talk switch (a) is left off, the microphone amplifier cathode is connected to the negative supply via the relay coil, thus biasing the stage to cut-off.

was, however, no grounding lug on the chassis or case.

A point to watch, when making any internal adjustment or repairs, is that in the standby condition h.t. is present on all stages. A negative voltage is applied to all the r.f. stages such that they are cut off in the receive condition.

In the NET position of the main control switch, all the stages except the p.a. are activated and unless the microphone is disconnected, feedback will occur. KW overcome this problem in a method that is worthy of note—see Fig. 2. The negative relay switching supply from the " cold " side of the relay is connected to the microphone amplifier cathode thus biasing the stage to cut off. The press-to-talk switch connects both to earth. In the Vespa ripple from the relay supply was induced into the microphone amplifier due to common impedance coupling. Although this is effectively attenuated by the sideband filter, it could cause cross modulation of speech and thus the purist may prefer to use a double pole press-to-talk (PTT) switch.

No microphone is supplied and there is little help in the handbook to decide what type to use. The microphone used for the tests was an e.m. type with a mean output of about 30mV on close talking.

MANUFACTURER'S TECHNICAL SPECIFICATION

Bands covered: 1·8-2·0, 3·5-3·7, 3·7-3·9, 7·0-7·2, 14·0-14·2, 14·2-14·4, 21·0-21·2, 21·3-21·5, 28·0-28·2, 28·4-28·6, 28·6-28·8 Mc/s.

Physical Dimensions: Transmitter—13¾ in. × 5⅞ in. × 10½ in. deep (cabinet maximum dimensions); A.c. power supply —8 in. × 5⅞ in. × 10½ in.

Weight: Transmitter—18 lb. approx.; A.c. p.s.u.—25 lb.

Microphone Input: High impedance; three pin socket for press-to-talk switch.

Power Input: S.S.B. 90 watts p.e.p.; C.W. 75 watts; A.M. 45 watts.

Power Supply: 200-250 volts or 105-250 volts a.c., 45-65 c/s.

Power Requirements: 12 volts at 2·5A, 700 volts at 120 mA (average), 200 volts at 150 mA, —90 volts at 20 mA, —20 to —50 volts at 20 mA.

Sideband Suppression: Better than 45db.

Carrier Suppression: Better than 50db.

Controls: V.F.O., Driver Tune, Wavechange, OFF-USB-LSB-TUNE Switch, Microphone Gain, Send-Receive-Net, P.A. Tune, P.A. Load. At the rear, sockets for aerial input, Aerial to Receiver, External MOX, Power Plug on the front panel, microphone socket and key jack.

Valve and Semiconductor Complement: 12AT7 carrier oscillator, 12AX7 microphone amplifier, 12AT7 cathode follower, two OA79 silicon diode balanced modulators, EF183 i.f. amplifier, 12AT7 first mixer, ECF82/6U8 v.f.o., 12AT7 second mixer, 6AM6 crystal oscillator, 6CH6 driver, 6146 p.a.

Price: £110. Power supply extra at £25.

Power Unit

The power unit is compact and full use is made of silicon diodes. Two transformers are used with mains tapping sockets for 200/210, 220/230 and 240/250 volts. The lack of a 110 volts range is rather surprising in view of KW's success in the export field. The multicore interconnecting lead, terminated in a Painton 159 series plug was only 27 in. long. The three core power lead was 5 ft. long. A possible source of trouble is the use of two 450 volts electrolytics in series across the main h.t. The balancing resistors are rather a high value: 330K/ohms. In the unit under test one of the electrolytics had 430 volts across it in the standby condition, with 240 volts a.c. applied to the 240/250 volt tap.

Calibration

The dial is mounted directly on the v.f.o. capacitor shaft and is calibrated 0-200 kc/s in 2 kc/s divisions. The cursor was well spaced from the dial, and it was difficult to avoid parallax errors. Cord drive is used from the main tuning control shaft, but in the event of breakage calibration would not be lost. Repair would necessitate removal of the v.f.o. assembly, but this is not a very onerous task.

Calibration error of the v.f.o. was measured at v.f.o. frequency as follows:

Scale reading	*Error—c/s*
0	—712
50	—577
100	—2344
150	—2196
200	—847

During the calibration tests on the unit concerned it was found that there was a random error of frequency at a given setting. This could not be entirely accounted for by backlash or setting errors. It may have been caused by poor bearings in the tuning capacitor. The scatter of frequencies measured by trying to set the dial to the same point several times was within 1 kc/s. This is not serious.

For the above readings the function switch was on u.s.b. On l.s.b. the carrier oscillator frequency is shifted to the other side of the sideband filter. In order to compensate for this, the v.f.o. frequency is automatically shifted by a relay which shorts out a coupling coil. The off-set was not quite correct but the error was fairly small; 80 c/s at one end of the v.f.o. range and 100 c/s at the other.

Altering the mains supply voltage by ±10 per cent resulted in a frequency change of about 40 c/s.

The frequency of all the crystals was measured and the errors recorded.

Crystal Frequency	*Error*
453·75 kc/s	+13 c/s
456·30 kc/s	+6 c/s
4955·0 kc/s	+230 c/s
6655·0 kc/s	+465 c/s
6855·0 kc/s	+571 c/s
10156·0 kc/s	—369 c/s
8577·5 kc/s	+269 c/s
8677·5 kc/s	+334 c/s
12077·5 kc/s	+514 c/s
12227·5 kc/s	+691 c/s
15577·5 kc/s	+93 c/s
15777·5 kc/s	+272 c/s
15877·5 kc/s	+458 c/s

Warm-up Drift

It was assumed that the crystal oscillator contribution to drift due to warm-up would be negligible, so only the v.f.o. was checked. The v.f.o. has h.t. applied on both receive and transmit and the drift was measured over a period of three hours from switch on with no periods of transmit. The total drift was about 800 c/s positive, of which 500 c/s took place in the first 15 minutes. During the last two hours the v.f.o. drifted just over 100 c/s positive.

Power Output

The power output of an s.s.b. transmitter for professional use is normally quoted in relation to the intermodulation products. For instance, a transmitter may give 50 watts at an intermodulation product level of 30db, but at 20db the power output could be 150 watts. In this case it was decided to set up the input power to that which is likely to be obtained from following the recommended tuning procedure.

The method of test was to feed two tones (650 c/s and 1 kc/s) into the microphone input. The transmitter was terminated in a calibrated wattmeter and an h.f. spectrum analyser was coupled into the load. The audio input was adjusted until the p.a. cathode current was 100mA (70 watts input). The intermodulation products and the power output were recorded. This power indication is a mean level and must be doubled to obtain the peak envelope power. The p.e.p. obtained in this manner is accurate within a small percentage provided the linearity is good.

The following are the results of these measurements:

Frequency	*I.P. Level*	*P.E.P. Output*
1·8 Mc/s	24db	8 watts (loaded to 50mA)
3·5 Mc/s	24db	54 watts
7·0 Mc/s	18db	44 watts
14·0 Mc/s	26db	50 watts
21·0 Mc/s	25db	48 watts
28·0 Mc/s	26db	46 watts

Slight tuning adjustments made a difference to the intermodulation products and power output so that these results were not very repeatable, but this is typical of s.s.b. transmitters. In order to get the best possible settings for compromise between power output and intermodulation products in almost any s.s.b. transmitter, it is necessary to tune up with a spectrum analyser coupled in. The above results were obtained by " fiddling " for best power output rather than for best intermodulation products and consequently are considered quite good.

In changing from band to band the p.a. oscillated on several occasions, but showed no sign of regeneration if the controls were first set to the approximate positions indicated on the front panel.

A.M. Facility

The maker's recommended tuning procedure for a.m. operation suggests that the correct gain settings for this mode are best found by monitoring with a receiver. They are quite correct as the settings for carrier level and microphone are critical.

Spurious Emissions

Any transmitter will radiate frequencies other than the wanted: they may be harmonics of the carrier frequency or related to the internal oscillators or intermodulation products of both. It is very often these sorts of emissions which give rise to TVI.

The transmitter was tested at a location where Channels 1, 5, 6 and 11 were available, but none of these channels were at any great strength. Tests were carried out with the transmitter operating on 7, 14, 21, and 28 Mc/s both into a dummy load next to a TV set and into a vertical aerial 150 ft. from the TV aerials. No external filters were used.

The only trouble encountered was in fact on Channel 1. Slight picture break-up on speech peaks occurred on 21 and 28 Mc/s when radiating on an aerial and oddly enough on 14 Mc/s when on a dummy load. The weak Channel 1 signal was being received on a Channel 5 aerial so the test was rather severe.

These tests show that provided the TV installation is satisfactory, and operated in the service area, TVI is unlikely.

The level of the unwanted sideband signals was measured on a spectrum analyser during the power output test. It was better than −50db.

Carrier suppression was also measured during the power output measurement, and a spectrum analyser was used. Since the sideband filter is used to help reject the carrier, measurements were made on both sidebands. It was well within the claim of 50db provided modulation was not present. However, it was noticed that when modulation was applied the carrier level rose by at least 20db, presumably because audio was unbalancing the modulator.

A.F. Response

The overall audio response was measured by varying the frequency of an audio generator fed into microphone input and recording the r.f. power output.

Audio Frequency	*Rel. to 1 kc/s*	
	U.S.B.	*L.S.B.*
300 c/s	−5·8db	−5·8db
600 c/s	−0·6db	−0·6db
1500 c/s	−1db	−2·3db
2000 c/s	−3·5db	−5·4db

Immediately above 2 kc/s the response fell off very steeply. The slight asymmetry was probably due to a corresponding asymmetry in the sideband filter. No pass-band ripple was detected during this test.

On-the-Air Tests

What really matters to any prospective buyer is what happens when the Vespa is used. In between the measurements with test gear many contacts were obtained on 14 and 21 Mc/s with indifferent (but well matched) aerials. The Vespa was easy to use and brought several unsolicited comments on the good speech quality. No electrical failures occurred, but several of the tuning knobs started to crack either side of the Allen screw holes.

The spring loaded net switch brought two comments from operators. First, on the lower bands it was necessary to insert carrier to obtain an audible beat in the associated receiver, thus making netting a three-handed affair. Secondly, if the switch paddle was suddenly released, it would fly over through the receive position to the transmit position!

The Guarantee

The KW Vespa is guaranteed for 12 months from date of purchase by the original purchaser. The guarantee is not transferable to another user. KW Electronics or the dealer reserve the right to charge for labour, handling expenses and return carriage; the customer has to pay for carriage to the works. In the event of trouble, the purchaser would be wise therefore to send a letter in the first instance. Valves have only the normal three months guarantee with the usual proviso regarding misuse.

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DXpedition to Agalega

By V. C. HARVEY-BRAIN, VQ9HB/VQ8BFA*

V. C. Harvey-Brain aboard his boat which was used for an earlier expedition to the Chagos Archipelago. It was decided not to use it for the November 1965 Agalega trip, however, owing to the island's treacherous anchorage and high costs for crew, food and fuel.

MORE than a year ago, I happened to make a c.w. contact with W0ELA, and during the course of the QSO, W0ELA let fall a chance remark which was to bear fruit later on, " Harvey, why don't you go down to Agalega again? Many of the boys badly want Agalega and would be delighted to work you there on either mode—s.s.b. or even c.w."

But Agalega is a somewhat " difficult nut to crack." Just a couple of pin-prick islands, almost lost in the vastness of the Indian Ocean, lying on the edge of the cyclone tracks. Lack of a suitable s.s.b. rig was one problem, and transport was yet another.

I could, of course, have made use of my own small vessel for this DXpedition, but crew's wages, diesel fuel and food would have all mounted up to a formidable figure. Furthermore, a considerable risk was involved when one considers that success would have been by no means certain, for the Agalega anchorage is notoriously bad and is often subject to the severe weather caused by tropical revolving storms passing farther to the South. For these reasons I eventually decided to book a passage on board a local schooner which occasionally visits these islands. The flaw in this arrangement was, of course, that the vessel only stayed three days at the Island while the cargo was discharged and loaded.

Such a one man DXpedition, limited to so short a period of time, and depending on make-shift equipment, is surely a very chancy affair. If, by ill luck, things went wrong it could so easily turn into a fiasco. A breakdown of some vital part in the chain comprising the rig and the lone operator would be off the air perhaps for many hours while he struggled to effect some primitive repair. Moreover, yet another disadvantage which must be accepted by the single operator is that when two bands are open at the same time he cannot exploit both. He cannot jump back and forth between, say, 15 and 20m. For these reasons, as well as for the pleasure of another's company, I tried—in vain—to obtain a VQ8 licence for Ted Crawford, W4IBD, but although VQ9 now recognizes the reciprocal licensing scheme, it appears that VQ8 does not do so.

Seychelles lives up to its reputation of being the Land of Manana par Excellence, for nothing precise can ever be obtained about sailing dates—or anything else at all for that matter. For this reason I was nearly caught napping—I was finally given just 36 hours notice to assemble all the gear and get it and myself on board. It was such close timing that I reached the quay on 5 November with the last load of baggage just as the shore warps were being cast off.

At this juncture it might be of some interest to give brief details of the rig. Its component parts were bought, borrowed and scrounged from all over the Island during the previous three or four weeks. But the backbone of this miscellaneous collection was a National NXC-3 Transceiver kindly loaned by W4IBD, and this certainly did a splendid job. There was also a 90 watt c.w. transmitter complete with its own separate transistor power unit. It covered all bands from 10 to 80m so that it was available for the 10/15m gap which the NCX-3 does not cover. In addition, I had my old Eddystone 750 with which I hoped to be able to listen away from the transmit frequency because the NCX-3 does not have incremental tuning. A product detector had been built into the 750 and this modification functioned extremely well. I also added a useful accessory: an electronic TR switch cum preselector (ARRL *Handbook*, 1964, page 225), and this, besides fulfilling its primary purpose, added a certain amount of front end selectivity and gain. The 750 heater circuit had to be re-wired in series-parallel so that it could be operated from the 12 volt batteries in conformity with the rest of the rig.

Finding a reliable source of mobile power was at first a major headache. Initially, an old a.c. generator of unknown nationality, vintage, wattage, or voltage was unearthed from the scrap heap. It was very rusty, but after being cleaned up a bit, and sprayed with paint, it assumed almost a jaunty air. Moreover, it seemed to work. However, an r.p.m. problem soon arose. A Stuart Turner 84cc two stroke lighting plant (old but in good condition) had to be adapted for belt drive, so that by means of a two to one ratio pulley system the generator could be run at something in the neighbourhood of 2000 r.p.m. On trial, however, it was obvious that results were too marginal. Not only did the generator warm up on load but there was also a drop of some 20 volts with the NCX-3 on TRANSMIT. This arrangement was therefore discarded and W4IBD built a Heathkit HP-13 transistorized power unit. This was then used in conjunction with the Stuart Turner engine driving its normal d.c. generator and charging 12 volt batteries. It was soon discovered that with a charging rate of about 15 amps the Heathkit unit could be run on load leaving the batteries with a small amount of " gain," and this arrangement turned out to be an ideal source of power.

The voyage to Agalega was fairly uneventful, apart from the fact that the weather was unseasonal, rough, and very unpleasant. Strong southerly winds and a high sea prevailed which reduced the vessel's speed to something of the order of 4 knots. Amongst other things the boat passed right through the centre of a depression which seemed to exhibit all the ugly portents of the embryo cyclone. Fortunately, however, this unpleasant manifestation took itself off to the west and gave no more trouble. But as a result of the inclement weather the expedition was two days late on schedule, and the boat finally arrived on the 10th.

By the time that the boat had anchored in front of the

* Bel Eau, Mahé, Seychelles Islands, Indian Ocean, via Mombassa, Kenya.
QSL Manager: L. Hill, G8KS, 31 St. Leonards Road, Eastbourne, Sussex.

settlement, night was already falling with tropical swiftness. It seemed most unlikely that I would get the gear and myself ashore that day, but you can imagine my surprise and delight when the shore party offered to transport everything through the breakers and on to the shore that night. But the operation was not without anxious moments, especially when the baggage was being manhandled over the ship's rail and lowered into the surging surf boat ten feet down in the indistinct blackness below.

Only feeble coconut oil lamps glittered ashore and soon all was confusion under the dark night amidst the soft, yielding, hindering sand. With great difficulty and much loss of valuable time I finally located all the missing items of baggage which had strayed and been scattered to the far corners of the island. Eventually the batteries were also found and there was soon a real light burning in the old leaky beach hut which was to serve as shack. At this point in time my idea was to sort out the rig. Others thought otherwise. Attracted as moths to a candle, many dark faces now appeared in and around the circle of light, for on the islands a ship's arrival day is also—mail day. And the brilliantly conveniently, splendidly lighted VQ8BFA was now commandeered as " Post Office Ad Hoc."

Everything has an end—sometime. Presently the crowd thinned, disappeared with the booty and presumably went off to bed. But I worked on through the timeless night. Timeless because my watch had stopped sometime before. All the while, outside the shack, reigned the peacefulness of a limitless, soft, starry night, and the dull roar: the reverberation of thundering breakers on those so remote and dangerous coral reefs. But tired now and only vaguely conscious of all this I covered up the assembled rig with plastic sheets against the certainty that rain could pass through the doubtful shelter of the roof. I prudently set up my camp bed under the table upon which the rig was mounted, and instantly fell asleep.

The first task in the morning was to erect the two aerials: a three band ground plane (ARRL *Handbook*, 1964, page 374), as well as a conventional 20m dipole. The ground plane was merely a not-too-straight 17 ft. bamboo pole mounted on top of an 18 ft. length of galvanized iron pipe. Being supported by its radials it was simple to erect, and it worked like a charm. Now-a-days I tend to shy away from any kind of beam when on a short-handed DXpedition on account of the manifold difficulties in getting it hung at a sufficient height.

So far—so good, but remember Murphy's Third Law of Electronics: " If anything can go wrong—*it will*." An unexpected snag now loomed which threatened to wreck the plan entirely. The lighting plant—always so compliant at Mahé—became a stubborn mule and refused to start. Such a calamity had never even been contemplated. But at 10 a.m. I was still pulling the starter cord of a completely dead engine. By then a certain amount of picturesque language was already floating around whilst I sweated in the full tropical sunshine on that blistering hot sandy beach. By noon the " Thing " was stripped down, by 2 p.m. it was re-assembled, and yet nothing had been found to be radically wrong. Some of the locals were sympathetic, but one ventured, unoriginally I thought, "Only Englishmen and mad dogs go out in the mid-day sun."

At about 4 p.m., when things were really looking black, a Fordson tractor hove in sight. I made haste to borrow one of its 6 volt batteries and then—connecting it in series with the other two station batteries—quickly rigged up a starter circuit. The engine turned over rapidly, coughed, spluttered, and surprisingly fired and came to life. Surprisingly, because on the subsequent post mortem at Mahé two obscure faults came to light, and I now feel that really she should never have started at all!

Feeling a great deal happier in the knowledge that the DXpedition was now saved I next turned my attention to the Heathkit power pack which was then mounted on what must have been about the ideal heat sink. It was screwed on to the inside of the windward corrugated iron wall of the shack. The batteries and the NCX-3 were connected and the circuit was complete.

At this moment, the pangs of hunger assailed the weary amateur. Hardly surprising I suppose, for I had eaten nothing from the time of landing the evening before.

Darkness. Inside the shack foolish insects circled the lone bulb which tried to cast a feeble patch of light around the area of the NCX-3. Chatter wafted in from the open windows and doors, where the curious commented in crèole on the habits of mad Englishmen, and on the strange scene within. And from outside in the night, some thirty feet away, came the sonorous note of the generator which never missed a beat. Mingling with it all, the roar of combers could be heard monotonously breaking in phosphorescence on the beach. The sucking sigh and rattle of pebbles as spent surf slipped back down the steeply sloping shingle . . . but, " VICTOR QUEEN EIGHT BAKER FOX ABLE, here is MIKE PETER FOUR BAKER CHARLIE CHARLIE. Good evening Harvey. Glad you've arrived safely at Agalega. You're 5 and 8 here in Bahrein. Many stations calling you. . . ."

" MP4BCC this is VQ8BFA. Fine Bob. Would be grateful for GMT. Watch stopped sometime last night! . . . ."

14.10 GMT. Tuning 14,110 to 14,115 kc/s. Still on transceive. Not a minute to spare. No time to fix the Eddystone. No time even for a meal, but only to snatch a biscuit now and again. The pencil scratches on. More and more stations coming in. Soon the mad unco-ordinated scramble of a European pile-up. So over the QRM in excelcis I first fish for the loud signals. Then trip lightly to the left edge; and to the right edge of the pile-up. Then maybe out into the clear. Try to keep them guessing; try to keep them moving. So to break up the hard core of the QR Mary. But at about 15.55 GMT, in spite of such manoeuvres, the European pile-up became uncontrollable; it was then a screaming and meaningless inferno. And then a few sporadic c.w. signals peaked over the din. " W2DXX ur 579." " W8QNW ur 579." Slowly edging them down towards 14,100 I acknowledged them on c.w. And so the band was open to Stateside.

The night wore on but the band Stateside still remained wonderfully open. It might so easily have been otherwise. Pile-ups were sometimes exceptionally heavy, and one SWL remarked later in his report, " Harvey, I don't know how you managed to copy anything through all that." But the NCX-3 was doing its stuff. It punched holes through all the QRM in a manner which seemed almost uncanny for a QRP rig. The Stuart Turner ran to perfection all through the night, needing only just the odd visit to check on petrol, oil, and water (the cooling system was by convection from a 20 gallon drum of water). Returning from one of these sorties I was suddenly conscious of a bout of " shivers," and knew this to be a danger signal and the warning of a dose of fever. This was probably brought on by the violent activity in the sun that day. It sounds a bit incongruous for the tropics, but I had my heavy tweed coat with me. I put it on now,

Analysis of Contacts

W 356, ZS 33, PY 27, DJ, DL 26, G 25, YV 20, VK 14, I 14, OH 10, UA, UH, UR, UW 10, LU 8, ON 6, VU 6, 4X4 5, OE 5, F 5, SM 4, HB 4, PA0 4, KH6 4, VE 3, KP4 3, ZL 3, CR6 3.
All the following 2: CR7, ZE, TI, 5Z4, VS9, 4S7, YU2.
All the following 1: XW, YO, CR9, 9M2, MP4, 5A, 5H3, FR7, ZP, ZD8, ZD5, 5R8, 5X5, EA, 9J2, ET3, OX3, VP2, VQ8, JA/MM, 7Z3, EP2, 9X5, 5N2.

VQ8BFA operating ashore on Agalega Island. The equipment is a home-built 20 watt c.w./a.m. transmitter, an Eddystone 750 receiver, and an NCX-3 transceiver.

took three Aspros, and a hot cup of coffee. By 00.45 local time next morning I had 269 contacts but on account of fever plus sleepiness I could stick at it no longer.

The second day, things began to get better organized. The fever had almost gone; the engine responded at the first pull; and no more meals at wayward hours.

Of course, I had to prepare all meals myself, and for this I brought my faithful Primus—the companion of eighteen years. Before leaving Mahé I was well aware that fish was scarce at Agalega and that even eggs were sometimes difficult to obtain, so I brought down with me practically all my provisions. Meals for the most part were very rudimentary and consisted largely of corned beef, cracker biscuits, cheese, honey, hot soups at night—and always lots of tea and coffee.

On this day several difficulties of a fairly minor nature cropped up. During the morning 21 Mc/s was open for c.w. so I fired up the Harvey Wells transmitter and the Eddystone receiver and put them through their paces. All went very well for an hour or so but then the Eddystone dial light blew. This was an integral part of the 12 volt series-parallel heater arrangement, and lamentations; I had, of course, forgotten to pack a spare bulb. Nor had I an equivalent resistor. I therefore had to put the heater system back on to 6 volts. This was a particular nuisance as this modification caused current to be drawn more heavily from one side of the battery than the other.

By the time that the re-arrangement of the heater circuit had been completed 21 Mc/s was " out." So starting up the generator, I turned on the NCX-3 and prepared to do some listening off the transmit frequency with the Eddystone.

Elementary dynamo hash and r.f. ignition interference tests had been made before leaving Mahé, but unfortunately only in conjunction with the NCX-3. It now turned out that the Eddystone 750 in its modified form was far more sensitive to this sort of interference, and to my disgust I now discovered that a harsh " tac-er-tac, tac-er-tac " appeared right across the 14 Mc/s band. R.f. probe tests from the Eddystone to the engine magneto at once revealed that 90 per cent of the interference was centred around the spark plug lead, and particularly at its termination inside the plastic magneto cover. No doubt a cure for this could have been devised, but time and material being very limited, I decided to continue on transceive as before.

The evening session opened with a small European pile-up but this soon tapered away into, at 14.29 GMT, an unbroken run of Ws with a sprinkling of PYs and YV5s. All of these appeared on or around 14·250 Mc/s. By 18.37 GMT, 140 contacts had been made but then the band went out.

The third day. The situation was now well in hand and everything thoroughly organized. It usually is like that, of course, when one is just about to pack up! Not much activity during the morning. At 03.47 GMT, I just managed to work three stations on 14 Mc/s before that band went right out: PY2SO (Sonia), UA6LY and VU2TS. Next, 15m opened up for a very short while on c.w., and amongst others contacts were made with GI3IVJ, G5AI, G3RFE and G3FKM.

The evening brought in a very mixed bag. The ground plane seemed to be spraying the stuff around through nearly all the 360 degrees—and so gave nearly everybody a chance. Here is a random cross section of the log: VQ8, JA, a number of ZLs, some VKs, I1AMU, UA2AO, F9RY, G2PL, G3TTF, HB9KO, G3MWG, W3YL (at 59 + 20db!), UR2AR, VE3QA, 4S7IW, DL6HP, DJ8IE and 7Z3AB. Then at about 17.05 GMT the Ws, the YV5s, the LUs and the PY3s again came in solid and held a monopoly of the band for the rest of the night. The band closed at around 22.05 GMT (02.05 local time), but by then there were another 216 contacts in the log.

The next day, Saturday, 14 November, was departure day and all baggage had to be aboard by 12.00 GMT. However, I managed to sneak in just a few more worthwhile contacts before dismantling the rig. They were KH6BVS, ZS2RM, KH6JQ, KH6DQ, PY3BAD, PY3UY, KH6EPW and lastly VU2AK and VU2YL. And so ended an extremely interesting, and I think not too unsuccessful DXpedition.

Finally, it is realized that this forced transceiver operation resulted in extremely difficult conditions for many to copy during the heavy QRM on the transmitting frequency. And probably, as a consequence, a lot were disappointed in that they were unable to contact VQ8BFA at all. However, the writer hopes to visit Agalega again sometime during 1966 and with more suitable equipment—so until then best wishes and good DX for 1966, and better luck next time.

Claims for RSGB Certificates

Full conditions of the issue of the Society's awards for contacts on the h.f. bands, together with a check list, are provided in a leaflet obtainable from RSGB Headquarters. All certificate claims should be sent to Headquarters, and, after acknowledgement of receipt, these will be passed to G5GH, the Society's Honorary Certificates Manager, for checking and issue of the award.

Claims for WBC and BCRTA from non-members must be accompanied by a remittance for 7s. or the equivalent thereof. Members are reminded that WAC certificates are not issued by the Society, but that verified claims are passed to IARU HQ at Newington, USA for action.

Co-operation in connection with the conditions of issue of the various certificates will lead to reduction in the amount of avoidable correspondence and will enable the Certificates Manager to reduce any delay to a minimum.

Simple Amplified A.G.C. for S.S.B.

By G. A. STANTON, G3SCV*

THE circuit to be described is the result of a number of experiments conducted to find a simple, yet satisfactory, a.g.c. system for the reception of s.s.b. signals, but without resorting to audio derived arrangements. It requires commendably few components, and may be fitted within a very small chassis space. In addition, there would seem to be no reason why the same approach should not be used in fully transistorized s.s.b. receivers, although in this respect the circuit would have to be adapted for semiconductors.

Circuit Arrangement

The circuit diagram of the arrangement is shown in Fig. 1. Input to the system is taken from the anode of the last i.f. valve, and this is fed to the grid of the a.g.c. amplifier, V1, which is an EF92. From this it will be apparent that this a.g.c. system is driven by the i.f. produced within the receiver, and this in turn demands that at the point at which the i.f. is

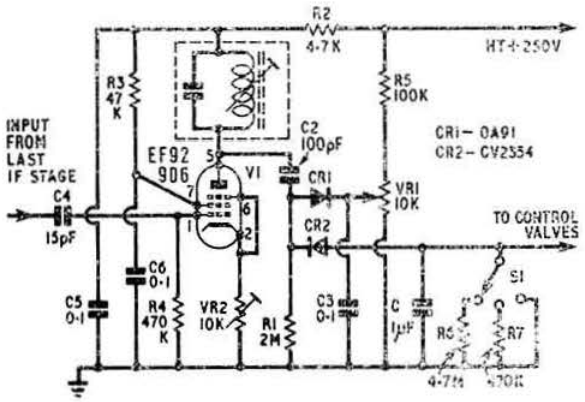


Fig. 1. The outboard a.g.c. amplifier designed by G3SCV. The anode tuned circuit can be one winding of an i.f. transformer intended for the same frequency as the receiver i.f. VR1 controls the degree of a.g.c. delay, and VR2 sets the level of a.g.c. applied to the receiver r.f. and i.f. stages.

removed, *only the i.f. is present*. This point is raised since in some receivers considerable b.f.o. voltage may be present at the anode of the last i.f. amplifier and this would have the effect of overloading the a.g.c. system to the exclusion of its normal function. This will inevitably occur where a diode detector is employed. For satisfactory reception of s.s.b. signals, and correct functioning of this a.g.c. circuit, a product detector is essential.

The anode of the i.f. amplifier, V1, is tuned to the i.f. in use, and in the writer's case this was 85 kc/s. The voltage developed across the anode load of V1 is fed via a 100pF capacitor to diodes CR1 and CR2. As a result of the rectifying action of CR1, a negative voltage proportional to the signal level is developed across R1. This negative voltage is passed by CR2, which acts as a series gate, and charges the capacitor C. The negative voltage across this capacitor is used as the control voltage for the a.g.c. stages in the receiver.

There are certain requirements in respect of the diode CR2. This diode must have a virtually infinite back resistance otherwise the charge on C will leak away through the reverse resistance of CR2. For this reason the usual germanium diodes are unsuitable. The diode employed at CR2 must be a silicon type, and of those available a surplus item with the type number CV2354 has been found suitable. Equally satisfactory should be the GEC type SX641, although this does have a slightly higher forward resistance. The diode CR1 is not so critical, although here again a good front to back ratio is desirable, and an OA91 is a good choice.

It should be noted that the diodes CR1 and CR2 form a voltage doubling circuit, and as a result, the voltage across C is approximately twice that across R1.

Associated with the capacitor C is the switch S1. This places across C different values of resistor, and these in turn govern the speed with which C discharges, thus different a.g.c. time constants are achieved. It should be noted that this switch also provides for the a.g.c. system to be switched off by shorting the control line down to earth.

The control VR1 sets the amount of signal voltage delay imposed before the a.g.c. commences to operate by reverse biasing the diode CR1. Until the peak signal level at CR1 exceeds the value of the delay bias provided by VR1, rectification does not take place, and hence no a.g.c. is developed. Thus this control sets the signal level at which the a.g.c. action commences.

The control VR2 governs the gain of the a.g.c amplifier V1, and in so doing controls the general level of the a.g.c. voltage applied to the receiver. Both VR1 and VR2 are preset potentiometers so allowing the delay and level to be adjusted to the requirements of a particular receiver.

Conclusion

Two practical points need to be added. V1 and its anode circuitry must be carefully screened from the remainder of the receiver in order to avoid instability, and in this connection it is quite essential to mount the anode circuit in a screening can. With a can of suitable size, and provided with sufficient terminations, components C2, C3, R1, CR1 and CR2 could, with advantage, also be housed within its compass.

Finally, all the capacitors concerned with decoupling the a.g.c. system within the receiver must be above reproach. If any of them are leaky, then they will upset the time constant provided by C and its associated switched resistors.

* 574 Chorley Old Road, Bolton, Lancs.

Eddie Read "Beat the Bank"

Old Timer Eddie Read, G6US, of Oswestry, won the first prize in the Philips "Beat the Bank" competition and decided to take the prize money of £500 rather than an all-expenses-paid fortnight for two in Monte Carlo. Frankie Vaughan made the presentation. The competition was open to all retailers stocking Philips Superlux lamps, who had to imagine they had won £100,000 which they could invest in eight different ways to produce best returns for the money over a ten-year period. Eddie Read has been licensed since 1928 and has been in business as a radio dealer for the past 40 years.

DX TV Club

Anyone interested in forming a DX TV Club should contact Mr R. Roper, 62 Wellington Street, Torpoint, Cornwall. The organizers would welcome views and letters from anyone with interest in this subject.

TECHNICAL TOPICS By PAT HAWKER, G3VA

Newcomers . Transistor Developments . Transistor Transmitters . Differential Keyer
Broadband Baluns . ZS1CK Transmatch . Frequency Synthesizers
Broadband Aerials . Biconical Aerials . Battery Charging

AT a time when the number of amateurs in the UK continues to climb steadily upwards, it may seem odd to note that, across the Atlantic, there has been, during the past two years, a marked decline in the number of new licences being issued. These have dropped from around 33,000 annually in the early 'sixties to about 20,000 in each of the past two years, although the number of station licences, at 270,000, is still going up.

The UK has always had a far lower proportion (by some 25-30 times) of amateurs to total population, and there is no reason to think that we have yet reached anything like saturation or face any downturn in interest. The American statistics may simply reflect the traditional lower level of activity that always attends a sunspot minimum period. But the ARRL is clearly taking the matter seriously, and trying to find the reasons for this state of affairs. Its total membership, at 101,000, dropped about 1000 in 1965. One novel view is that the growth in the use of s.s.b. at the expense of a.m. has meant that far fewer causal listeners are brought into association with the hobby by listening to phone stations. There may well be a valid point here, though it is difficult to be sure since nobody ever seems to have attempted to make a serious enquiry into just how and why newcomers are attracted originally into the hobby. It would indeed be a paradox if in developing new and efficient techniques, we finally arrived at the situation that there were fewer and fewer people to communicate with!

There are indeed already some advanced areas where this is the situation. In *QST* (October 1965) K3NIO showed that by the use of extremely low speeds, bandwidths of the order of 2 c/s, and highly-refined " read out " equipment all sorts of over-the-horizon scatter modes could be utilized on apparently dead bands. But this type of work depends on special equipment at both ends—and history shows us that in such circumstances new techniques take much longer to spread than where the change is made only at one end; in other words a new system should wherever possible be compatible with existing ones.

There is little doubt that by exploiting more fully the fundamental principles of communication theory—which shows that signalling speeds, bandwidths and signal-to-noise ratios can be traded one against the other—we can today begin to think in terms of signal-below-noise ratios, in much the same way as the radio astronomers do. Those who have seen demonstrations of the " piccolo " RTTY system of the Diplomatic Wireless Service, with the teleprinter churning out copy from signals which appear to be lost in the noise, will be aware of what can already be done to defeat our old enemy.

More Transistors

Transistors continue to be developed having features of potential interest to amateurs—though to remember all the type numbers is a problem that is now far worse with transistors than it ever was with valves. One of the latest developments is a new series of Mullard " entertainment type " silicon planars having a form of built-in screen layer diffused into the base area; this reduces the rather high feedback capacitance of planar devices by a factor of four when the device is used in the grounded-emitter mode. In effect the junction between the *n*-type and *p*-type screen acts as a reverse biased diode.

A useful feature of such devices is that it is claimed that they permit the design of amplifiers up to about 35 Mc/s (that is television i.f. amplifiers) without neutralization.

In the audio field, SGS-Fairchild have the BC138 silicon planar devices which can provide 10 watts output at low distortion and can operate from a 40 volt line. There are also more *p-n-p* type silicon devices around, so that complementary pairs are now available in both germanium and silicon.

In *TT* (May, 1965) we referred to the use in America (and increasingly in the UK) of the term " music rating " as an alternative to the less flattering r.m.s. output rating. Apparently, however, the term " music rating " has been brought into some disrepute in the States, and the American Institute of High Fidelity has recently recommended instead " dynamic power," with a somewhat tighter specification on the conditions under which this is measured. In effect this means the same thing as the former music rating: that is the sine-wave r.m.s. power that would be delivered without distortion from the amplifier if the power supplies were fully stabilized (the argument being that in practice audio amplifiers are only called upon to deliver peak output momentarily and not to handle continuous sine waves).

The alternative rating, that is the power which an amplifier can deliver from a sine wave input over a minimum period of 30 seconds, is now termed " continuous power rating."

Transistor Transmitters

Everyone who puts pen to paper welcomes evidence that his efforts sometimes prove useful to readers. So a recent letter from QRP-enthusiast G3DOP, reporting the successful use of two *TT* circuits as the basis of a 3·5 Mc/s transistor transmitter (Fig. 1) proved quite a tonic.

G3DOP uses the super-alpha pair v.f.o. (*TT*, January 1965) to drive a Texas Instruments 2N696 keyed buffer amplifier, with some forward bias, of his own devising, followed by the hybrid earthed-collector p.a. described in *TT*, November 1964 (both circuits are also in *TT/tRA*).

He seems really enthusiastic about the reports he has been receiving with this rig running at powers between 0·2 and 0·6 watt. And with the growing availability of reasonably priced h.f. power transistors this approach should prove equally useful up to a few watts.

A four-stage v.f.o. transistor c.w. rig for 7 Mc/s using a Fairchild 2N3919 silicon planar transistor in the p.a. is described by WB6AIG in *QST* (March 1966). Though this is nominally a 30 watt input transmitter, a chart plotting power output against supply voltage shows that to deliver 15 watts out, some 26 volts supply is needed. With a single 12-14 volts car battery some 5 watts output is available.

The article again makes the point that a transistor power amplifier must never be operated without load, and that voltage to the transmitter should be turned off when adjusting the aerial matching tap on the tank circuit; a current-

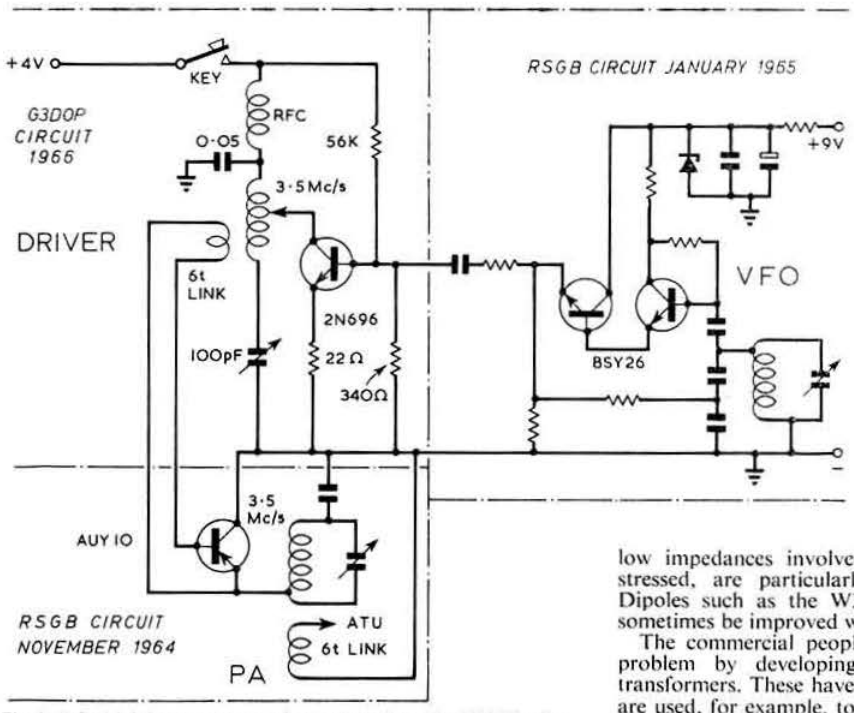


Fig. 1. A 3·5 Mc/s low power transistor transmitter by G3DOP using a v.f.o. and p.a. circuits previously described in *Technical Topics*.

limiting resistor should be used when adjusting the rig or when tuning the aerial since a high s.w.r. can destroy the final.

WB6AIG also provides the circuit for an optional differential keyer (Fig. 2) to allow break-in, turning the v.f.o. on just before and off just after the p.a. The value of C2 governs the hang-on time for the v.f.o. and the controlled switch transistor delays the turning on of the p.a. by a time governed by R1, C1. Care must be taken if any form of TR switch is used to see that the aerial is not disconnected from the transmitter until after the p.a. is off. Component values would vary with the transmitter, but the idea should prove adaptable to other rigs.

Broadband Baluns

The problem of feeding a balanced aerial, such as a dipole, from unbalanced co-ax has long been recognized, and has led to the development of many types of balun (balanced-to-unbalanced) transformers. The basic problem was well put by G6CJ back in 1965 (BULLETIN, December 1955): " a centre fed dipole is a balanced circuit; a concentric cable is unbalanced, they cannot be joined directly without some trouble or other—the fact that this often goes undetected has only made it more difficult to understand what is happening when things go wrong."

G6CJ pointed out that this is the reason why it is sometimes impossible to get sensible results from impedance or polar diagram measurements, and can cause the shack to be alive with r.f. causing TVI; or the aerial fires in the wrong direction; or local electrical noise crawls up the outside of the line and back into the receiver. Because of the low impedances involved, multi-element Yagi arrays, he stressed, are particularly sensitive to unbalanced feed. Dipoles such as the W3DZZ multi-band units may also sometimes be improved with a balun.

The commercial people have been able to sew up this problem by developing weatherproof wideband ferrite transformers. These have ratings up to many kilowatts, and are used, for example, to feed wideband log-periodic arrays from transmitters with pi or pi-L output networks. But these users are often prepared to pay a price which would, so to speak, " unbalance " an amateur's budget rather more than it would balance his aerial.

There are, of course, various forms of standard coax baluns, some providing a 4 : 1 and others a 1 : 1 impedance transformation. Most of these tend to be frequency selective, and can add yet another critical dimension to aerial construction as well as posing problems for multi-band aerials.

Recently various forms of broadband baluns at more modest prices have been appearing in the United States. In a *QST* review (October 1965) several baluns priced between £3 10s. and around £5 were described. Two of these, including the W2AU balun and the lightweight Fungle balun, are based on toroid cores. In this country, KW Electronics manufacture a balun priced at 35/-. But the third family of devices were the Hy-gain 1 : 1 types using two tightly coupled coils of coax: Fig. 3.

Clearly, publication of this design has inspired a number of amateurs to try one for themselves, at costs of only a few shillings for the coax. Fuller descriptions have appeared in *CQ* (February 1966) by W6SAI, and in *DL-QTC* (March 1966) by DL1HM. The W6SAI article gives a very detailed description of the construction of one of these broadband lumped-constant baluns.

A 16 ft. 6 in. length of 50 ohm coax such as RG8/U or equivalent is tightly coiled to form a 9 turn coil with an inside diameter of 6¾ in. leaving an inch or two at either end. W6SAI uses a piece of p.v.c. plastic pipe as a former, but it is possible to form the coil without using a former.

When the centre-point of the coil has been carefully found, the outer coax plastic cover is trimmed back and the flexible screen, but not the inner lead, is broken; then a jumper short circuit is soldered across one section of the coax: see Fig. 3. A similar jumper is connected across one of the outer ends of the coax coil.

W6SAI describes in considerable detail the construction of the device and how he fastens the coax on to the former;

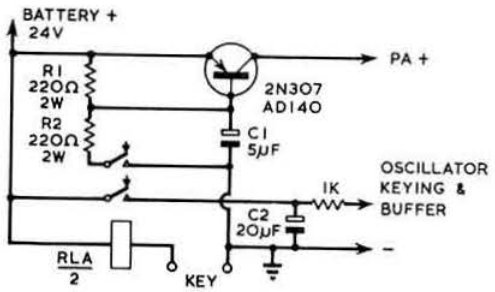


Fig. 2. A differential keyer for a transistor transmitter. Note that the polarities are for *n-p-n* transmitter transistors. RL1 is a 24-28 V d.c. d.p.d.t. relay. Other types of power transistors could be used.

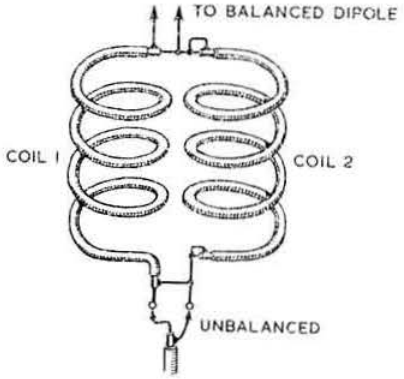


Fig. 3. A broad band balun with 1 : 1 impedance transformation. Although shown as two coils, a single length of co-ax may be used (see text).

but provided that it is remembered that the two sections of the coil should be electrically similar and tightly coupled together (preferably in a type of bifiliar winding), there seems no reason why other forms of construction should not be used. The devices are broadband and it is claimed that a 9 turn unit will be effective over the range 6-32 Mc/s; by adding turns the lower limit can be extended, and a 13 turn balun is said to work down to about 1·5 Mc/s.

The ZS1CK Transmatch

A useful device for matching any transmitter to any aerial system is described by ZS1CK in *Radio-ZS* (February 1966): Fig. 4. ZS1CK claims no particular originality for his unit, and basically it is an s.w.r. indicator of the K6QHZ "Mickey-Match" type, popular for over seven years. However, continuous indication of both forward and reflected power in the co-ax section is available by using one of the surplus aircraft "cross arm" dual meters. Two 22 s.w.g. enamel wires are carefully inserted between the inner tube and the braiding of a 9 inch length of 72 or 52 ohms coax, making sure that the enamel is not scratched off to form an electrical connection. Then the forward and reflected power in the wires is measured by separate metering circuits.

The s.w.r. meter, aerial matching network and an aerial change over relay are all built into one compact unit. ZS1CK gives his tuning technique as follows:

"Tune the transmitter to about three-quarters of its normal indicated power on its anode meter. Switch the transmatch to the appropriate band and tune with C3 until one meter reads maximum and the other minimum. Dip the p.a. again, trim C4 for minimum on the reflected meter (A); this will also indicate maximum on the forward meter. If the current on the meter reads off the scale, reduce the power by turning VR3/VR4 which are two 3000 ohm potentiometers on the same shaft."

ZS1CK points out that the unit also acts as an aerial matching device for the receiver and should increase strength of incoming signals when correctly tuned.

Frequency Synthesizers

There still seems to be considerable interest in developing relatively simple forms of frequency synthesizers for amateur use—provoked no doubt by some of the very fine (but often very complex) units now being used on commercial and Service equipment. The most common forms of commercial frequency synthesizers are those based on (a) crystal banks; (b) various forms of phase-locked oscillators in conjunction with spectrum generators or digital techniques involving variable ratio divider chains; and (c) those directly controlled from a single (usually 1 Mc/s) high stability crystal oscillator by means of Wardley triple-mix circuits (akin to the tuning system of the Racal RA17).

At present, it is probably true to say that only the crystal bank techniques can readily be adapted to amateur construction (although the HRO500 has shown that phase-locked oscillator techniques are not entirely out of the question). A number of crystal bank designs have been published during the past few years; the latest is "The Crystal Decade" by W4ATE (*73*, February 1966) which uses five FT243 "coarse" decade crystals: 3100, 3200, 3400 and 3500 kc/s along with a set of FT241A crystals spaced at 1·8 kc/s intervals from 400-500 kc/s to give an output of 3500-4000 kc/s: Fig. 5.

This involves quite a lot of crystals but W4ATE suggests that complete sets of surplus FT241A units have already been acquired by many amateurs so that the cost is much less than might appear.

He simplifies his unit by not attempting to provide crystal switching but has just the two crystal sockets. He then changes frequency by plugging in the appropriate crystals; continuous coverage is obtained by using the FT243 crystals in a v.x.o. circuit arranged to pull them up to 1·8 kc/s. By using 6AG7 oscillators and a 6L6 power mixer (with the l.f. oscillator feeding the screen) he gets reasonable output with a minimum number of stages. Whether such a unit can offer any real stability improvement over a first-rate straight v.f.o. or a heterodyne type v.f.o. (which is the simplest form of frequency synthesizer) seems rather questionable, particularly since the 6AG7 oscillators would involve driving the crystals considerably harder than might be done in a modern low power transistor c.o. But the idea could form a useful introduction to crystal bank synthesizers if you are lucky enough to have one of those spare sets of FT241A crystals in the shack.

We have also been examining the circuit of a nine-transistor

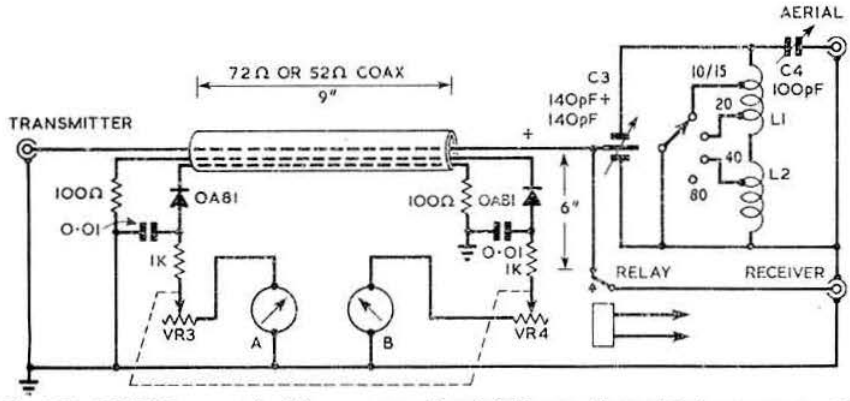


Fig. 4. The ZS1CK Transmatch. M is a crossarm aircraft indicator with two 500μA movements. R3, R4, 3000-ohm potentiometers on same shaft. Ry, aerial changeover relay with make contact. L1 10 turns 16 s.w.g., 1½ inch diameter, L2 24 turns (Command transmitter coil) taps 10, 15 metres 3 turns; 20 metres 7 turns; 40 metres 17 turns.

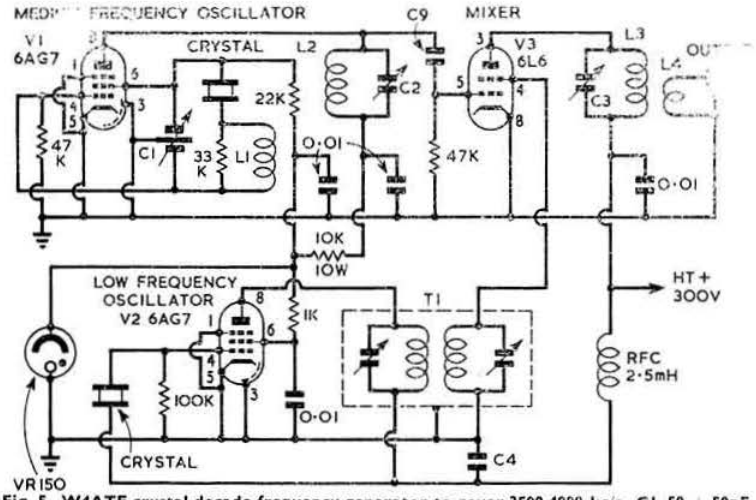


Fig. 5. W4ATE crystal decade frequency generator to cover 3500-4000 kc/s. C1, 50 + 50pF. C2, C3, 100pF. C4, 500pF mica, C9, 1000pF, mica. L1, 40 turns 22 s.w.g. enamelled wire scramble wound on ½ in. diameter ferrite core, 1 in. long. L2, 45 turns on ¼ in. form, 22 s.w.g. L3, 27 turns on 1⅛ in. form, 18 s.w.g. wire. L4, 5 turns, 18 s.w.g. wire wound over earthy end of L4. T1, 455 kc/s air tuned i.f. transformer. T1 should be tuned to provide as uniform output over 400-500 kc/s as possible (peak one core about 425 kc/s, other core about 475 kc/s).

crystal bank synthesizer used on a modern pack-set—based on some 40 crystals and providing 10,000 switched 1 kc/s steps from 2 to 12 Mc/s—and note that at least two of the mixers are balanced types. One is a four diode ring modulator mixer of the type described in *TT* (March 1965) and there is also an output filter to help keep spurious signals down. Admittedly this synthesizer is used for receiving as well as transmitting, and in such cases the spurious outputs have to be reduced to a much lower level.

Since writing these notes we have had an opportunity of using the new Plessey PR155 receiver (see *Electronics Weekly* April 20) using a form of synthesis with a phase-lock and will be discussing this design in the next *TT*.

Broadband Aerials

Commercial and Service communicators do not usually have the advantage of having their h.f. bands in harmonic relationship, and the development of frequency synthesizers, wideband distributed amplifiers, self-tuning power amplifiers and similar techniques has encouraged the use of broadband aerials which do not require any matching adjustments over a considerable frequency range, thus allowing fast frequency changes.

The simplest way of increasing the bandwidth of an aerial is to decrease the ratio of its physical length to its diameter. This is why, where an aerial has to be pre-cut and carted around to temporary locations, a folded dipole is generally preferable to a single-wire dipole which is likely to be more affected by nearby objects.

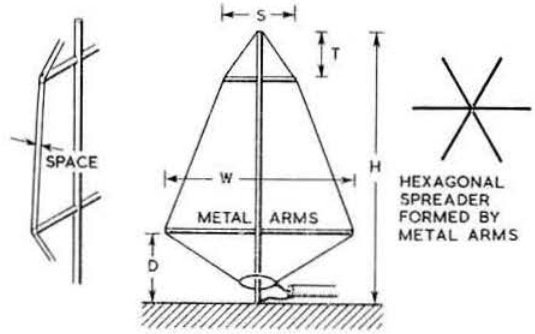
The rhombic beam is a good example of a reasonably broadband aerial, providing continuous operation over about a 2 : 1 frequency range. Another technique, described in a number of amateur journals but more often used in commercial circuits, is the large family of logarithmic aerials, including the long periodic. Logarithmic structures have gain, radiation patterns, and input impedances which are practically independent of frequency over bandwidths limited only by the dimensions and constructional techniques of the arrays.

In practice they comprise some form of repeated structure whose dimensions increase in geometric progression. The r.f. power from the transmitter passes along the structure until it arrives at a section where the dimensions, in terms of wavelength, are suitable for radiation. Such structures may include flat and conical spirals as well as the more familiar log periodic form. The reason why they are not more used by amateurs is that the gain is governed by the number of active elements at any particular frequency, and thus for a given size of array will be appreciably below what can be obtained from a single-frequency system such as a Yagi. The log periodic arrays are usually sloping in height from either two masts or from a single main support.

Broadband Biconicals

Broadband vertical arrays also have a number of attractions, including the elimination of any switched networks such as those needed for multi-band verticals and ground planes as described in recent *TT*s. Unfortunately most of the broadband verticals tend to have rather complicated structures. Details of h.f. discones, for example, have been given in a number of amateur publications but have never proved very popular, one of the many problems being the "top hat" disc and the dimensions which in practice limit their use to 14 Mc/s and above.

An alternative, though related broad-band vertical is the biconical monopole. This is a form of aerial which has been used by the British and American services. In effect it replaces the disc of a discone with another conical arrangement, and brings the feedpoint down to the base. Constructional details of one form of this aerial is given by W5WEU/4, in *CQ* (January 1966), in which an effective bandwidth of 4 : 1 is claimed. The aerial takes the form of two cones, made from a skeleton of wires, one above the other. The *CQ* design has six-sided double wire cones with electrical connection at the interface between the two cones by means of the metal cross pieces: Fig. 6. While a 43 ft. structure is needed to cover 3·5-15 Mc/s; a 23 ft. high aerial will cover 7-28 Mc/s; and even a 12 ft. high one 14-56 Mc/s. W5WEU has been using a 12 ft. model with promising results and reports other amateurs using the 23 ft. version. Altogether there are 12 perimeter wires grouped in six double



	H	W	D	T	S	SPACE	WIRE
3·5 - 15 Mc/s	43'	17'-8"	16'-10"	2'-2"	5'-10"	3"	NR 8
7 - 28 Mc/s	23'	9'-6"	9'	12"	3'-2"	2"	NR 10
14 - 56 Mc/s	12'	5'	4'-9"	8"	1'-8"	1"	NR 12

Fig. 6. Constructional data for the W5WEU biconical aerial.

units. W5WEU suggests the smaller models work best higher off the ground with a good counterpoise earth.

Reading the *CQ* article, with its emphasis on amateur use of these aerials, reminded us that there was a useful description of a slightly different form of biconical monopole (plus a good deal of information on radiation patterns and design formulae) presented by Mr H. P. Mason of the Admiralty Surface Weapons Establishment at the 1963 IEE "Convention on H.F. Communication." His paper is printed in the Convention book which may be found in a number of technical and company libraries. His design (Fig. 7) uses some 12 single wires equally spaced around the central steel mast which is on an insulated base. The cone interfaces are joined together by wire, there being no cross-arms, but with external stays to keep the whole aerial in shape.

The ASWE paper claims a 2·6 : 1 bandwidth with low s.w.r. but this could almost certainly be extended for amateur use. Apparently three aerials covering 2-5 Mc/s, 4-11 Mc/s and 10-26 Mc/s have been designed for naval coast stations.

The paper indicates, most vividly, how important is the best possible ground plane if the aerial is to give optimum DX performance. A series of vertical radiation pattern diagrams show the great difference in the amount of low angle radiation when mounted above different ground planes. The paper recommended the use of 36 ground radials of about the lowest frequency.

Whereas there is plenty of radiation, even with an average ground system, at high angles, the vital low angle (0-15°) radiation largely disappears from those diagrams representing radiation with a less efficient ground system. This, of course, is true with all forms of vertical aerials fed against earth and emphasizes once again that the best way of improving such aerials almost always consists of providing a better earth system. What I have never yet found is any detailed comparison between the effectiveness of a ground radial system and that of the four- or three-wire up-in-the-air technique which we associate with "ground plane" aerials—

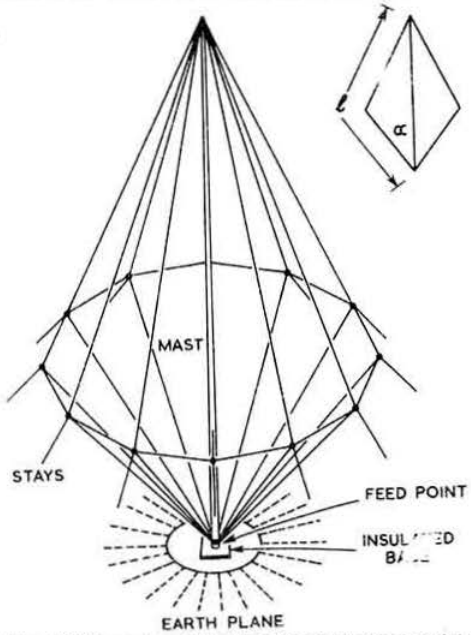


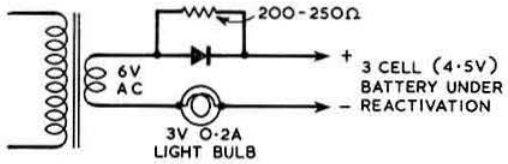
Fig. 7. The ASWE version of the broadband biconical aerial. With a lower cone half-angle (α) of 38·5° feed impedance is 50 ohms. If this is decreased to 23·2° impedance increases to 75 ohms. For the 50 ohm version, the length of each semi-perimeter wire (l) is equal to 0·269 to 0·735λ, and for the 75 ohm version the corresponding figures are 0·284-0·735λ. The earth plane comprises some 36 radials of 0·4λ.

and how much the ground conductivity below such sloping ground plane systems affects low angle radiation.

Dry Battery Recharging

Joe Cropper, G3BY—an old friend from those wartime days when some 100 or more amateurs were crowded into a continuous Field Day (though not always called that!) at a certain "farmyard" whose crop of aerials is still visible from the M1—comments on dry-battery recharging (see *TT*, March 1966). He draws attention to an article on this subject in *Wireless World* (October 1955) by the late R. W. Hallows.

This article described a preferred method developed in the Netherlands using "dirty d.c." The charger (Fig. 8) has no filter capacitors and has a 200-250 ohm resistor wired in



parallel with the rectifier to provide an a.c. component which Hallows felt might cause "an electrolytic shake up!" The technique eliminates heating of the cells, at least with larger units, and appears to replate the zinc more evenly. Apparently dirty d.c. is a recognized technique in replating operations.

G3BY himself uses this technique for his partly transistorized equipment and reports that five cycle batteries have seen him through two low power field days and other odd jobs and are still in use after more than two years—even though he admits that the cells have not always been promptly recharged. In his case the transformer secondary is 18 volts to charge the 15 volts of cycle battery. Small transistor radio cells would get warm, but G3BY believes that this could be taken care of by using a low current bulb in the "dirty d.c." department.

Here and There

B. Priestley, G3JGO points out that there is a special wallpaper lining paper called "Starfoil" with an inner layer of aluminium. It retails at around 15 shillings for an 11-yard roll. This is intended for use in damp conditions, but G3GJO suggests it might also eliminate TVI—though he does not say whether his basic idea is to use the paper for extra screening of the transmitter, the shack, or the neighbours' living room. Certainly it would be one way of forming a screened room.

Radio-Electronics has a tip for dealing with outside rust-frozen nuts and bolts such as those found when changing aerials. Squirt ordinary laundry bleach generously around the hardware. Then in a short time, says *R-E*, you'll find you can remove the nuts easily.

A recent *CQ* survey has shown that despite transceivers, most American amateurs are adhering to separate receivers, transmitters, and more interest is being shown in home-brew projects than in any previous survey.

A Dictionary of Electronics

The Penguin *Dictionary of Electronics* by S. Handel has been prepared principally for those professionally concerned with electronics but a great many people, particularly radio amateurs, will find it a most valuable reference source. The book runs to 384 pages and contains about 5000 references, many of which are illustrated.

Copies may be obtained from RSGB Headquarters, price 8s. 2d. including postage.

A Simple Mains Isolated Power Unit for Transistorized Equipment

BY A. S. CARPENTER, G3TYJ*

MEMBERS cannot ignore the fact that transistors are taking over much of the work hitherto carried out by valves. Their small physical dimensions coupled with their capabilities are, without doubt, still a source of wonder to those of us who remember the early days, for the sensitivity of many modern transistorized receivers is remarkably high. Transistors also encourage " kitchen table " constructions and may account for some of the resurgence of the radio hobby. All that is required is a few transistors plus one or two sub-miniature components, a small-bit soldering iron—and a battery—and plans are soon afoot.

Although transistors require small currents for satisfactory operation it is soon discovered that battery power is both expensive and wasteful. Under quiescent conditions a communications-type receiver using 10 transistors (and this is about the minimum usable number) would consume approximately 12mA from a 9-volt supply but this would rise to around 40-50mA on signal peaks if class B output was used. The useful life of a PP9 type battery, for example, would not then be long, particularly under extended operating conditions, and a mains-derived power source may be considered beneficial.

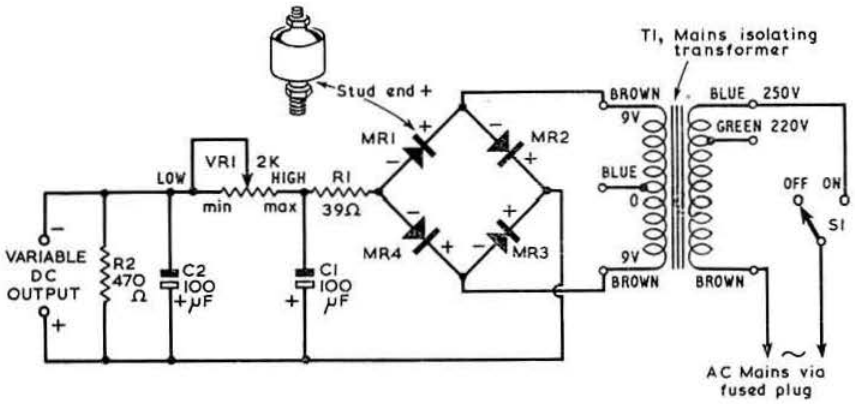


Fig. 1. Care should be taken to observe correct polarity of the diodes when assembling to avoid the possible premature demise of these components.

A Practical Mains Unit

Whilst it is not difficult to design a suitable unit to supply transistorized apparatus it is less easy to keep the physical dimensions small since a mains transformer *must* be used in the interests of safety. If physical size is of no importance it might be possible to make use of a discarded heater transformer since a d.c. potential of only 9-10 volts is usually required; the actual unit under consideration, however, is quite small and is little larger than a standard PP9 battery. It may thus be used to drive a domestic transistor receiver if needed even if this robs it of its portability to a small extent. For general usage, however, it is beneficial to have some control over the output voltage and this facility is incorporated in the version described here.

* 15 Portway, Frome, Somerset.

The circuit of the prototype is shown in Fig. 1 and is quite straightforward. T1 isolates the supply to ensure safety, a single secondary winding being associated with a full wave rectification system using MR1-MR4, the pairs MR1/3 and MR2/4 being alternately high and low impedance to the a.c. supply. Rectification occurs on every half cycle and if no load is connected to the output terminals the unit still functions due to resistor R2—which also provides a discharge path for capacitors C1 and C2. Regulation is also assisted to a small degree by R2 since it consumes approximately 30mA at maximum output.

A limited range of voltage control is achieved by making the resistive element of the *RC* smoothing network variable and panel controlled. With such a simple system it is not possible to calibrate the control knob in d.c. volts since the maximum available output depends on the load connected externally. Under light load conditions—say 5mA—a d.c. potential of around 15 volts appears at the output terminals of the prototype when VR1 is set to MAX; the capacitors C1 and C2 are then paralleled. Since no form of voltage stabilizing is incorporated the output voltage falls proportionately as load current increases and at 70mA a 50 per cent drop is noted—as may be seen in Fig 2. Fortunately only small currents are required from the unit for many purposes and there is enough control range to accommodate a 50mA current drain at 9 volts—and more if only 6 volts is required.

The maximum to minimum voltage ratio available at the output terminals (approximately 2 : 1) may be increased by using a fixed value resistor—say 1K ohm—in place of VR1 and making R2 variable. The negative potential would then be available via the potentiometer slider and zero output would be possible. In this case an additional 100μF capacitor

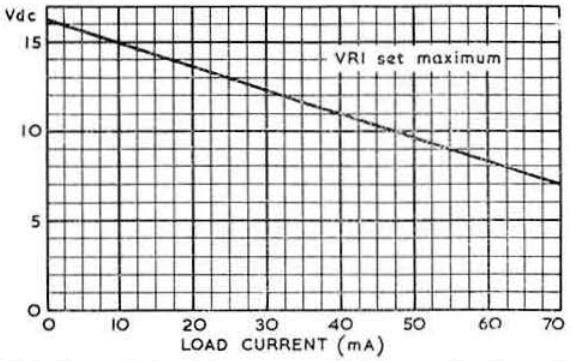


Fig. 2. The regulation of the power supply is illustrated by this graph, the output voltage is related to current being drawn.

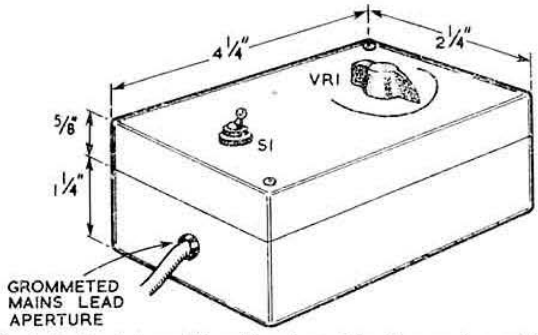


Fig. 3. A plastic box with a lid at least ⅞ in. deep makes an ideal housing for the power supply.

should be connected between the slider and the positive line in the correct sense. It may be noted that the poor regulation of the unit would be most serious if a type class B audio amplifier was connected and sudden current demands would cause a rapid drop in d.c. voltage.

heat sinks are considered essential, however, use a rectangle of 16 s.w.g. aluminium for the chassis. If this is done C2, which is mounted upright, should be reversed so that its negative lead-out cannot foul the metal.

The colour-coded lead-out wires of T1 come from the sides of the windings and not as drawn in the diagram, which was prepared to assist clarity. No problem need arise over recognizing the correct leads, despite the fact that these are similarly coded, since the primary leads emanate from one side of the stack and those associated with the secondary from the other side. The transformer needs no fixing bolts since it has inbuilt locking lugs which are passed through the "chassis" and flattened. The rectifiers are supplied with locking nuts fitted.

It may be noted that no fuse is fitted, use being made of that in the mains plug, but if needed one could be placed in the position assigned to S1 if the switching can be incorporated with VR1—which should then be connected to ensure that minimum voltage is at switch-on. No output sockets are shown since flying leads fitted with non-reversible press stud connectors are utilized so that mating pairs can be quickly locked in as required. Such leads should be arranged to be longer and shorter than each other respectively by

Construction

Because it is unwise to have a.c. mains apparatus lying around unboxed a simple plastic container measuring 4¼ in. × 2¼ in. × 1⅝ in. is used to house the unit. Suitable boxes are easily obtainable but one with a lid about ⅞ in. deep is best—see Fig. 3—since the "chassis" is actually secured within this.

Grommeted holes, one at each end, carry input and output leads, the knob of VR1 and S1 being the only externally visible items. The "chassis" referred to is a piece of paxolin cut slightly smaller than the inside measurements of the box lid and carries all the components. The layout and wiring plan is shown in Fig. 4 and because the rectifiers are only lightly loaded no heat sinks need be fitted; if

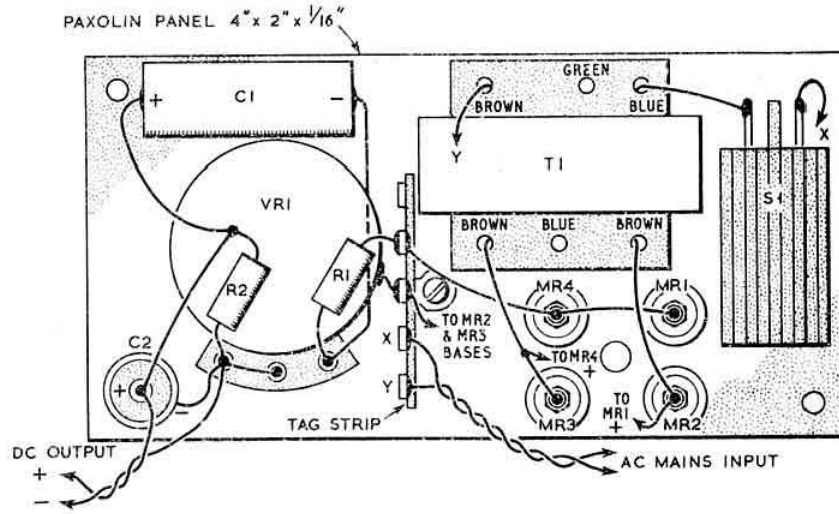


Fig. 4. Suggested layout of components on paxolin panel, although any similar layout may of course be used.

Components List

R1	39 ohms
R2	470 ohms
VR1	2K ohms potentiometer
C1	100μF 15V Electrolytic
C2	100μF 15V
GR1-4	A.E.I. Rectifiers type GJ7-M
T1	Mains Transformer type MT9. Primary: 220-250 VAC input. Secondary: 9-0-9VAC at 100 mA
S1	On/Off toggle type

Other items are:— Plastic box 4¼ × 2¼ × 1⅝ in, rectangle paxolin or aluminium approximately 4 × 2 in., a 4 and 1 tag strip, mains input and output flexes, two grommets, output connectors oddments of wire and sleeving, 4BA nuts and bolts, solder, etc.

about 2 in. for although the d.c. potential is hardly a lethal one a short circuit due to inter-stud contact is undesirable. There is ample space though to fit permanent output sockets but these should be non-reversible in type and clearly labelled or damage to transistors in connection may result. There is also sufficient space to fit 0·01μF 1000 volts d.c. capacitors to the mains transformer primary winding if this is necessary.

The whole unit is wired up on the chassis section and this is finally locked to the inside of the box lid using 4BA nuts and bolts.

Testing and Use

Initial tests consist of checking for short circuits, and measuring the output voltage with no externally connected load. The ends of travel of the control knob for VR1 should be clearly marked either "HIGH" and "LOW" or "MAX" and "MIN," as preferred and a check made for any excessive heating. If all is well the box may be sealed and the unit is then ready for operation.

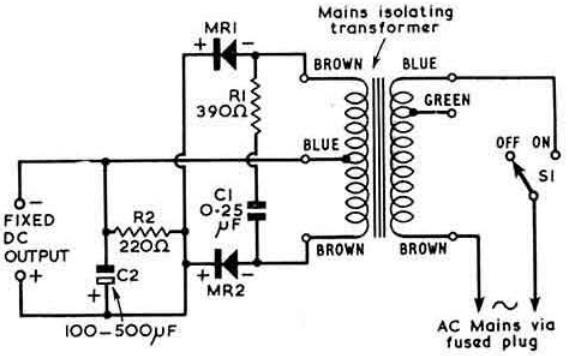


Fig. 5. A simpler unit for those who do not require a variable voltage. Maximum output will be 9 volts.

To use the unit with a receiver or other suitable apparatus make the necessary connections and *set the knob of VR1 to either* " LOW " *or* " MIN " *before closing S1*. Switch on and monitor the d.c. voltage with a testmeter; since this is likely to be low due to the load connected adjust VR1 to the required setting. If possible leave the meter *in situ* but if this is not practicable check from time to time as work proceeds.

Conclusion

This comparatively simple unit can prove extremely useful and the prototype has been in use for a long period at G3TYJ. Simpler versions could be constructed around the same mains transformer and readers who do not require a variable voltage version might find the restricted circuit shown in Fig. 5 suitable. This is a well-tried specimen and is ideal for many purposes; it also is less expensive to make up since only two rectifiers are required although a full wave system is retained by making use of the transformer centre tap. The maximum available voltage is 9 volts d.c. and because the usual smoothing circuit cannot be used C2 should be made large or a small amount of hum might result which could prove troublesome when headphones are being worn.

Mullard Film Meetings

Mullard Meetings, arranged by the Mullard Films and Lectures Organization, will be held at the following towns and cities during the month of May: 5th, Huddersfield (Regent Ballroom); 9th, Southampton (Polygon Hotel); 17th, Bristol (Victoria Rooms); 18th, Torquay (Grand Hotel); 19th, Barnstaple (Bromley's Cafe); 20th, Taunton (Conference Hall); 24th, Hull (Royal Station Hotel); 25th, Wolverhampton (Percy Thomas Hall, YMCA); 26th, Portsmouth (The Guildhall).

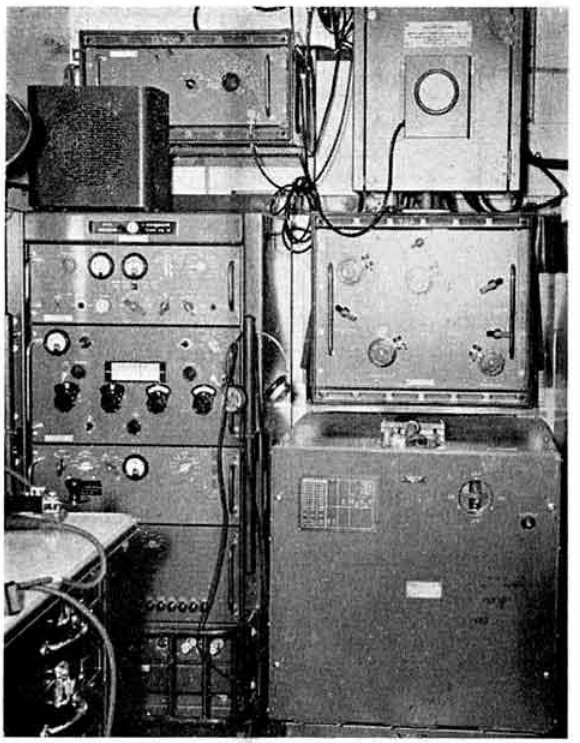
All meetings will commence at 7.45 p.m. and RSGB members will be welcome. Where time permits application should be made to Mr Ian Nicholson, Mullard House, Torrington Place, London, W.C.1, for a formal invitation. On each occasion during May the talk will be " Transistor Topics." The films will be *Thin-film Microcircuits* and *Electromagnetic Waves, Part II*.

Radio Amateur Old Timers' Association

The ninth reunion of the Radio Amateur Old Timers' Association will be held at The Horse Shoe Hotel, Tottenham Court Road, London, W.1, on Friday, 6 May, 1966. Membership of the Association is open to all who have held a full transmitting licence issued by the United Kingdom Postmaster General for an unbroken period of at least 25 years, including the war years. Details of RAOTA can be obtained from the Founder-Secretary, John Clarricoats, O.B.E., G6CL, 16 Ashridge Gardens, London, N.13.

Temporary Licences for Visitors to Denmark

The Danish licensing authority has granted special permission for foreign amateurs, including British licensees, to operate EDR's station OZ7EDR during the Ham Meeting at Hotel Nyborg Strand, from 28 May to 30 May, 1966. Mobile licences for this period will also be issued on request, provided that the following information and documents are submitted. The application, which should include arrival and departure dates, must be accompanied by a certified photocopy of the amateur's licence, or a statement by the appropriate licensing authority to the effect that the applicant possesses a current licence. The frequencies on which it is intended to operate must also be stated. Amateurs who are issued with these temporary licences will be obliged to operate under the terms of the Danish category B regulations, which impose a limit of 10 watts on 20, 40, and 80m. The callsigns will be suffixed by /OZ. The address for applications is Generaldirektoratet For Post Og Telegrafvæsenet, Centralpostbygningen, Tietgensgade 37, 2, Copenhagen V, Denmark.



At a special ceremony at Catterick Camp, Yorkshire, the Royal Signals Amateur Radio Society was presented with a complete transmitting/receiving station by the Marconi Co. It comprises an HS27 transmitter, HR28 receiver, and several ancillary units to provide complete facilities for operating on c.w., a.m., s.s.b. and RTTY, all housed in an impressive " container " measuring 12 ft. by 7 ft. The HS27 transmitter is to the right of the photograph; it can deliver 350 watts p.e.p. from a pair of TT16s, and is driven by a phase-locked oscillator synchronized with a frequency synthesizer. Stability is of the order of a quarter of one cycle! The HR28 receiver to the left covers 2 to 30 Mc/s, using a tunable first i.f., and automatically selects the i.f. bandwidth appropriate to the mode of reception in use. The centre units are the transmitter power supply, the aerial matching unit and the s.w.r. meter. Since the installation of the equipment it has been used extensively, particularly on RTTY, the best DX to date being an RTTY contact with KW6DS on Wake Island using a simple dipole aerial.

Modifications to the KW2000 for A.M.

By B. S. SUTHERLAND, G3IES*

EXCELLENT as the KW2000 undoubtedly is, like many other products manufactured for a mass market there are certain refinements and improvements that can be added to increase its existing versatility. The following modifications fall into three categories, any or all of which can be adopted as desired: (i) carrier insertion with full a.m. facilities; (ii) stabilization of 12 volt line when used mobile; (iii) general mechanical and electrical improvements. Whereas the transceiver is capable of a.m. reception by use of the exalted carrier technique, reception by this method is frequently marred by the presence of f.m. on the incoming signal, and in the case of some mobile transmissions this effect is worsened by the added complication of mechanical instability, thus making copy sometimes impossible. To overcome these difficulties it is necessary to switch out the product detector, and utilize a diode detector circuit.

To perform this function break the earth return circuit of V16 (carrier oscillator) at any point between the function

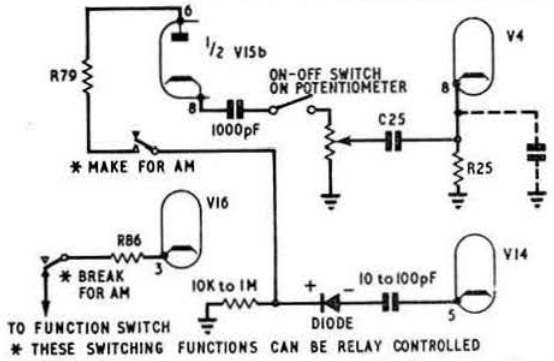


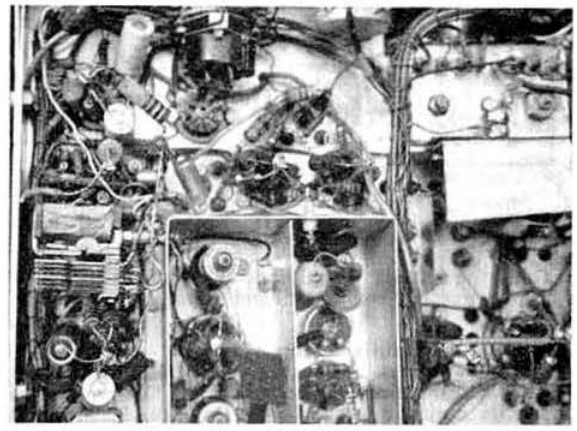
Fig. 1. Modifications to the KW2000 to provide diode detection of a.m. signals and carrier insertion for a.m. transmission.

switch (l.s.b.) and pin 3 (cathode) of V16. Make the circuit between the crystal diode and the product detector side of C127 and feed it through a 100 pF capacitor to pin 5 (cathode) of V14 (a.v.c. detector). The diode is wired with the positive side towards the switch and decoupled to earth via a 100K ohms resistor. Neither the capacitor nor the resistance values are critical and it would be worth experimenting with these to achieve the best results.

The provision of carrier insertion is equally easy, and is achieved by disconnecting the earth side of C25 on V4 (1st transmitter mixer) and connecting it direct to the wiper of the CARRIER INSERTION potentiometer of between 1K and 3K ohms in value. The hot end goes via a 1000 pF capacitor and the potentiometer switch to the cathode of V15B (product detector), pin 8. The other end of the pot. goes direct to earth. This control may be fitted in line with the existing controls on the front panel, beneath the meter.

All wiring must be carried out in screened lead. It will also be necessary to re-adjust the carrier balance control to offset the added capacitance of this additional wiring, and slight adjustment of IFT4 and L27 may also be required. When the carrier insertion facility is not in use the insertion control must be backed right off so that the wiper is at earth potential, as the smallest amount of resistance will cause an incipient carrier when in the s.s.b. mode. An r.f. meter tightly coupled to the coaxial aerial socket can be used to

* "Beechcroft," 26 Cock Road, Kingswood, Bristol.



The underside of part of the KW 2000 chassis, showing the additional relay and diode at the bottom left, and the Zener diode mounted on an isolated heat sink in the top right-hand corner.

provide a positive indication of any excessive carrier when re-balancing the modulator.

Should the thought of having to throw two switches not appeal both facilities can be relay controlled. This will require a 12 volt miniature relay with four change-over contacts, and the carrier insertion potentiometer will require a double pole switch incorporated. In order to be able to operate full carrier insertion coupled with A3 reception it is necessary to switch in this relay and at the same time be able to disable it automatically on TRANSMIT. This function is performed by the existing relay RL4 which is mounted on the side of the vox box. The spare pair of relay contacts which were extended to the external contacts of the speaker plug are used to actuate the additional relay. This necessitates opening up the vox box and altering the " make on transmit " contacts to break on TRANSMIT. One side of spring-set is earthed and the other side is wired via the on/off switch on the carrier-insertion pot through the additional relay to pin 2 (12V d.c.) of the power socket. An indicator lamp can, if desired, be wired to the relay side of this switch to show that the a.m. facility is operative.

Before operating the carrier insertion control, tune the transmitter for maximum r.f. in the s.s.b. mode, and switch in the carrier. Failure to do this adjustment will result in considerable distortion. The maximum p.a. current under A3a conditions must not exceed 50mA in the fully dipped state. The MIC GAIN control should be so adjusted to indicate a slight upward deflection on speech peaks, which is best achieved by using a r.f. absorption meter.

The remote switching facility utilized to operate the

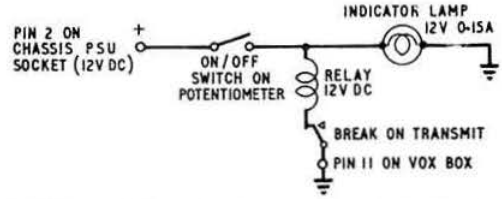


Fig. 2. Relay switching circuit for press-to-talk operation on a.m.

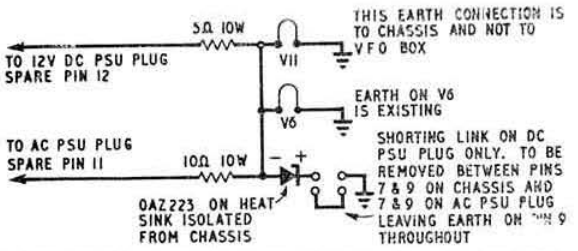


Fig. 3. Voltage stabilization circuit for 12 volt mobile operation.

additional relay can be re-incorporated by using one of the four springsets on this relay.

When using the transceiver mobile, it was observed that the varying input voltage from the generator caused a slow rise and fall in frequency, both on transmit and receive. On investigation it was noted that although the stabilization of the h.t. line was satisfactory and never shifted by more than 0·1 volt, the 12 volt line varied from between 11 and 14·5V, and it was this factor that was causing the drift to the oscillator (V11). It was apparent that to overcome this problem a stabilized l.t. line was essential, and this was achieved very successfully by the use of a Zener diode, the Mullard OAZ-223 being the most suitable, having a 7 watt rating at 6·2 volts. The only difficulty encountered here was the need to disable it when used in conjunction with the a.c. p.s.u. However, this was achieved automatically by utilizing a system of strapping on the a.c. and d.c. supply plugs. The exact details of this have been omitted as some of the later models have a slightly different wiring arrangement on the plugs; it should, however, be quite simple to modify your particular plug to conform to the circuit configuration. Should this circuit be used in conjunction with a vehicle fitted with a negative earth system, the polarity of the Zener diode must be reversed.

The actual wiring modifications are very simple and only require that the series heater connection between V11 and V6 be altered to put them in parallel, making sure that the earth side of V11 is returned to chassis and not to the v.f.o. box, as this would cause ripple on the signal. It is also important that the Zener diode be mounted on a small heat sink and *isolated* from chassis. The two series resistors must be of close tolerance and high stability and be mounted on top of the chassis in a position where adequate ventilation is possible. A suitable position would be on the rear of the chassis, behind the two plug-in relays.

The final modifications consist of (a) an additional hairline scored parallel and on the front side of the plastic cursor to overcome parallax, (b) mechanical damping of main tuning dial by the insertion of nylon or felt washers under the tuning control, and a metal plate to be fixed so as to cover existing aperture, (c) visual i.r.t. indication achieved by wiring dial light through the middle two of the four spare contacts at the bottom rear on the back wafer of the i.r.t. switch, so that the dial is only illuminated when on direct transceive. (d) Changing over the large knob on the function switch to i.r.t. tune position will give greater flexibility and (e) extending the r.f. gain control by substituting the existing 250K ohms pot. for a 40K ohms pot with a 82K ohms resistor in series with line (earlier production models only).

In conclusion the writer wishes to thank the many amateurs and friends throughout the UK and Europe who have helped both in spirit and deed with these modifications, particularly those who have donated so generously to the Radio Amateur Invalid and Bedfast Club for advance information on these details. He would be interested to hear of any additional improvements they, or others have undertaken themselves. G3IES is, incidentally, in no way connected with the KW organization, other than as a satisfied customer. They have been advised of this article, but in no way endorse it, and the writer therefore suggests that before undertaking any of these improvements you make sure that the set is out of guarantee.

Morse is the Ham's Best Friend

By E. CHICKEN, A.M.I.E.R.E., G3BIK*

THE SWL without a command of the Morse code is like the prospecter who spends all his life in a fruitless search for gold, because he lacks the proper equipment necessary to sort out the dull-looking grains of gold from the paydirt.

The short-wave bands are an absolute gold-mine of exotic sounding c.w. call-signs, your's for the taking, at any time of the day or night. When the bands appear dead to you SWLs who are straining your ears for weak telephony signals, try switching on the b.f.o., and a seemingly dead band will spring to life with many hitherto unnoticed c.w. signals. But what prevents *you* from wallowing up to your ears in this treasure? The Morse code!

How these little words strike fear into the hearts of so many SWLs who not only allow it to become an absolute road block on the road to the amateur transmitting licence, but who will not even consider learning to use the code because of some totally unjustifiable feeling that it is a kind of mystic rite to be performed by better men than they.

Absolute rubbish! The Morse code is the SWL's key to

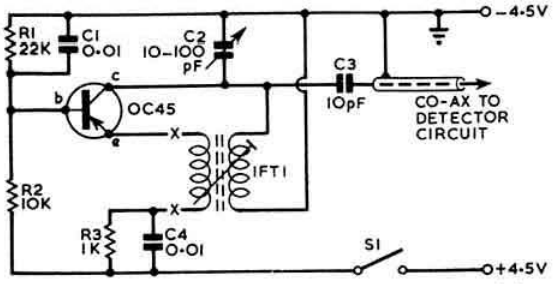


Fig. 1. A transistorized b.f.o. suitable for adding to a normal short-wave radio for receiving c.w. IFT1 is an i.f. transformer designed for the same frequency as the receiver i.f.

an untapped field of radio pleasure, and—make no mistake about this—it can be mastered very quickly, easily and pleasantly. Remember it is not some form of self inflicted punishment, but rather an additional source of enjoyment which can be yours for very little outlay. The benefits received will far outweigh the slight self discipline involved, so why not take the plunge *now*—jump in with your eyes wide open, and you will never regret it.

But how does one go about it you may ask yourself—is this not a task which requires the assistance of a second interested party? The short answer to that question is no. This venture is a purely personal one, to be embarked upon by you alone, and the following notes are for your guidance.

Let us first assess your requirements. We must assume that you already own a short-wave receiver, but is it capable of resolving c.w.? To do so, if it is a superhet, it must have a beat frequency oscillator (b.f.o.). Now there are many SWLs who do their listening on an ordinary broadcast receiver, which will require a b.f.o., for without one, the incoming c.w. signals will be heard only as clicks in the loudspeaker.

This requirement is easily fulfilled by the addition of a simple external transistorized b.f.o. as shown in Figs. 1 and 2. The layout is not at all critical, and provided the wiring is reasonably rigid it will work without any trouble.

An intermediate frequency (i.f.) transformer with a resonant frequency similar to those used in the receiver, acts as the collector tuned circuit and emitter feed-back winding. Remove any fixed padder capacitors from within the i.f. transformer, and connect a small tuning capacitor of about 10-100 pF range across the collector winding. This is conveniently done by mounting the capacitor on the metal panel of the b.f.o. and making the battery negative earth. This tuning capacitor forms a " pitch " control. Either a surplus " white spot " or an OC45 transistor may be used.

The only points to watch are (a) ensure that the battery polarity is correct before switching on, and (b) if it does not oscillate first time try reversing the connections to the emitter feed-back winding as shown at points X-X in Fig. 1.

Bear in mind that this b.f.o. is simply an unmodulated radio frequency oscillator, oscillating at a frequency only a few hundred c/s different from the i.f. of the receiver with which it is to be used. A simple method of determining whether it is oscillating and at what frequency, is to listen on the medium-wave band of the household broadcast receiver for the second harmonic of the b.f.o. Suppose for instance that the b.f.o. is to oscillate at about 465 kc/s, then the second harmonic should be found at 930 kc/s, which corresponds to a wavelength of roughly 323m. Adjust the core of the i.f. transformer collector winding until the b.f.o. tuning capacitor allows the b.f.o. frequency to swing on either side of 465 kc/s.

The output of the b.f.o. is fed via coaxial cable to the receiver, and the centre lead of the coax connected to the detector side of the final i.f. transformer in the receiver. Tune in to a strong broadcast station, preferably on the medium-wave band, and switch on the b.f.o. By rotating the " pitch " control of the b.f.o. a strong whistle should be heard in the loudspeaker on top of the broadcast station. Without touching the tuning of the receiver, alter the b.f.o. " pitch " control until the whistle is at what you consider to be a suitable pitch for copying Morse code, then leave it set at that position. Tuning round the short-wave bands will now produce hosts of c.w. (Morse) signals which were previously unrecognisable as such.

It is important to realise that the b.f.o. pitch control

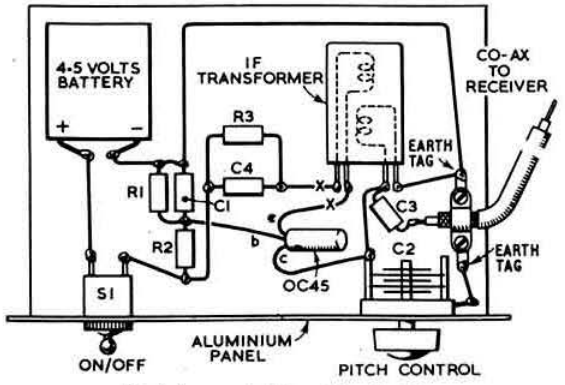


Fig. 2. A suggested layout for the b.f.o.

* 52 Marlborough Avenue, Grange park, Gosforth, Newcastle-upon-Tyne, 3

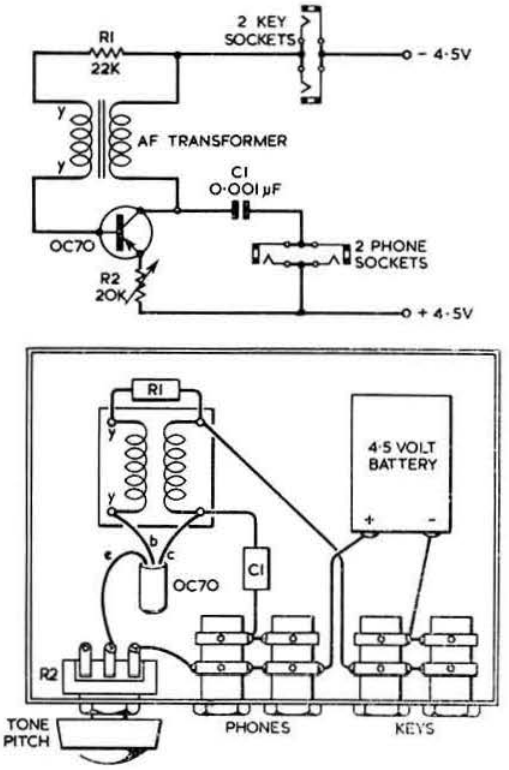


Fig. 3. A low frequency Morse practice oscillator and suitable layout.

affects only the pitch of the audio signal, and in no way influences the tuning of the receiver. In practice, once set to the desired pitch, the b.f.o. need not be touched except for the on/off switch.

You may find that merely by bringing the b.f.o. coaxial lead into the proximity of the detector circuit wiring there is sufficient injection to produce the required beat note in the loudspeaker.

The battery drain is negligible so the battery may well last for a year or so, but for the more ambitious types, to avoid using a battery, the battery leads may be connected across the cathode bias resistor of the receiver output valve, putting the positive lead to the cathode and the negative to chassis. This dodge is only recommended to those of you who possess a voltmeter with which to measure first the cathode voltage, and it assumes that the cathode resistor is fully decoupled by the usual 25-50 μF capacitor.

Switching off the b.f.o. restores the receiver to its original condition.

The next requirement is a Morse key. Do not be tempted into buying anything fancy such as a "bug" key or an electronic keyer—such devices are strictly for the expert telegraphist, and your immediate aim is to learn to *receive* morse.

To use in conjunction with the key, you will of course require a practice oscillator, and a cheap and easy to make answer to this need is shown in Fig. 3. This oscillator is guaranteed sure-fire with almost any cheap workable transistor, such as the surplus red, white or blue spot types, or an OC70, and again almost any small audio frequency transformer. It is shown with two paralleled sockets for the key, and likewise for the headphones, to allow simultaneous operation by two interested parties if so desired.

As in the case of the b.f.o. there are only two points to watch, (a) that the battery polarity is correct before pressing the key, and (b) if it does not oscillate first time try reversing the connections to the base winding shown as points Y-Y in Fig. 3. The variable resistor in the emitter return affords some degree of variation in the pitch of the audio tone. Should the tone range be unsuitable, try interchanging the transformer primary and secondary windings, or increasing the value of the base-biasing resistor R1, or use a different transformer.

The writer made a trial hook-up in less than ten minutes, which worked like a charm with any of four a.f. transformers picked at random from the junk box. The layout is entirely uncritical, but it would be preferable to mount both the oscillator assembly and the Morse key on the same small wooden base block (with some felt-cloth glued to the underside if the dining table is likely to be used as a practice desk). The battery drain is negligible and it works on any battery voltage between 1½ and 9.

The last and most important requirement, is a list of the Morse code symbols, and for completeness, a shortened list giving only the most commonly used ones is presented in this article.

Mastering the Code

So now you have the equipment, how best to start? The list of code symbols must to you at this stage look most formidable, yet it is in fact far from complete. The full list would include accented letters, semi-colons, abbreviated numerals, etc., all of which are totally unnecessary for your purposes, and even in the given list you need only concern yourself with the letters of the alphabet in the first instance. Once having mastered those, you can devote your efforts to the numerals 0 to 9, then, at a much later stage, and only after you are thoroughly familiar with the alphabet and numerals, progress to punctuation.

Now to begin the actual task of learning the code. It is desirable that you should give some thought to the different lengths and spacings of the elements used, i.e. the dots and the dashes, which from now on, will be referred to as dits and dahs, because in the pronunciation of these words the relative time duration of the dits, dahs, and spacing, is automatically a near approach to the correct timing. This is an important point of course, as you are on your own with no tutor or recording to give you oral guidance on timing.

The length of the dit is the basic unit, all spacings and dahs being directly related to this, ● indicating one dit length.

One dah is equal in time length to three unspaced dits, that is three dits side by side and touching thus:

●●●○○○●●●○○○●●●○○○●●●○○○●●●

(T) (T) (T) (T) (T)

Each element (dah or dit) used in the construction of a complete symbol is spaced from its neighbour by a time length equal to one dit, thus:

●○●○●●●○●

(F)

Each complete symbol (letter, numeral or punctuation) of a complete word or group, is spaced from the succeeding symbol by a time length equal to three unspaced dits (or one dah) thus:

●●●○●○●●●○○○●○○○●●●○●○●●●○●●●

| K E Y |

Each word or group is spaced from the succeeding word or group by a time length equal to five unspaced dits thus:

●○●○●●●○○○●○●●●○●●●○●○○○○○●●●○●○●○○○

|U P |D

●●●○●●●○●●●○○○●○●●●○●●●○○○●●●●●

O W N|

Given this information it will be appreciated that perfect

Morse requires the kind of precision normally acquired only by mechanical means, but do not be discouraged at all by this. You will soon be able to send Morse which though not as precise as machine sent Morse, will be *perfectly acceptable*, and to receive incoming Morse whether perfect or indifferent. So do not worry *too* much about precision just now, this will come later after you have actually been receiving good Morse for a while.

Now turn to the list of Morse symbols and work through the alphabet saying aloud the letters and symbols thus: A—di dah, B—dah di di dit, C—dah di dah dit, noting that the letter "t" has been missed off all but the final closing dit, in other words it is written now as in the normal process of enunciation. In the voicing of these symbols you will be near enough to the correct time relation between the dits and the dahs for all normal purposes.

There are several relationships which soon become apparent, for example:

E	dit	T	dah
I	di dit	M	dah dah
S	di di dit	O	dah dah dah
H	di di di dit		
N	dah dit	A	di dah
D	dah di dit	W	di dah dah
B	dah di di dit	J	di dah dah dah

Whether you care to memorise these easier symbols before memorising the slightly more complex ones like "Q" or "Y", is a matter of personal preference, but in the long run it is just as quick and easy to memorise them in alphabetical order. Commit to memory these twenty-six symbols by constant repetition, until they are readily associated with their corresponding letters, then try repeating them in correct alphabetical order missing out the actual letters this time.—di dah, dah di di dit, dah di dah dit, etc. Pause slightly between each letter, and after you have become reasonably proficient at sending the 26 symbols out loud without reference to the list, try to simulate the effect of spacing between words by leaving a slightly longer spacing after every fifth letter. This exercise will help to give an idea of the difference in spacing between letters and words, and provided you endeavour to standardize the lengths of pauses, timing will be quite acceptable.

At this stage it is vital to accept that you are trying to recognise the *sound* corresponding to a letter rather than the visual pattern of dits and dahs that make up the symbol. The ultimate aim is to be able to listen to incoming morse, and write down each letter as it arrives without thinking in terms of dits and dahs, just as though the telegraphist at the sending end was quoting the letter to you rather than sending the Morse symbol. This is a facility which comes quickly with practice.

A useful method of self-powered Morse which the writer has indulged in for many years is this. Whisper the words dah di dah dit, first normally, then bring your lower lip into contact with your upper teeth, and try again. You will find yourself making a sort of rushing sound which when

(*Continued on page 320*)

International Morse Code

Letters

A	Di dah	●○●●●
B	Dah di di dit	●●●○●○●○●
C	Dah di dah dit	●●●○●○●●●○●
D	Dah di dit	●●●○●○●
E	Dit	●
F	Di di dah dit	●○●○●●●○●
G	Dah dah dit	●●●○●●●○●
H	Di di di dit	●○●○●○●
I	Di dit	●○●
J	Di dah dah dah	●○●●●○●●●○●●●
K	Dah di dah	●●●○●○●●●
L	Di dah di dit	●○●●●○●○●
M	Dah dah	●●●○●●●
N	Dah dit	●●●○●
O	Dah dah dah	●●●○●●●○●●●
P	Di dah dah dit	●○●●●○●●●○●
Q	Dah dah di dah	●●●○●●●○●○●●●
R	Di dah dit	●○●●●○●
S	Di di dit	●○●○●
T	Dah	●●●
U	Di di dah	●○●○●●●
V	Di di di dah	●○●○●○●●●
W	Di dah dah	●○●●●○●●●
X	Dah di di dah	●●●○●○●○●●●
Y	Dah di dah dah	●●●○●○●●●○●●●
Z	Dah dah di dit	●●●○●●●○●○●

Numerals

1	Di dah dah dah dah	●○●●●○●●●○●●●○●●●
2	Di di dah dah dah	●○●○●●●○●●●○●●●
3	Di di di dah dah	●○●○●○●●●○●●●
4	Di di di di dah	●○●○●○●○●●●
5	Di di di di dit	●○●○●○●○●
6	Dah di di di dit	●●●○●○●○●○●
7	Dah dah di di dit	●●●○●●●○●○●○●
8	Dah dah dah di dit	●●●○●●●○●●●○●○●
9	Dah dah dah dah dit	●●●○●●●○●●●○●●●○●
0	Dah dah dah dah dah	●●●○●●●○●●●○●●●○●●●

Punctuation

Beginning of Message	Dah di dah di dah	●●●○●○●●●○●○●●●
Period (Full stop)	Di dah di dah di dah	●○●●●○●○●●●○●○●●●
Comma	Dah dah di di dah dah	●●●○●●●○●○●○●●●○●●●
Interrogative (?)	Di di dah dah di dit	●○●○●●●○●●●○●○●
Break sign (=)	Dah di di di dah	●●●○●○●○●○●●●
Wait	Di dah di di dit	●○●●●○●○●○●
Parenthesis ()	Dah di dah dah di dah	●●●○●○●●●○●●●○●○●●●
Fraction bar (/)	Dah di di dah dit	●●●○●○●○●●●○●
Erase (error)	Di di di di di di di dit	●○●○●○●○●○●○●○●
End of message	Di dah di dah dit	●○●●●○●○●●●○●
End of Transmission	Di di di dah di dah	●○●○●○●●●○●○●●●

THE MONTH ON THE AIR

By JOHN ALLAWAY G3FKM

AS a very occasional user of the top 20 kc/s segment of 80m, your scribe would like to begin this month's article with a few observations concerning the present situation in this part of our frequency allocation. One of the peculiarities of 80m from the DX point of view is the remarkably selective skip, a DX station may become audible, peak, and fade out again all in the space of ten minutes or less. This seems to be more noticeable the farther North one is located. Another peculiarity is the great scarcity of frequencies where the QRM level is low enough for a weak signal to be copied through it. This means that all who wish to contact a rare DX station must of necessity try to behave in an orderly manner to avoid interfering with each other and making the QSO impossible. The best answer to this problem seems to be for someone who is copying the DX station well to act as MC and try to keep the proceedings orderly. Unfortunately not all MC's and certainly not all stations wishing to make a contact seem to make allowance for the skip factor, and many patient and co-operative individuals find that by the time their turn comes the propagation has changed. So many operators *will* insist on wasting time by needlessly repeating their call and full location (for example), apparently oblivious of the many others waiting for their first QSO with Lower Slobovnia! All this can provide first class entertainment for those who do not suffer from raised blood pressure, but a little more consideration for others (coming also from those who will insist on carrying out inter UK QSO's between 3780 and 3800 kc/s), would make life much more pleasant.

News from Overseas

Ian Wollen, **4S7IW**, will be in the UK for about six months from about 1 May, and will have the logs for the last three years of his operation from Ceylon with him. Anyone still needing a 4S7IW QSL may obtain one by sending QSO details and a s.a.e. to the address given in QTH Corner. Ian will be using the call G3UZI whilst in England.

More news of events in Gibraltar comes from **ZB2AM.** He reports a rapidly increasing number of ZB2 licensees, including ZB2AT who is the first Gibraltarian to pass the examination and Morse test. Two distinctive calls have been issued—ZB2SS, which has been allocated to the local Sea Scout group, and ZB2VHF, which is the 2m station operated by ZB2AP from a site more than 1000 feet a.s.l. ZB2AM is still on 160m and has had contacts with W1, 2, 3, and 9. ZB2AR/MM is aboard HMS *Puma* in the South Atlantic, and visited ZD7, ZD8, and ZD9, on the way to South Africa.

Two well-known Jamaican stations will soon be leaving the air. **6Y5FH** is due to return to the UK in the late summer, and **6Y5XG** is already QRT and will be returning to G land soon to be G3HVG, after 18 years as VS7XG, VU2XG, VP5XG and 6Y5XG. QSL's for 6Y5XG should now be sent via G8VG (see *QTH Corner*). Frank, 6Y5FH, says that so far it has not been possible to interest any other Jamaican amateur in Top Band working, so the outlook for 6Y5-G contacts in future is not too good. Those who have been fortunate enough to hear or contact Frank on 160m will be interested to know that he was using a G5RV type aerial with the feeders strapped, the highest point of the system being only 27 ft. above ground. He did have a fairly extensive earthing system however.

News of the **8th Boy Scout Jamboree on the Air,** which took place on 16-17 October last, has just been received from VE3WSB, the Canadian World Scout Bureau station. This report mentions activity from stations in at least 67 countries throughout the world. The largest number of stations taking part were in Canada, numbering some 430. In the UK there were more than 140 stations taking part and these made contact with 113 other Scout stations in 25 countries. The Baden-Powell House station, GB3BPH, ran four transmitters continuously throughout the whole period of the Jamboree. It has been decided to hold the 9th Jamboree on the weekend of 22-23 October, 1966. This event seems to be a most excellent way of introducing newcomers to the ranks of Amateur Radio at the same time as bonding together young people all over the world, and deserves every support and encouragement.

Owing to pressure of business G4MJ has found it necessary to resign from the position of UK secretary of the **Ex-G Radio Club.** In future this post will be held by G2FUX, to whom all future correspondence and s.a.e.'s for BULLETINS should be addressed. His QTH is: F. W. Fletcher, 53 St. Ives Park, Ringwood, Hants. The Ex-G Radio Club is primarily for amateurs born in the UK who are domiciled abroad, and meets regularly on the air at 19.00 on Sundays on a frequency near to 14,345 kc/s. During June, July, and August nets are held on the first and third Sundays only. There is also a c.w. net, presided over by K5WZA, and held on 14,065 kc/s at 21.00 on Saturdays.

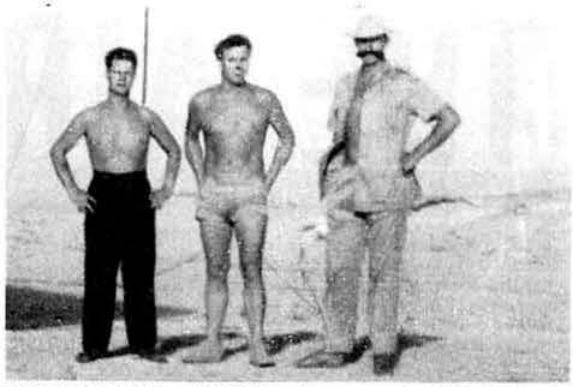
In a letter to G3FKM, **K6JAJ** mentions that he is willing to act as QSL manager for any DX station who would care to take advantage of his offer. Anyone interested in this generous offer should contact: Gary E. Haugen, 5566 Dewey Street, Riverside, California, USA.

G3NXS recently visited India, where he stayed with VU2FN, and had a most interesting time. VU2FN is Stan Dabrowski, ex-VE3ECN (c/o Canadian High Commission,

Equipment used for the recent VS9KRV expedition to Kamaran Island.

* 10 Knightlow Road, Birmingham 17.

Please send all items to arrive not later than 6 May for June, 10 June for July and 8 July for the August issue.



VS9ACC, VS9ARV and VS9AFR, who operated as VS9KRV during the March DXpedition to Kamaran Island.

New Delhi, 11.) and he is running 90 watts to a TA33 Jr. beam, some 45 feet above a flat roof. He is at present also making arrangements to operate the Collins equipment installed by Gus Browning in Sikkim last year. There are difficulties due to the political situation, but it is hoped that this will soon become less tense. Another well-known amateur met was Father Moran, 9N1MM, in Katmandu, who told Fred that he is particularly interested in contacting stations in the UK. In concluding his letter G3NXS also wishes to thank all the G stations which he contacted when operating from OH2DX.

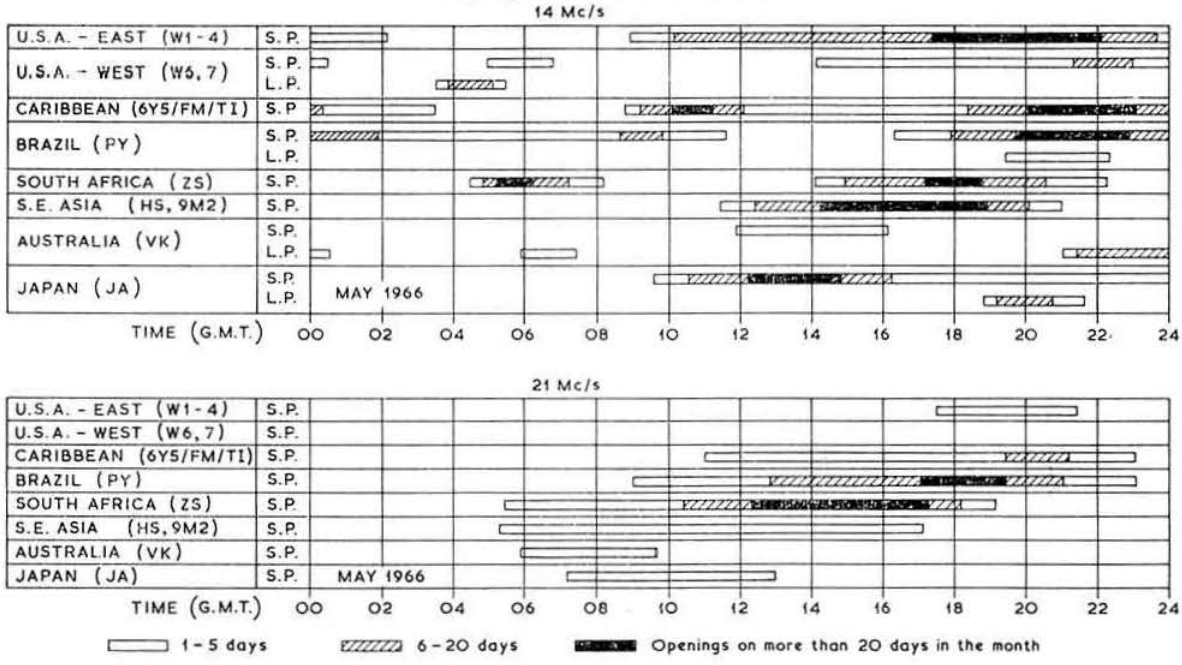
Two old friends have now reappeared with new call-signs. G3NUF, better known perhaps as VQ1GDW, is now in Uruguay and has been given the call CX9AAN. Willy, it will be remembered has also held the calls VQ8AQR, VQ8AR, VQ4IT, and DL2BT. GW3LXI, who recently caused quite a commotion on the bands as ZD7GP, is now in Liberia and has the call EL2AP.

Mrs Colleen Thorpe, Widow of ZL2AWJ*

Readers will no doubt be very pleased to hear that Ted's widow has been granted a pension by the New Zealand Broadcasting Corporation. At the same time a world wide appeal is being made by certain American organizations for donations to a fund being collected to help Mrs Thorpe. The fund is being administered by W4NJF, and it is understood that he has the support of *CQ Magazine* and *QST*. Gifts to this cause should be sent to: Gary E. Milius, 421 Saddle Rock Road, Norfolk, Va. 23502. Small amounts of cash may be sent to the US as gifts, and are easily arranged by any bank. It might be mentioned, in passing, that ZL2AWJ had been planning a DXpedition of

* See page 242, April 1966 issue.

Propagation Predictions



During May the midsummer conditions in the ionosphere become more fully established and the effect is an improvement in propagation conditions on 14 Mc/s. 28 Mc/s will be of little practical value for DX because of the present low solar activity. On days with F2 m.u.f.'s above average certain opportunities exist for contacts with Africa (12.30-18.30 GMT) and South America (15.00-19.30). On 21 Mc/s, as in the previous month, only Africa and South America can be worked with certainty, though this band as well as 28 Mc/s will liven up in the course of the month as a result of sporadic short skip contacts over distances of 500-1100 miles. These contacts are made possible by reflection from the sporadic-E layer. As stated at the beginning the midsummer season leads to an improvement in conditions on 14 Mc/s. This band will remain open noticeably longer in the evening than has so far been the case. Occasionally it may remain open all night, especially to Central and South America.

When conditions are favourable, contacts will be possible on 14 Mc/s with various DX zones via the long path, especially with Japan, South America and Australia. The long path can sometimes produce higher signal strengths than the short path. On favourable days (those with above average F2 m.u.f.'s) contacts with Hawaii will be possible from 06.00 to 09.00 GMT on the short path and exceptionally from 04.30 to 05.00 and from 09.00 to 10.00. Propagation conditions on 7 and 3·5 Mc/s will differ little from those of last month. Occasionally in the latter half of the night on 3·5 Mc/s local traffic beyond the ground wave area may be interrupted by the dead zone.

The provisional sunspot number for March 1966 was 24·5 with the period of greatest activity lying in the second half of the month. The predicted smoothed sunspot numbers for July, August and September are 35, 37 and 39 respectively.

The following amateurs and wives attended a recent dinner in South Africa (left to right): Mervyn, ZS6BIG; Judy, ZS6BIG's XYL; Judy, G3LZN's XYL; Norman, ZS6ATA (with beard); George, G3LZN (in corner); Deral, XYL of SWL Roy; SWL Roy, and Judy, ZS6ATA's XYL.

his own to Niue and other places before Chuck and Don set out, and that they invited him to join them. He bore the entire cost of his part of the trip out of his own pocket.

Top Band News

In his March **160 Metre DX Bulletin**, W1BB summarizes the very considerable achievements of the last Top Band season. He will be making an extensive tour to the Far East and the Pacific area late this year, so will miss the beginning of the next DX season. However he hopes to be back home in time for the *CQ* 160 *Metre Contest*. Stew asks intending correspondents not to send mail to his home address to reach there between early September and late January. One point which is mentioned in the Bulletin is that it is quite likely that the amateur occupancy of this band in Region 1 will come under attack at the ITU Conference in Yugoslavia in May. It is to be hoped that the amateur representatives (which include the Society's President, G2BVN) will be able to keep our privileged position on the band intact.

Another point raised by W1BB is the desirability, or otherwise, of running the " First Timer's Tests " again next winter. He would welcome comments and suggestions on these events, which seem to the writer to be a very excellent idea.

Only three reports have been received of DX heard or worked on 160m this month. Stations reported include: OH2BH (05.00), OH0NH (20.30), VE2UQ (23.12), VE3QU (06.18), VO1BD (05.50), K2GAL (05.54), W3BUR (05.52), W8HGW (05.54), ZB2AM (22.58), ZL3RB (05.30-06.37), and 6Y5XG (04.30-05.31).

The following call-signs have appeared on the band from time to time, and all appear to be pirates: F5DP, FA8LP, IIIZ, IS1FR, SP9LP, UA2AL, UA9KJD, and ZM7AA. With reference to the U calls, the Central Radio Club of the USSR has confirmed that no 160m operation is provided for in the international regulations for Russian stations.

A note has also been received from G3NMR to the effect that EL7B has never operated on 160m either from his /MM location or from his home, and in fact he has no equipment for the band.

WA1CAG reports that he will be active on 1801kc/s from 04.00 to 06.00 daily during July and August, and would be very interested to receive any reports of his signals being heard in Europe.

DXpeditions

The DXpedition to **Kamaran Island** by the Royal Signals ARS seems to have been a great success. The three operators of **VS9KRV** (VS9ACC, VS9AFR and VS9ARV) managed to make a total of 3337 QSO's on five bands, over 2000 of which were on 14 Mc/s, which was found to be by far their best band. Operations commenced within six hours of arrival on the island on 4 March, and for the following nine days were taking place on at least two bands continuously. The first contact was with ET3HL on 21 Mc/s. A number of W's, VE's and VK's were contacted on 3·5 Mc/s, and quite a few G and other European stations also had 80m contacts. In all some 112 countries, 45 states and 38 zones were worked. Some trouble was encountered when the 20m beam was blown down, but it was back in position in a couple of hours, bent but still functioning! A breakdown of the log shows that VS9KRV had 38 QSO's on 10m, 855 on 15m, 2002 on 20m, 149 on 40m, and 293 on 80m. QSL's should be on their way soon, via the RSGB. There is some hope that a further expedition may take place during May—this time to Kuria Maria, VS9H. Further details are awaited.

Members of Region 4 (Limerick) of the IRTS will be operating from Clear Island, off Co. Cork, during Whit weekend 28-30 May. Their call-sign will be **EI0R**, and they will operate on all bands 80 to 10m on a.m., s.s.b., and c.w. On 2m they will use a.m. and c.w. QSL's should be sent to the address in *QTH Corner*, and will be answered via the bureau.

Latest news from W2GHK is that all QSL's for LX2UW and also Gus Browning's African activities have now been sent out. Stu may be visiting Tunisia in the not too distant future, and has hopes of obtaining a 3V8 licence. In future DOTM will be handling QSL cards for ZD9BE, who was due to receive s.s.b. equipment about the middle of April.

There is still no definite information available concerning the proposed expedition to **Rio de Oro**. Unfortunately the trip had to be temporarily postponed on account of a bereavement in EA4CR's family. The call to be used is said to be EA9ID.

ET3AC is reputed to be making a trip to **French Somaliland** possibly between 16-20 May. QSL cards for this operation will be dealt with via K8UZA.

There is still no definite news of VQ9HB. Unofficial rumours say that Harvey will not now be making any more trips, but is about to leave the Seychelles for good, and is disposing of his boat.

Don Miller finally opened up from **Minerva Reef** on 16 April, using the call 1M4A, and working in the s.s.b. Contest. From this location he is hoping to proceed to Maria Teresa Reef for a few days where he will use the call-sign W9WNV/FO8M. After this he should return to Fiji before moving on to the Manihiki Islands (ZK1).

Awards

The League of Radio Amateurs of Mozambique has made available a new award, to be known as the

Stuart Meyer, Don Miller and Gus Browning.

"**W-CR7-A,**" for any foreign amateur submitting proof of having contacted 15 licensed CR7 stations since 12 January 1949. Amateurs in ZE, ZS, 5H3, 5Z4, 5X5, 5R8, 9J2, 9Q5 and CR6 need 25 QSO's. The appropriate QSL cards plus a list mentioning any stations worked but from whom no QSL has been received should be sent together with 5 IRC's to: LREM, Caixa Postal 812, Lourenço Marques, Mozambique.

Details have been received from Belgium of two awards. The first is one which is being sponsored by the International Group of Knokke Radio Amateurs. This is the **IFC Award,** and is obtained by contacting at least 10 members of the group, and then forwarding their QSL's with three IRC's to: ON4LV, Lippenslaan 284, Knokke, Belgium. Members are known to include DL2DH, F8RU, ON4's, DJ, IB, IO, LM, LO, LV, PU, UM, ON5's IB, JU, LO, LV, and PA0PAL. Applicants are advised to write to ON4IB, PO Box 38, Bruges 3, Belgium, for fuller details. The second certificate is the new "**WFBA**". This is given to those who can produce proof of having contacted four members of the Belgian Forces stationed in Germany, since 1 January, 1965. Applications should consist of the applicant's own QSL's for the stations contacted and a copy of the log showing the date, time, band, mode, reports exchanged etc., and four IRC's. They should be sent to DL2UZ, E. Tassin, Am Romerhoff 46, 51 Aachen, Germany. Known Belgian holders of DL calls include DL2BG, BV, BW, BY, BZ, CH, DH, KQ, QW UZ, VP, WH, DL5XD, XT, DL8PF, and DJ0BH.

Martin, KX6BQ, carries the flag of the Ex-G Radio Club high from his latest location in the Marshall Islands. He will soon be the proud possessor of 6 element beams on 10 and 20m, a 5 element beam on 15m, and a 3 element beam on 40m. This in addition to a 28 ft. dish for 432 Mc/s moonbounce experiments.

QTH Corner

EA6AR	Franz Turek, DL7FT, Petunienweg 99, 1 Berlin 47, Germany.
EI0R	Terry Deegan, 2 Casement Avenue, Limerick, Eire.
ET3AC	via K8UZA, Roy Shrout Jr, 513 Riverside Drive, Welch, W.Va.
W9WNV/FO8M	via W4ECI.
FW8RC	via FK8AU, Raoul Thomas, 6 Rue Orly, Noumea, New Caledonia.
HS1AK/P	Box 11/121 Bangkok, Thailand.
WA4QKY/KG6I	via K6UJW, Joe Fischer, 4825 Regalo Road, Woodland Hills, Calif. 91364.
K6KII/KG6	via K6JIC 4845 N. Baldwin Av. Temple City, Calif. 91780.
KS6BH	via K6CYG, Sheldon C. Shallon, 11058 Queensland, Los Angeles, 34, Calif.
KS6BO	via W4WYX, 504 Hiawatha Trail, Georgetown, Kentucky.
KS6BV	via K4TWF, 4539 Kings Park Drive, Memphis, Tenn.
KW6EL/KW6EM	ex-KB6EPN, KB6CB, Box 96, Wake Island, 96930.
MP4BFT	via K0SZY, Marion Parrish, Wages Rte, Yuma, Colorado.
MP4TBO	via VE1AKZ, J. H. McLellan, P.O. Box 631, St. John, N.B., Canada.
PY7ACQ/0	P.O. Box 842, Recife, Brazil.
ST2BSS	Jim Collins, US Embassy, Khartoum, Sudan.
SU1DL	Burghard Kinzel, Cairo-Helwan High Institute of Technology, Box 24, Butz, Germany.
VK9CJ	Box 204, Port Moresby, Papua.
VK9GN	Box 73, Ukarumpa, TNG.
VP2NW	via W2CTN.
XW8BM	W. F. Lamson, 2188 Parkwood Av. Flint 7, Mich. USA.
ZD9BE	via DOTM.
ZF1RD	via K8LSG, Roger de Busk, 123 Cloverly, Grosse Pointe Farms, Mich.
1M4A	via W4ECI.
4S7IW	Ian Wollen, 23 River Green, Hamble, Southampton.
5X5IU	R. Roberts, 1 Berlin 42, Tempelhoferdamm 88, Germany.
6Y5XG	via G8VG, W. H. Windle, 121 Laburnum Av. Dartford, Kent.
9J2IE	via W2CTN.
9M6AP	via G3TXE, A. Parker, Little Boundston Lodge, Boundston Rd, Farnham, Surrey.

QSL Managers

DOTM	W2GHK, P.O. Box 7388, Newark, NJ, 07107.
W2CTN	156 Ketcham Avenue, Amityville, NY, 11071.
W4ECI	3101 Fourth Avenue South, Birmingham, Ala. 53233.

RSGB QSL Bureau: G2MI, Bromley, Kent.

Contests

The **12th European (WAE) DX Contest,** sponsored by DARC, will be held in two parts as usual, the c.w. section from 00.00 on 13 August to 24.00 14 August, and the telephony section on 10-11 September. All bands 3·5 to 28 Mc/s will be used, and contacts for points must be between European and non-European stations. During each contact numbers will be exchanged, consisting of report followed by the serial number of the QSO (starting from 001). Complete QSO's count one point, except on 3·5 Mc/s where they count as two points. European stations use the DXCC list effective on 1 August, 1966 as multipliers, additionally each call area in W, VE, VO, JA, VK, ZL, PY, ZS, and UA9/UA0 counts as a multiplier. Non-European stations use the *WAE* list. Points may also be obtained by sending and receiving QTC's, and it is suggested that intending participants send a s.a.e. to G3FKM for full information on the contest.

QRP News

This month an interesting point with regard to QRP contests is raised by G3URX. He points out that there may be a very considerable difference between the power output of a transmitter designed specifically for low power, and the output of a higher power transmitter which is under-run for the purposes of the contest. Why not allow c.w. the same concession as s.s.b. and measure it as output? Ten watts to a vertical has produced QSO's with HK3ADO, PY2BDO, PY7VLS, VE3DKB, and about a dozen W's.

The latest news from G3TMB, who has not been very active is that he has managed to raise 9J2DT on c.w. and 9L1JP on a.m.—both on 10m. As will be seen from a perusal of the call-signs listed under the *Band Reports* section, there is a great deal happening on 21 and 28 Mc/s. Both are ideal for the QRP operator, and in fact your scribe wonders just what will be possible if 28 Mc/s really opens up in view of the quite fantastic DX which was workable during the last sunspot maximum.

It would be interesting to receive more support for this section and your scribe would very much appreciate hearings from more of the low power types. Could it be that there are now only a very few who still run QRP?

DXCC News

It has been reported that ARRL have decided not to count QSL cards from the Ebon Atoll, and Comoran Island groups after all. Following an official announcement in "*QST*" of their attainment of country status this seems to be rather strange! Perhaps this may be *something* to do with April? Clarification of the situation is awaited with interest.

Band Reports

With the increasing hours of daylight there has been a very marked improvement in conditions on all the h.f. bands. The only band which appears to have disappeared from the DX scene for the summer is 160 metres. After last month's blaze of glory when several G's succeeded in achieving the ultimate in DX by working ZL3RB there have been no further reports of any other unusual happenings. This may be because the other bands are so good that few of the regular reporters have been listening on 160! The amount of DX being heard on 10 and 15m is now considerable, and one correspondent sums up the situation by saying that you cannot tell when 10 is open, except at weekends, because there appears to be so little weekday activity. At long last 15 is beginning to catch on, and some very impressive DX has been heard, but again there is room for much more activity. As usual at this time of year 20 is delivering "the goods" for nearly 24 hours most days, and the Pacific area is being heard nearly every morning, with the usual pile-ups of apparently partly deaf callers in the s.s.b. band. Why *must* G1ABC keep calling when the distant station says "QRZ the G9XY?" Very many thanks are due to this month's contributors which include: G2BOZ, G2LB, G3DO, G3AAE, G3HCT, G3HDA, G3IGW, G3JFL, G3KSH, G3NMH, G3SML, G3SVD, G3UML, G3UOL, G3URX, GW3AX, G4MJ, G8JM, G8VG, BRS20317, BRS26676, BRS26928, A3942, A4038, A4182, A4308, A4370, A4431, A4489, A4552, A4641, A4776, A4871, and A4955.

3·5 Mc/s C.W.: FG7XX (21.00), HI8XAL (23.40), KV4CI (22.30), OY7ML (21.00), TF3EA (21.00), UJ8AC (23.45), VK2AP (23.35), VP7NS, VP9WB, VS9KRV, (all 21.00), ZD7IP (03.45), ZD7SA, ZL3FZ, (06.54), ZL4BO (07.20), 5N2AAF (01.20), 6Y5BB (01.10), 9A1TAI (23.28), 9H1AB (21.00), 9V1LP (21.20).

3·5 Mc/s S.S.B.: CN8MT (21.20), HB0ABS (00.05), HI8XAL (06.00), HP1JC (06.59), WA4MFS/KP4 (07.05), KV4CF (07.20), VS9KRV (21.45), ZC4RM (22.20), ZL3FT, 4LM (06.49), 4X4IX (21.44).

7 Mc/s C.W.: CO2BO (03.20), CR4BB (22.30), HI8XAL (08.22), HP4JQ (23.30), HR5LB (07.20), JA4BJO (17.33), KG4CK (07.40), UA0PY (13.30, 23.45), UA0UX (16.12), VK2PV (07.54), VP2GAW (07.30), VP6BW (00.23), VP7NN, NQ, NW (23.45-02.45), VP9BP (00.08), VS9KRV (21.45-23.45), VS9MP (02.15), W6KYG (02.14), W7AYY (07.22), YN1CJ (08.20), ZD7IP (21.00), ZD8J (formerly VQ9J-23.00), ZL1, 2, 3, 4 (06.42-07.30), 6Y5XG (00.55), 9M2LO (20.52), 9Y4LT (00.15).

7 Mc/s S.S.B.: (All 21.00 to 22.00 unless otherwise stated). EA6AR (21.45), EP2BU, ET3AC (22.46), FG7XL (08.26), HP1JC (07.00), JA4BJO, JA6AK, JA6CMI, W1FZJ/KP4, MP4TBO, OA4NVF (06.46), OD5EJ (20.15), OY7ML, OX3JV, LP, PY1, 2, 4, 7 (20.00-22.00), SV0WR, UD6BR, VE1ASJ, VK's 2AVA, KBM, WI, 3ATN, 4BQ, VP6KL (21.20), VS9AFR, VS9KRV, XE3RE (06.49), XW8BM (20.27), YV1PW (07.15), ZL2BCG (07.00), ZS1JA (20.49), 7X2AH (19.54), 9J2DT (21.02), 9M2OV (21.37), 9Y4's VU, VT, GP.

14 Mc/s C.W.: CR3AD (08.41), EP2RV (11.06), HL9KF, KC4USK (08.15), LA3P/P, (17.27), LU1ZG (19.30), PY7ACQ/O (21.05), SU1DL (17.00), TR8AG (21.16), UM8KAI (14.00), VP2SJ (13.30), VP3YG (22.10), VP8HZ (21.22), VP8IZ (19.00), VQ8BJ (17.27), VR2DK (09.05), VR2EK (08.30), VS6DS (11.35), VS9MP (19.30), XE1TD (18.00), ZD7IP (18.36), ZD8AR (21.50), ZF1XX (11.57), 4S7DA (18.10), 4S7EC (16.27), 5W1AZ (08.00), 7X0AP (18.35), 9M6KS (15.49), 9V1RS (15.30).

14 Mc/s A.M.: EA6BG (17.30), ET3USA (19.40), FR7ZN (17.18), VQ8BJ (17.34), 5H3JL (19.36), 9V1NP (10.32).

14 Mc/s S.S.B.: BV1USA (16.50), CE6FK (23.49), CP6GC (21.23), CR5SP (07.02), CR9AI (16.20), CX9AAN (22.12), DU1MR (13.40), DU6TY (15.15), FO8AB (08.12), FO8AG (07.40), FY7YD (21.20), FW8RC (09.18), HI4XAB (20.26), HI7XTM (23.05), HK0AI (21.26), HK0AI/P (Providencia Is.) (23.00), HP6MC (21.55), HR1CP (22.10), HS1AK/P (15.50), JA8MM (12.24), KC4USW (06.45), KC6BW (10.30), KG6's ALF, ALT, NAA (11.30), KH6FBJ (09.04), KJ6DA (17.45), KM6BB (07.13), KM6CE (07.40), KS4CA (08.20), KS6's BH, BO, BV (06.55-08.20), KW6EM (08.15), OA7AX (18.44), OY7S (13.50), PJ2MI (22.25), PJ4AC (21.02), TU2AS (16.43), UA1KED (18.10), UA0YP (15.11), VK9XI (14.39), VP1PB (21.15), VP2AA (22.40), VP8CW (21.53), VP8HZ (21.20), VP8IH/MM (21.33), VQ8AX (16.10), VQ9HB (16.33), VR2AK (07.00), XW8BM (15.09), YV7AV (22.55), ZL4CH (Campbell Is.) (08.16), ZL5AA (Antarctica) (07.30), 1M4A (14.40), 5Z4IR (19.31), 6O1AU (18.46), 6Y5XG (22.15), 9K2AM (16.37), 9M6NQ (14.50), 9V1ME (13.47).

21 Mc/s C.W.: CE4EC (18.55), CP5EZ (19.22), CR7IG (08.50), FG7XX (12.46), FL8MC (11.21), HM1AB (08.11), JA6AK (08.40), KR6MM (09.45), KV4CI (19.08), LA2MA/MM (10.16), LU8OI (20.02), MP4TBU (09.22), OX6BBN (15.10), PZ1BE (15.35), SU1IM (12.40), VK9CJ (10.40), VK9GN (10.30), VP6PJ (18.20), VQ8AW (12.58), VS6FO (09.25), VS9KRV (11.14), VS9MP (13.30), VU2GC (13.00), K7ABV (16.10), XE1OE (17.20), XW8BM (12.35), ZD5M (16.50), ZD7IP (12.28), ZP5LS (17.40), 5R8CQ (16.40), 5U7AC (16.35), 6O6BW (11.29), 7G1A (18.28), 9J2DT (12.25), 9L1TL (18.25), 9Y4LZ (20.01), 9Y5XG (17.12).

21 Mc/s A.M.: CR4AG (17.45), CR7FR (07.55), CT3AQ (17.38), ET3WH (14.02), KV4CX (16.12), KZ5RY (18.00), LU5DZ (16.48), MP4BBA (14.10), PY5AQM (17.40), SU1IH (17.13), TN8BK (08.35), TT8AB (16.36), TU2AN (17.04), UA9TT (10.16), VK3PQ (10.14), VS9ARK (11.37), ZS9G (14.30), 5A1TV (15.37), 6W8DR (17.35), 7Q7LC (16.45), 7X2AH (12.14), 9K2AD (14.35), 9L1JB (18.20), 9Q5NG (17.15).

21 Mc/s S.S.B.: CE3OX (17.54), CP6GC (20.15), CR6LAS (16.48), CR7BT (16.44), CX8AAW (20.01), EL3C (16.17), DU2CV (08.38), ET3WH (12.05), FS7RT (13.10), HC1AB (16.51), HK6RV (21.13), HZ1AB (16.16), JA2BTV (08.04), KA2TJ (11.17), KP4CL (18.20), KV4CX (16.12), LU3AEF (19.40), MP4BBW (14.44), MP4TBO (12.40), OA7AX (18.50), PY7ACQ/O (15.09), TU2AF (12.24), VE0MY (18.50), VK6RM (09.30), VK7AAC (11.11), VK9DR (09.30), VK9GN (10.34), VP3AA (18.30), VP8CW (18.25), VQ9TC (18.02), VS9PCZ (15.24), XE1OE (16.24), XW8AZ (11.20), YA3TNC (13.35), ZD7RH (10.32), ZS3XG (18.36), ZP9AY (19.49), 4S7IW (10.45), 4U1SU (12.45), 6O1AU (11.51), 7Q7BN (17.07), 9Q5PA (18.10), 9M2DQ (11.05), 9U5BB (17.49).

28 Mc/s C.W.: CR7IZ (18.10), PY5ASN (19.07), ZC4CI (11.25), ZD7IP (11.55), 5N2AAF (10.17), 5Z4JX (12.02), 9J2GJ (12.42), 9Q5LJ (12.39).

28 Mc/s A.M.: CR6AF (16.17), CR7BV (16.16), CX4DE (17.40), CX7AAS (18.35), EA8FU (19.01), PY2EQ (17.40), UL7APG (11.20), ZE2JA (13.53), ZS2OM (14.50), ZS9G (15.30), 9J2DT (14.05), 9Q5LJ (15.27).

28 Mc/s S.S.B.: CE6CC (19.50), CE6EW (19.52), EL's 2A, 2R, 2S, 8B (around 17.25), KP4BKW (20.27), LU1DTL (20.03), PY2PA (17.25), TL8SW (14.50), VP8CW (18.04), VQ9TC (17.51), VS9AJC (13.18), VS9PCZ (15.30), W2JBK (19.25), WA4NHX (18.30), YV5AGM (18.50), ZD8RD, WZ (15.10), ZE1AA (16.40), ZS1JA (13.58), ZS6DF (17.00),

5H3JJ (18.21), 5X5JK (18.58), 7Q7RM (16.12), 9J2BK (13.42).

DX Briefs

CR7GF is said to have licences now for FH8, FR7 (Europa), FR7 (Glorioso), FR7 (Juan de Nova), FR7 (Tromelin) and VQ9 (Aldabra). However, the financial side of the trip is causing difficulties and no definite dates can yet be given.

The only resident amateur in **Nauru**, VK9AM, has been reported on 21,230 kc/s a.m.

Smitty, 6O1AU, hopes to be operating from **Jordan** for about one month in September this year. He is also reported to have a YI licence.

There are four active XW8 stations at present—XW8AX, 8AZ, 8BD, and 8BM. The last mentioned is about to leave Laos for Spain very soon.

Iris and Lloyd Colvin, who toured the Pacific area recently, have been issued with the calls G5ACI/WB6QEP and G5ACH/W6KG respectively, to use during their forthcoming visit to the UK. They are expected to operate from GD and GC.

LU1AZ is reported by VP8CW to be on from the South Orkney Islands. Further information about this one is awaited. VP8HO and VP8IE are likewise reported to be on South Georgia.

W0MLY has been trying to obtain permission to operate from Annobon Island but has discovered that only Spanish nationals would be issued with permits.

KM6BI reported, during a QSO with G3HDA, that the station's address is incorrect in the *Call Book*. The writer has had his QSL card returned by the Postmaster in San Francisco although the latest address was used. Apparently only FCC may authorize the publication of the correct address!

All correspondents are thanked for their co-operation, and acknowledgement is made to the *West Gulf DX Bulletin* (W5IEJ), the *LIDXA Bulletin* (W2FGD/W2MES), *DX'press* (PA0FX), *The DX'er* (Northern California DX Club), *Florida DX Report* (Florida DX Club), W1BB's *160 Metre DX Bulletin*, and *DX News-sheet* (Geoff Watts). Please send all items to arrive not later than **6 May** for June, **10 June** for July, and **8 July** for the August issue.

Morse is the Ham's Best Friend

(Continued from page 314)

tongued by the dahs and dits, produces a not too unpleasant quiet " Morse-like " noise capable of clean " dry " keying up to 40 w.p.m. This method might sound a little odd, but quite seriously, it provides an excellent means of sending practice which can be audible to yourself without attracting undue attention. Morse soon becomes such a part of everyday life that you find yourself quietly sending bus-signs, adverts, nameplates etc. In fact, you should endeavour to send to yourself every written word that your eyes scan when not otherwise occupied. There is immense pleasure to be had from trying to keep pace with the rolling credit titles on TV for instance!

The Morse Key and Practice Oscillator

Sit comfortably at the table with the key positioned at the table edge close by the right hand. Rest the tip of the forefinger on the top of the key knob and position the thumb and middle finger down the side of the knob on either side of the forefinger. This is, of course, the natural position of the fingers—do *not* grip the key knob, but rather let the weight of the wrist falling downwards press the key. The correct motion is for the wrist to move up and down without undue movement of the forearm and elbow, plus a gentle pressure of the forefinger. Provided the key return spring is not too tight, nor the gap too great, this style produces least fatigue.

Do not try to rush things—far better to be thoroughly familiar with the alphabet and to be able to send slow rhythmic Morse than to send stilted faster code. This Morse keying practice is of great benefit since it is impressing the true sounds of the different symbols upon your mind. Put in as much time with the key as you can afford, and try your hand at sending groups of mixed letters, by compiling a hundred or so well mixed five letter groups.

After a while you will want to assess your sending speed, and quite rightly so! To do this, count the number of five letter groups you can send—without errors—in three minutes, and divide by three to give your w.p.m. Alternatively, working on a basis of five letters to the word, send for three minutes from any plain language text, count the total number of letters sent and divide by fifteen to get your w.p.m. (to a fair approximation).

From now on the world is yours. Switch on the short wave receiver and slowly sweep the full dial listening for c.w. (Morse) signals. Within minutes you will be able to differentiate between the steady rhythmic sound of the automatic senders, and the hand sent signals, even though the speed may be too great for you to copy. Ignore the high speed stations and look for slow sounding keying. Do not expect to be able to copy it immediately, after all there is a difference between sending to yourself and receiving incoming Morse, but you will very quickly adapt yourself to this new role. There is a surprising number of slow sending stations to be heard. Many of them are commercial stations, repeating their identification letters or call-signs.

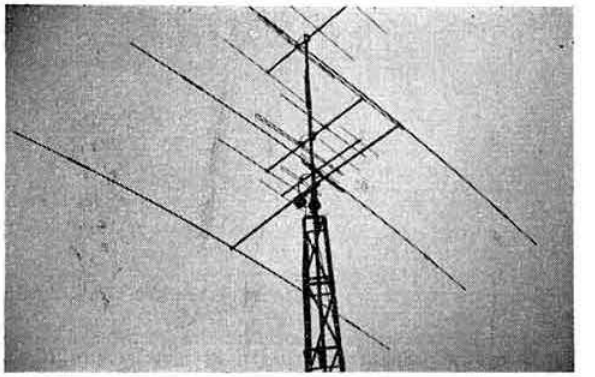
Remember that radio conditions often call for low speed Morse. Most of the writer's best DX contacts have been made at speeds no greater than 5 w.p.m. Even those cursed jamming stations which have marred your reception of so many short wave broadcasts, identify themselves frequently in slow Morse.

Should you find difficulty in copying incoming signals, a multi-speed tape recorder may be put to good use, by recording some Morse signals at the highest tape recording speed, and replaying it at a lower tape speed. For example, 20 w.p.m. Morse recorded at $7\frac{1}{2}$ in/sec. will give 10 w.p.m. Morse when replayed at $3\frac{3}{4}$ in/sec. and 5 w.p.m. at $1\frac{7}{8}$ in/sec. Naturally, the pitch of the replayed signal will be lowered too, so it would be best to record at a pitch slightly higher than normally used.

Now learn and practice the numerals using the same technique as for the alphabet, and when thoroughly familiar with them, look to the punctuation. The punctuation symbols are generally longer than those of the letters and numerals, and are sent as complete symbols, not as a combination of letters,—for example the End of Transmission symbol is sent as di di di dah di dah, not as SK.

Please, do not *ever* use the international distress signal, even in private practice—this has been deliberately omitted from the list of symbols, and we must regard it as absolutely sacrosanct, for obvious reasons.

So you are at last on your way! Do not be hesitant and do not slacken in your practice. This vast treasure chest lies open before you, opened by a simple Morse key, and rest assured that by the time the next issue falls on your doormat, you will be tapping hitherto untouchable DX treasures. Morse code is truly worth its weight in gold dahs.



G3TXB's tower supporting an h.f. TA33 jnr beam, a 2m five element Yagi, and a 4m 4-over-4.

Station behind the Call

G3TXB*

AN ardent SWL for over 20 years Ray Vincent developed a keen interest in Amateur Radio and following visits to local shacks he decided to study for the RAE. Through the assistance of G3PIH, Ray obtained his licence in February, 1965, and since then the call G3TXB has become well known on v.h.f. and the DX bands. Within four weeks of obtaining his licence Ray had worked 150 stations on 4m.

What makes this remarkable is that Ray lost both his sight and hands when serving with the 8th Army at Tobruk in 1942. He was married in 1942 and his daughter now keeps his log book up to date from recordings made during QSOs. Before Amateur Radio became a feature of Ray's life, his time was devoted to running a gymnasium for local youths and football clubs. However, those activities have been given up and the room now houses his radio equipment.

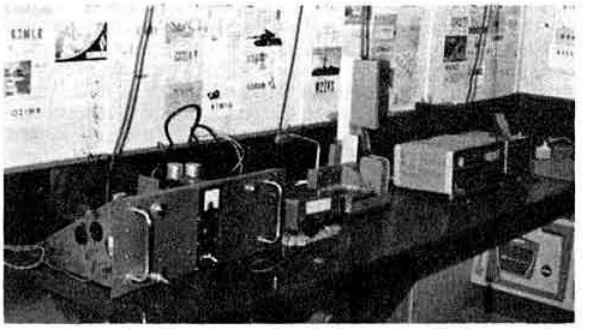
For the h.f. bands Ray runs a KW2000A into a Green LA600 linear, for 4m a TW Communicator running 15 watts and for 2m a Pye base station. Aerials used are, for the h.f. bands a TA33 jnr. beam on a Heathkit tower, for 4m a 4-over-4 at 50 ft. and for 2m a 5 element Yagi. G3THQ, assisted Ray in wiring the radio room and in erecting the tower.

Owing to his disabilities tuning the KW2000A did present a problem but this was soon solved by a valve audio oscillator built by G3RJT. Although this functioned well it was somewhat bulky and has since been replaced by a transistor device developed by G3CLF, and contained in a single die-cast box. The tuning-up procedure is as follows: one oscillator note is tuned for a particular meter reading—in this case 150mA. The other oscillator is then tuned to zero beat the first oscillator when the transmitter is correctly tuned. It is thanks to this system that Ray has been able to work the DX bands and make friends all over the world. Some of the more exotic contacts have been with DXpeditions to the North and South Poles and to a group on a mountain in Afghanistan.

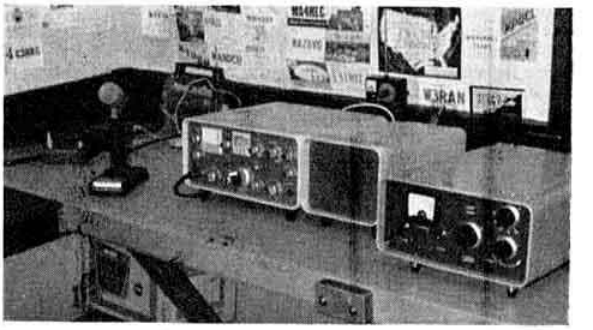
Smoking presented yet another problem but was solved by the cigarette dispenser shown in photograph right centre and was the result of G3FRF's ingenuity. At the top of the unit is the cigarette holder, which can dispense up to 20 cigarettes before refilling. After the cigarette has been ejected it is placed on an electric filament and lit.

Ray plays an active part at two of the local clubs at Wembley and Ealing where recently 80 per cent of licensed members have joined him on 4m.

A regular visitor from the United States is WA1ASM who drops in every three weeks. Others include WA4WWM (ex-GM3BEA), K1ZLB and Frank Yellen, WB2ETI, of Long Island, New York. Seldom a day passes without one of Ray's many friends calling in.



General layout of the v.h.f. station: left to right, 2m transmitter/receiver, an automatic cigarette dispenser and lighter and the 4m transceiver.



Layout of h.f. station: left to right, Shure microphone, KW2000A transceiver and the Green LA600 linear amplifier.

* Ray Vincent, 162 Randall Avenue, London, N.W.2.

QUA Associates

conducted by "JIX"

THE spring is bringing the usual burst of growth and renewal. By the time you read this, the gardens will probably be a blaze of colour. Now is the outdoor season, and new aerials are also blossoming, mobile rallies taking place and so on.

The most promising development this year is the acceptance by the London Federation of Boys' Clubs of an Adventure Through Science Unit. There is a Science Officer, and the North London Centre is at the Athan Boys' Club, Walthamstow. There will be a Centre based in South London soon. Also, the radio shack and observatory in a Forest Camping ground should be under way this year. A network of Amateur stations should link many clubs by radio, as well as giving opportunity for building and experimental work.

If you want to join in the work of this Youth activity either as a beginner, or if you have skill and advice to offer, please contact me, or The Science Officer, London Federation of Boys' Clubs, 222 Blackfriars Road, SE1. Or, of course, visit your nearest Fed. Club.

We have little space for technical discussion this month, for your correspondence has grown to such proportions that nearly all the space available will be taken up. (I asked the Editor to print "QUA. . . ." with "micro-dot" type face, but he said the supply of microscopes to read it would be too expensive!)

Malcolm Pritchard, A4894, writes a chatty letter with plenty of technical points. One difficulty he has is component layout for best results, and I think one tip is useful on this point. If you stick a piece of paper on the chassis, then place the components on the top, juggle them around for shortest interconnections and neat layout, then mark the hole positions on the paper. The drilling can be done through the paper, which is then stripped off—having protected the metalwork into the bargain!

Murry Wilson, writing again from Ipswich, is getting active on the school radio club scene. Best wishes Murry. As a matter of interest, would "QUA . . ." readers like a pamphlet about starting a club? It could be in two parts, a school club, and an independent club. Are there any views?

Another member who has activities on at school, is **David Hendon, A3895,** although Dave says that little enthusiasm is shown for outward looking projects.

Dave Butler, A4242, writes for the first time. He is one of the editors of the Southgate and Finchley Radio Club newsletter. David listens on all bands, including 4m. There may be readers who could give a short lecture to Dave's club, I'm sure he would like to hear from you, and pass details on to the club's secretary.

John, A4215, writes to say he is keen on Michael Seaward's certificate. I expect John and Michael will correspond about this.

John Wardle, A3321, drops a line about receivers. Out of the list in which John has interest, I would say the AR88 was the best as an all round job, although a bit heavy!

John Ward, BRS26197, writes to HQ about power units, although not directly addressed to "QUA." His letter enables me to say that a small power unit is about ready for a BULLETIN article which would be ideal for John's purpose.

Mike Ballance, A4722, writes from school in Woolhampton, mentioning the RAE successes and other club work there, very good.

David Richardson, A4635, is obviously an enthusiast. He writes saying " . . . every day I seem to become more attached to this marvellous hobby." But, he says, "I find Liverpool a very dull place in connection with radio!" Well, how about that, I was under the impression that Liverpool was quite a hive of goings-on, "A" members and Youth radio work, that is. Where is Paul and Co. to put Dave right? David's address is: 40 Myers Road East, Gt. Crosby, Liverpool 23.

I met **John Hersom, A4313,** on the way home from the Seymour Hall Exhibition last year. Now he has dropped a line mentioning that the local club (Barnet) has closed down. Perhaps other members in that area might be interested in starting up again.

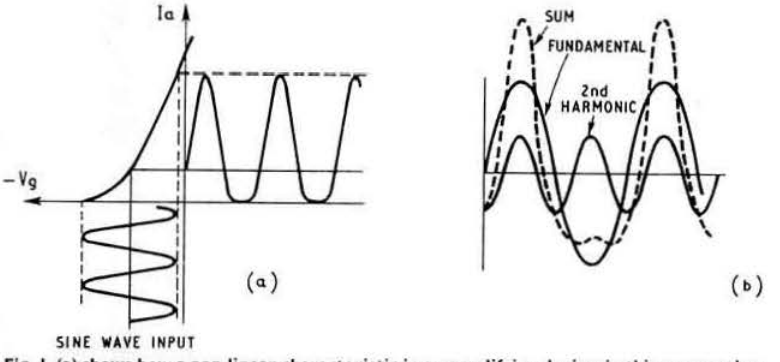


Fig. 1. (a) shows how a non-linear characteristic in an amplifying device, in this case a valve, distorts a sine waveform. The way in which harmonics are produced as a result of distortion is illustrated in (b); to simplify the explanation, however, the phenomenon is described in reverse, i.e. it is shown how a flattened waveform is produced by a fundamental signal plus its second harmonic.

David Butler, A4242, writes again with a few details on a postcard. He listens on 4 and 2m as well as 70cm, but says 80m is the most profitable. He heard ZS1BB/MM on that band.

Stephen Shaw, A4124, writes one of his detailed reports. Steve's QSL return percentage seems to be around 15; is this the average?

That is just about all for this month. Please remember to drop an s.a.e. if you would like a personal reply—I'm nearly forced to install a stamp printing machine this end! Don't forget to support the various projects, and if you have schemes you would like yours truly to join in, then drop a line.

H for Harmonic

A blessing and a curse in Amateur Radio, harmonics are easily understood, but the effective suppression of unwanted

* K. L. Smith, 82 Granville Road, Walthamstow, London, E.17.

ones may be a little more difficult. It is not easy to maintain the pure sine wave shape of an oscillation and the slightest change in shape from a sine wave means that harmonics have been introduced. The second harmonic is double the fundamental, the third is treble, and so on. Usually, the amplitude of the harmonic rapidly gets less as the *order* increases, in other words, the sixth, seventh, etc. harmonics are much smaller than the second, third, fourth and fifth. Any change in the shape of the signal waveform gives rise to harmonics. Whenever a valve or transistor is used to amplify a signal there is a change in the shape, hence the trouble with unwanted harmonics. The reason is shown in Fig. 1. By using tuned circuits in r.f. amplifiers we can reduce all frequencies except the one in resonance. This means that although the amplifier has introduced harmonics, only the one frequency, is, in fact, obtained. This may be the second, third etc. harmonics, which is the principle of frequency multiplier stages, a useful application for harmonic production. It stands to reason that selective circuits must be used to prevent the radiation of harmonics from a transmitter.

Henry, H

This unit of inductance was derived from the name of the American engineer who nearly discovered electro-magnetic induction independently of Faraday. Henry worked with very large electro-magnets, and noticed that a large spark always occurred when the current was switched off. The Henry, as a unit, is defined as " that inductance which has one volt induced across it when the current changes through it at the rate of one amp per second."

Heterodyne

The mixing of two frequencies is a common occurrence in radio work. We use a local oscillator in a superhet type

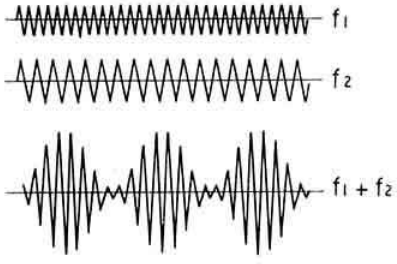


Fig. 2. When two similar frequencies are mixed (added), the resultant waveform exhibits a beat pattern as shown in the bottom diagram. The frequency of the overal variation in amplitude is equal to the difference between the two fundamental frequencies. The drawing is not to scale.

receiver and " beat " the incoming signal with this to produce the intermediate frequency. Whenever frequencies are mixed or beat together in this way, we say they are " heterodyning." In fact, the very word superhet is a contraction of the original description of this type of receiver, namely—Supersonic-heterodyne.

Listeners Championship 1966

Amendment to Rules

For the 144 Mc/s Portable contests in which QRA locators only are given by transmitting stations, the following amendments are made to Rule 3 published in the January 1966 RSGB BULLETIN, page 48.

(i) Delete all reference to counties.

(ii) For each station logged in the same two-letter QRA rectangle as the entrant . . . 10 points.

(iii) For each station logged in any other two-letter QRA rectangle . . . 20 points.

(iv) For each two-letter QRA rectangle received an additional 40 points may be claimed.

Thus if a receiving station in Oxford, QRA ZL14E, logs G6SC/P at ZL17F he will claim ten points, and for logging G3TEY/P at YN60J he will claim twenty points. *It will not be necessary for listeners to possess QRA Locator maps*, for they only need know the first two letters of their own position, which can be calculated from the information provided in the article " QRA Locatormanship " published in the March 1965 RSGB BULLETIN, page 162.

Scout County Rally, Buckinghamshire

Over the weekend 23-24 July, 1966, the Buckinghamshire Scouts will be holding a County Rally, in connection with the Boy Scout World Friendship Year, at RAF Halton, near Aylesbury. It is hoped to set up an Amateur Radio station, and Dave Foster, G3NRU, is seeking the assistance of other amateurs, especially those with scouting connections. Any amateurs who would like to offer their services, and possibly equipment also, are invited to contact G3NRU, " Alma," Grigg Lane, Headcorn, Ashford, Kent.

YL Amateur in Philippines

DU1GSP is the call-sign of the only active YL station in the Philippines; it is also believed to be the only Girl Scout Headquarters to have established its own Amateur Radio station.

Baden-Powell House

British Scouts have recently taken possession of amplifying equipment given to them by Sunbeam Electric Ltd. The presentation was made by Mr O. L. Niehouse, Managing Director, and the Chief Scout (Sir Charles Maclean) accepted the gift on behalf of the Boy Scouts' Association. The new equipment has been incorporated in the Amateur Radio station operated from Baden-Powell House, the Boy Scouts' Association international centre in Kensington, London.

G6SC Re-issued to Son

S. R. Chapple, who lives at Epsom, in Surrey, has obtained the agreement of the Post Office to operate under his late father's call-sign G6SC, with effect from 17 February last. He formerly held the call G3OSC.

Can You Help?

- H. R. Searle, BRS27510, 26 Tudor Gardens, Leigh-on-sea, Essex, who requires information on the MCR1 and R1132A receivers?
- G. Henshaw, A4213, 32 Drummond Road, Ilkeston, Derbyshire, who requires information on the 3582A RAF receiver and its associated r.f. unit?
- H. Harris, The Huon, Branksome Hill Road, Bournemouth, who requires a June 1965 RSGB BULLETIN?
- R. Brand, G2ANB, 78 Broad Walk, Hockley, Essex, who requires the handbook for the CR100 and No. 10 Calibrator, also information on fitting an S meter to the CR100?

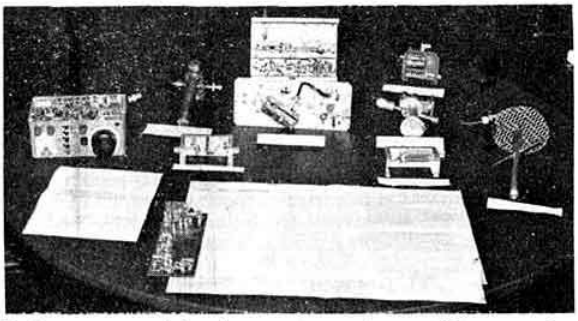
Kindred Spirits at the Kingsley

By JACK HUM, G5UM *

LAST year at this time we used the headline " Very Happy Fiesta " to describe the 1965 V.H.F. Convention. We would say that again where the 1966 event was concerned. For the dozenth time the kindred spirits of v.h.f. (and of course u.h.f.) got together to talk and be talked to, to eat, and simply to look—and there was plenty to look at in the shapes of the examples of current v.h.f./u.h.f. design both professional and amateur exhibited in the annexe next to the main meeting and eating room.

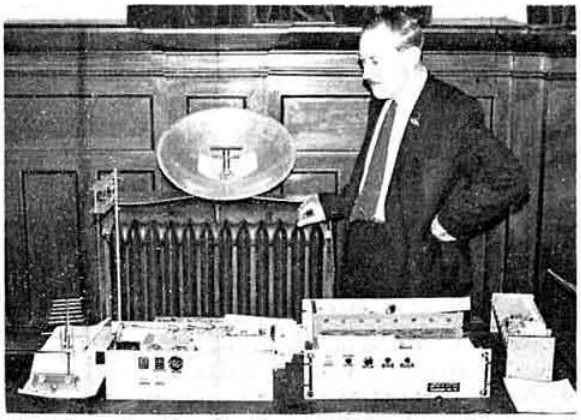
Those who have found from past conventions that there is so much to do that little time remains for personal rag-chewing now adopt the wise course of getting along *before* lunch. Because the Convention opened at 11 a.m. there was chance to put in a couple of hours before the lectures begin at 2 p.m.

For this year's lecture session there were two " main features," compared with four last year. This was just as well: each lecture, packed full of information, needed an hour to give itself breathing space.



Equipment entered for the constructors' competition was of a very high standard, and several examples are shown in this photograph. *(Photo by G3HXN)*

First came " The GB2GC Story," with G3SHK covering the logistics of last year's finely-organized expedition to Alderney by a group of north-west London members, and G3HBW the technical and design details of the equipment which was taken along to permit operation on all four of the occupied v.h.f. and u.h.f. bands.



G3IIR, Immediate Past President of RSGB, contemplates several of the larger units of members' equipment. *(Photo by G3HXN)*

Since he took up v.h.f. two years ago, G6FI of Staines declares that it has opened an entirely new world of Amateur Radio for him to enjoy in his retirement. The enjoyment will now be enhanced by the TW converter for which his number came up in the mammoth draw at the Convention. " Freddie Ink " shows the voucher to wife Eve. *(Photo via G5UM)*

After the tea-break came the Charlie Newton, G2FKZ, lecture on " Radio Aurora."

Everyone who had heard Charlie in action before knew what to expect—and that was immense enthusiasm coupled with a thorough grasp of a pretty complicated subject. We need say no more in detail about it in this space, because a G2FKZ article is scheduled for publication elsewhere in this magazine, except just to remark that the dozen and a half mural-diagrams which embellished his talk must have taken 'FKZ weeks if not months to prepare.

Cash for Space

In the interval between the lectures Geoff Stone, G3FZL, the Society's V.H.F. Manager, told of the work being done by DJ4ZC to build a European translator for eventual launching in an orbital satellite.

This would cost about £300. Could the four national societies primarily interested—DARC, VERON, USKA and RSGB—find the cash, the larger societies perhaps paying a bit more than the smaller ones? Already, added Geoff, the RSGB Council had agreed to start off a " European Oscar " fund by donating £25. The RSGB share ought to be about £65. Would members donate the rest?

Would they! By the time dinner came round that evening G3FZL was able to announce that swift donations from members present and from *Short Wave Magazine* had already brought the total to £78.

Before you could say " crossed dipoles " the total shot up to £100 as diners forked out the balance even while Geoff was speaking.

The Winners

During the course of the Convention dinner (105 present, including quite a few ladies), Geoff Stone announced that:

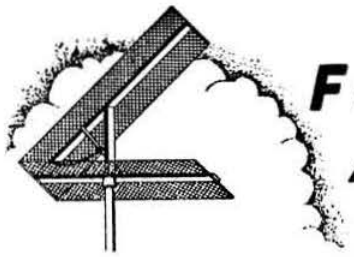
The 1962 V.H.F. Committee cup would go to G3RPE of Hemel Hempstead for the 13cm converter placed first in the Constructors' Competition.

The winners of the Two Metre Open Contest were the GW3RUF/P team with 30,457 points;—BRS15755 had won the V.H.F. Listeners' Championship—and G3SKR, one of the lively north-west London younger set, got that " Sky-beam " as holder of the Lucky Number programme.

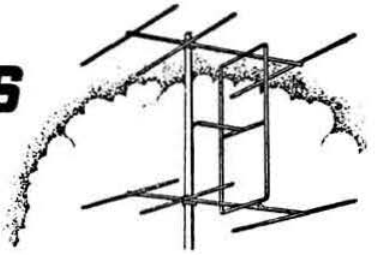
Prandial

Once again at the V.H.F. Convention dinner the top table included several distinguished persons, one of whom, Mr

(*Continued on page 326*)



FOUR METRES AND DOWN



By F. G. LAMBETH, G2AIW *

I SHOULD like to start on a personal note this month. I have been responsible for this column for eleven and a half years now, and the time has come to hand over this responsibility (which has been none the less a pleasure). The opportunity is taken to express sincere thanks and appreciation to all those who have assisted through the years, with reports, suggestions, and in other ways, without which no feature of this kind could succeed. In taking leave of you, I feel that the necessity for the continuance of this support to my successor (Jack Hum, G5UM) cannot be too strongly emphasized. He takes over, I am sure, with the goodwill of all of us, and his reputation in the field of v.h.f./u.h.f. is a happy augury for the future.

Miscellaneous News

The V.H.F. Contests Committee wishes to remind readers of the first 432 Mc/s Contest in 1966. It is an open event, and will be held on 28 and 29 May. The rules were published in the March issue. On 29 May the 1296 Mc/s Contest is timed to immediately follow the 432 Mc/s contest at 12.00 GMT. Crossband contacts will count either way.

G3PXP and **G3BNL** will be making an expedition to Drum Mountain, Caernarvonshire, during the Whitsun weekend and will be operating portable on all v.h.f./u.h.f. bands from 70 to 1296 Mc/s. Operation will commence on the Saturday night and will continue throughout the week-end. GW3BNL/P will operate during the 432 and 1296 Mc/s contests and GW3PXP/P will be on 70 and 144 Mc/s.

Radio Aurorae

From the VERON *V.H.F. Bulletin* we learn that there were very good Aurora conditions on 23 March, and SM6CSO reports that although he himself was not able to profit thereby, his friend SM6PO had a QSO with UA1DZ and heard the following stations: OZ1IGY, LA1VHF, LA2VHF, LA4VHF, OH3VHF, DL0AR and GB3LER. Many s.s.b. signals were also heard. According to SM6PO, these were the best aurora conditions for years.

Four Metres

The **Thanet Radio Society** and **G3JMB** are actively discussing the possibility of a regular 4m Activity Night, and are suggesting Fridays for this purpose. As it appears that 4m activity generally relates to stations being operative rather than conditions, it would be interesting to find out what happens when as many stations as possible come on the band in this way. Comments are invited.

G3MWZ (Cherry Willingham, Lincoln) has just started on v.h.f. after seven years on the h.f. bands. He is now active on 4m with a B44 Mark 3 and a 3 element Yagi. Operation is portable only, using a 160m mobile power supply. He finds 4m really quiet—possibly too quiet, after the hubbub of 160m! G3MWZ's usual portable site is Burton Clift (2 miles north of Lincoln) at 200 ft. a.s.l. From this spot, G3FDW and G3KPU (both of Retford) have been worked, and G3GJF/P (nr. Sheffield) is the best DX so far at 40 miles. Another QSO was with G3HRP (Scunthorpe). A trip to North Wales (the Great Orme) resulted in QSOs with GW3GNT (Beaumaris, Anglesey) and GW3MDK (Colwyn Bay). G3MWZ hopes to be portable on 4m in Wales again during June, in Eire during July, and in the meantime is open for skeds while based at Lincoln.

Two Metre News

GI3JKX (12 miles east of Londonderry, QRA Locator PW75E), would be particularly glad of Scottish QSOs. The only clear take-off is to the north-east, which explains this preference. The frequency used is 145·9 Mc/s and the aerial is an 8-over-8 slot at 35 ft.

A very new arrival on 2m is **OY7X** (Faeroe). He is using a 4 element beam, and if you can work him it will mean a brand new country. He is looking towards Gt. Britain in particular for QSOs.

During an excellent opening on 7 March, **G3DNR** (Broadstairs) worked PA0LB (Hulst), DJ9AXA (Aachen), ON4CB (Ghent), ON5DA (La Louirere) and ON5MI (Liege).

G3OCB (Nr. Truro) reveals that the Cornish Group is still very active, but that the bands are very dead. The 22.00 Monday sked with G3BA on 145·1 Mc/s s.s.b. continues and is usually successful although sometimes the received signal at G3OCB is very weak and disappears in the noise. However, copy is about 70/80 per cent on average over a distance of about 220 miles. There is another Monday sked now (with G3SHK) also over about 220 miles, but the results so far are not very good. Stations recently worked include GW3FSP (s.s.b.) and G6HV and G3IMG who are both in Devon. A short trip to Surrey recently brought mobile

Please send all reports to J. Hum, G5UM, " Wyldes," Burnham Green Lane, Bulls Green, Knebworth, Herts, to arrive by 6 May for the June issue, and 10 June for the July issue.

Fred Lambeth, G2AIW, has conducted the BULLETIN'S v.h.f. feature with distinction since December 1954 and we all owe him a debt of gratitude for his consistent chronicling of more than eleven exciting years of v.h.f. and u.h.f. progress. Fred indeed has become almost synonymous with all matters of v.h.f. interest.

Although he is giving up responsibility for Four Metres and Down and handing over to Jack Hum, G5UM, another well-known v.h.f. enthusiast, he is not giving up his work on behalf of v.h.f. operators. Later this month he will be attending the Region 1 IARU Conference in Opatija as honorary secretary of the Region 1 V.H.F. Committee.

contacts with some 20 stations in South-East England. The band sounded rather different in Surrey!

Seventy Centimetres

G3JDN (Reigate) is very disappointed that a great number of 70cm operators in the Home Counties do not turn their beams south. The only stations he has worked in two weeks are G3KEQ, G8AMA, G8AJU, G8AMU and G8AOD, in that order, and there are many more possibles. The local activity has been low, it is realised, but this is to be remedied shortly. In addition to G3JDN, G8AMU and G8AOD are already on the band; they are to be joined shortly by G3BBR, G3RCY, G3RIN and G3RIM, who are additions to the band surely worth looking for. G3JDN's transmitter line-up ends in a temporary QQV03-20A tripler delivering 4 watts of r.f. The receiver (also temporary) is an AF186 preamp., G2DD converter, and an AR88D tuning 24 to 26 Mc/s. The aerial is a 10 element beam at 34 ft. G3JDN is not new to v.h.f., because for the past six years his one and only band has been 2m.

G3OCB (Nr. Truro) is working on a transverter/p.a. The tin-bashing is finished and it is now a question of inducing hairpin loops to resonate satisfactorily. The initial line-up is to be a 12AT7 c.o./doubler, E180F doubler, QQV02-6 tripler to 400 Mc/s and a QQV02-6 class C amplifier into a QQV03-20A mixer. A.m./s.s.b./c.w. is fed at 32 Mc/s into the mixer. The 432 Mc/s output, it is hoped, will be enough to drive another QQV03-20A class AB1 stage which will drive a pair of 4X150As or 4CX250Bs in the p.a.

G6SBD/T (Dudley) is running 11 watts input to a Green E.C.E. CTR70, but a higher power transmitter is on the way. The aerial is an 8-over-8 J Beam at 20 ft., and the QTH is 621 ft. a.s.l. with good outlook from south to west. The receiver is an AF186/v.h.f. tuner/TV set combination which seems to work quite well.

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

Call-sign	Location	Nominal Frequency	Emission	Aerial Direction
GB3ANG	Craigowl Hill, Dundee	145·985 Mc/s	A1	
GB3CTC	Redruth, Cornwall	144·10 Mc/s	A1	North-East
GB3GEC	Hammersmith, London	431·5 Mc/s	A1	
GB3GI	Strabane, N.I.	145·990 Mc/s	A1	
GB3LER	Lerwick	145·995 Mc/s	A1	S
GB3LER	Lerwick	70·305 Mc/s	A1	N/S
GB3LER	Lerwick	29·005 Mc/s	A1	N/S
GB3VHF	Wrotham, Kent	144·50 Mc/s	A1	North-West

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
15 March ...	17.25 GMT	130 c/s low
23 March ...	13.00 GMT	150 c/s low
30 March ...	08.35 GMT	30 c/s low

Stations worked fairly regularly include G2UN, G3LLS, G8AIH, G8ALY, G8AKX, G3SOA and G8ACB, and pictures have been sent to G3SOA (G6ACA/T), G8ACB (G6KQJ/T), G8AKX and G6ABL/T. Stations worked under good conditions include G3IRA and G3NNG. Bristol stations are regularly heard on 2m but so far have not been worked on 70cm.

GW3RUF/P, the Midlands Contest Club, hopes to be operating from Mt. Snowdon during 6-9 May and out of contest times would like skeds for 70cm. It will be the first time that 70cm gear will have been taken and they should be active on Saturday 7 May, from about 14.00 GMT until early morning, 9 May. They will operate on 70cm and 4m before and after the 2m portable contest. Skeds should be arranged with G3KXA.

Kindred Spirits **(Continued from page 324)**

A. A. Gouriet, chief of BBC research, ought to be even more famous than he is to an amateur radio world that knows his original oscillator better by its name of Clapp. If v.h.f. is to go v.f.o. it will probably be largely with Gouriet-type oscillators.

Mr Gouriet's speech proposed the toast of " The RSGB." Responding, President G2BVN reminded members of the critical nature of forthcoming international conferences to the amateur radio movement, and the absolute importance of speaking from a position of strength and unity.

Then came the toast of " The London U.H.F. Group," amusingly put by Council Member Fraser Shepherd, GM3EGW, and replied to by Phil Thorogood, G4KD, associated with the Group since it began.

No V.H.F. Convention dinner would be complete without a speech by Dr Smith-Rose, Past President. His flow of anecdotes seemed as novel and inexhaustible as ever. If there had been any aisles to roll in, we'd have been there.

In equal good humour Austin Forsyth, G6FO, made the reply to the toast " The Visitors " in a speech in which one could detect many of the flashes of wit and wisdom that illuminate his journal, the *Short Wave Magazine*.

After that the grand draw, and something for almost everyone before QRT-time of 10.30 p.m.

Yes, it was a Very Happy Fiesta once again, " always the same and always different " as the Fs are supposed to say. But already, with next year's a gleam in the eye of the RSGB V.H.F. Committee, *plus ça change* may be more in evidence than *la même chose*—which will be not a bad way of celebrating the thirteenth.

Three personalities who are DX to many in the UK: left to right, EI6AS, GM3FYB and GI3KYP seen outside the Kingsley Hotel.

News from Headquarters

Regional Representation 1966-1968

The Council has appointed the following members to the office of Representative for their respective Regions. They will hold office until 31 December, 1968.

Region 5: S. J. Cranfield, G5BQ, St. Lukes, 47 Waller Road, Cambridge.

Region 6: L. W. Lewis, G8ML, 43 Clevelands Avenue, Cheltenham.

Region 14: A. F. Hunter, GM3LTW, 4-5 Cassilis Road, Marbole, Ayrshire.

Area Representatives

The following have been appointed Area Representatives:

CHESTER
C. Rich, 90 Becketts Lane, Chester.

CREWE AND DISTRICT
R. H. Owen, 10 Circle Avenue, Wollaston, Nantwich, Cheshire.

NORWOOD AND SOUTH LONDON
T. J. Knappett, 279 Brownhill Road, London, SE6.

PRESTON
G. Lancefield, 191 Higher Walton Road, Walton-le-Dale, Preston, Lancs.

Affiliation

The following are now affiliated to RSGB:

BRUNEL COLLEGE AMATEUR RADIO SOCIETY
J. W. Grant, Brunel College Students' Union, Woodlands Avenue, Acton, London, W3.

EAST LANCASHIRE AMATEUR RADIO CLUB
J. Simpson, 1 Marsh Terrace, Darwen.

FYLINGDALES RADIO CLUB
W. Burton, G8ANQ, 14 Westbourne Road, Castle Park, Whitby, Yorks.

KINGS LYNN AND DISTRICT YMCA AMATEUR RADIO CLUB
A. Chilvers, Shakespeare House, King Street, King's Lynn, Norfolk.

MAIDENHEAD AND DISTRICT AMATEUR RADIO CLUB
E. C. Palmer, G3FVC, 37 Headington Road, Maidenhead, Berks.

SOUTHAMPTON COLLEGE OF TECHNOLOGY AMATEUR RADIO CLUB
P. A. Butcher, Southampton College of Technology, Students' Union Amateur Radio Club, East Park Terrace, Southampton.

UNIVERSITY OF ESSEX RADIO SOCIETY
P. Haine, University of Essex Union, Wivenhoe Park, Colchester, Essex.

Affiliated Society Representatives

The following have been appointed Affiliated Society Representatives:

DORKING AND DISTRICT RADIO SOCIETY
W. Walsh, G3HZJ, 4 Meadowbrook Road, Dorking, Surrey.

SURREY RADIO CONTACT CLUB
S. A. Morley, G3FWR, 22 Old Farleigh Road, Selsdon, Surrey.

RSGB QSL Bureau

Holders of licences under the reciprocal licensing scheme who are operating in the United Kingdom are asked to note that their QSL Bureau Sub-Manager is E. G. Allen, G3DRN, 65a Melbury Gardens, London, SW20. This applies regardless of the UK prefix (G, GM, GI, GW, etc.) under which they are operating.

Reciprocal Licensing

Some amateurs have commented that the German Federal Republic is not issuing unrestricted mobile licences. At present, they are issued only to residents and in connection with rallies arranged by German organizations.

The Post Office has asked us to make the point that it is not responsible for the conditions of an agreement; if it were to insist upon a completely reciprocal agreement in every way negotiations could well be held up for many months. The Post Office will enter into any agreement that is obviously not entirely one-sided in the hope that conditions may be eased at a later date. It is the duty of the national society in the country concerned to press the telecommunications authorities for the best possible licensing conditions for visiting radio amateurs.

IARU Region I Conference

Throughout the period of the IARU Region I Conference to be held at the Hotel Kvarner, Opatija, Yugoslavia, from 23 to 28 May, 1966, YU0IARU will operate from Conference Headquarters. YU0IARU will use a.m. and s.s.b. mainly on 14 Mc/s although some transmissions may take place on other bands and on c.w.

On the opening day of the Conference (23 May) the Yugoslav Government is to issue a special postage stamp to commemorate the 20th Anniversary of SRJ as well as the Conference itself. To mark the occasion an Exhibition of Yugoslav postage stamps is to be held at the Kvarner Hotel.

The Conference is being organized internationally by the Secretary of IARU Region I Division (Mr John Clarricoats, O.B.E., G6CL) and locally by the President (Mr Janez Znidarsic, YU1AA) and Secretary (Mr Ferid Suman, YU1AF) of SRJ.

G3YF Memorial Trophy

The G3YF Memorial Trophy was received by the RSGB President at a recent meeting of the Chingford RSGB Group held at the home of G4GA. The Trophy comprises the key used by G3YF both at his home station and on the numerous occasions when he participated in National Field Day with the local group. The Trophy is to be awarded annually to the highest scoring station on 14 Mc/s during NFD and each holder will also receive a handsome certificate.

Mr J. J. Hollington, G4GA, is seen receiving, on behalf of the Chingford RSGB Group, the G3YF Memorial Trophy from Mrs F. Hooson.

More Pirates Fined

As the result of Post Office enquiries into the unlicensed use of wireless telegraphy transmitting equipment, the following convictions have been obtained.

On 17 February, 1966, at St. Helens Magistrates' Court, Edward William Gwynn Evans of 33 Atherton Street, St. Helens, Robert Bennett of 16 Emily Street, St. Helens and James Richard Sephton of 37 Marina Avenue, St. Helens, each pleaded guilty to a charge of using wireless telegraphy transmitting apparatus without a licence contrary to Section 1 of the Wireless Telegraphy Act, 1949. They were each fined £10 and ordered to pay £3 costs.

On 24 February, 1966, at Newton-le-Willows Magistrates' Court, Joseph Thomas Alker of 23 Cumberland Crescent, Haydock, St. Helens, Lancs, pleaded guilty to a similar charge. He was fined £25 and ordered to pay £6 6s. costs.

On 25 February, 1966 Michael John Lee of The Orchard, Sawpit Hill, Hazlemere, High Wycombe, pleaded guilty to a similar charge. He was fined £10, and ordered to pay £8 8s. costs and to forfeit the equipment to the Postmaster General.

On 1 March, 1966, at the Magistrates' Court, Windsor End, Beaconsfield, Derek Casey of 34 Layters Close, Chalfont St. Peter, Selwyn Francis Patterson of The Hill, Knotty Green, Beaconsfield, Roger William Tone of High Hedges, Copthall Corner, Chalfont St. Peter, and a Mr Norman John Tripp, were convicted of similar offences. They were each fined £5, and ordered to pay £1, £5, £5 and £3 respectively toward the costs.

Radio Equipment for Forestry Use

According to the Postmaster General (Anthony Wedgwood Benn) forestry and timber interests are looking into the possibility of purchasing suitable radio controlled equipment capable of operation on a frequency around 458 Mc/s.

Mobile Rig Presentation

Alec Reid, VE3BE, Canadian Director of the ARRL from 1930 to 1960 and a Vice President since 1960 was recently presented with a complete mobile rig by the amateurs of Canada in appreciation of his long service to Amateur Radio and to the League. Alec represented the IARU at the Atlantic City Radio Conference (1959) and was a member of the Canadian delegation at the Geneva (1959) Conference. Before the war he was BERU Representative for Canada and very active on the DX bands. Canadian Director, Noel Eaton, VE3CJ, made the presentation.

Most of the Headquarters staff attended the Presidential Installation on 7 January, 1966. Seated, left to right, Sheila Sims, Mrs Jeanette Mason (formerly secretary to the General Manager), Ely Diez and Mrs M. Jardine (secretary to the General Manager). Standing, left to right, G2AHL, Jackie Gwynn, G3TRP and A4663. Absent when this photograph was taken were Peter Smee (Assistant Secretary), Michael Hurley and Sylvia Meridale.

(Photo by G3NMR)

Harlow Society Receives Call-sign G6UT

As a memorial to the late T. A. St. Johnston ("Uncle Tom"), the Harlow Radio Society has been allocated his call-sign, G6UT, for its club station.

G6UT was at one time President of the Harlow society. He died in 1964 after more than 60 years of active interest in Amateur Radio.

Silent Keys

We record with much sorrow the passing of the following amateurs:

J. Cunningham, G3HPE, West Wickham, Kent.

P. Birks, G3FBQ, Stoke-on-Trent.

A. G. Chapham, G3KIE, London.

K. E. B. Jay, G2HJ, East Hendred, Berkshire.

W. G. Hopcroft, GM4AN, Kirkaldy, Fife.

G. A. Gaskell, BRS27379, Prestbury, Cheshire.

Obituaries

K. Coates, G3IZT

We regret to report the sudden death, at the age of 46, of Kenneth Coates, G3IZT, a very popular figure amongst the Merseyside amateurs. During the war he served in the Grenadier Guards, seeing service on the continent after taking part in the D-Day landing.

He was a man of many interests, which included music, and he was well known as an accomplished exponent in the percussion section, frequently assisting various dance bands in the area. He was a keen worker for his Church and taught Sunday School classes. Nevertheless he still found time to participate actively in the hobby of amateur radio and could be heard most Sunday mornings on 10m. The writer has happy memories during the last sunspot peak of being on that band with him and hunting together for the rare calls.

He was always ready to lend his apparatus for group activities and the Society has lost an excellent member. He leaves a widow, son and daughter, to whom we offer our deepest sympathy.

G2AMV

W. Maddocks, G2AWF

With the passing of W. A. Maddocks, G2AWF, on 6 March, Amateur Radio has lost a loyal and devoted enthusiast.

Bill had been interested in radio for very many years and was professionally engaged, before his retirement, in work connected with the electrical industry. Unfortunately failing health in the last few years had restricted his activities, but nevertheless, he was frequently to be heard on most bands except v.h.f. His jovial and friendly personality both in person and over the air made him a very popular figure. He will be missed not only locally but by many of those with whom he has had contacts and by many short wave listeners.

His enthusiasm for the hobby may be judged by the name of his house which was "Poldhu." Needless to say, the aerial array will no doubt have been associated by passers-by with the name of his QTH. We offer our sincere sympathy to his widow and son.

W. J. Squires, GW3IYI

We regret to announce that W. J. Squires, GW3IYI, passed away suddenly on 6 February. "Bill," as he was known to all his friends, was a staunch member of the RSGB and did all he could to further its cause.

He was also a founder member of the Llanelly and District Amateur Radio Club, and would always lend a willing hand to anyone interested in radio. He was greatly interested in mobile working and his car, with its whip aerial, was a familiar sight in the town and other parts of South Wales.

He was active to the end, and on the day before he passed away, worked four continents on s.s.b. while his car was stationary in the drive of his home. He leaves behind a devoted and loving wife and parents, and also a host of sorrowing friends. We, his friends, mourn the loss of one who in every sense of the word was a true Amateur, and his loss will be hard to replace.

W.J.W.

Society Affairs

A Brief Report on the March, 1966 meeting of the Council

THE meeting was held on 7 March, 1966, and was attended by Messrs R. F. Stevens (President), N. Caws, J. F. Shepherd, J. C. Foster, J. C. Graham, E. G. Ingram, L. E. Newnham, A. D. Patterson, W. A. Roberts, G. M. C. Stone, J. W. Swinnerton, E. W. Yeomanson (Members of the Council), John A. Rouse (General Manager and Secretary), and P. C. M. Smee (Assistant Secretary).

Apologies for absence were submitted on behalf of Messrs J. Etherington, L. N. Goldsbrough, F. K. Parker and Louis Varney.

Region 14 Meeting

It was reported that 48 members had attended a meeting of members resident in Region 14 held at the Brabloch Hotel, Paisley on 13 February. The meeting had been addressed by Mr J. F. Shepherd, Council Member for Scotland, and Mr G. P. Millar, Region 13 Representative. As a result of the meeting a nomination for a new Regional Representative had been made.

Recommendations of Committees

The Council accepted recommendations relating to the organization of a Technical Symposium (*Education*), the provision of a financial " float " for RSGB National Mobile Rallies during 1966 (*Mobile*), authority for the Finance and Staff Committee to instruct the directors of Lambda Investment Co. Ltd. in matters concerning the company (*Finance and Staff*), the results of the RSGB 21/28 Mc/s Telephony Contest, Receiving Section, 1965, and the Affiliated Societies' Contest 1966 (*H.F. Contests*), the establishment of a United Kingdom Euro-Oscar Fund and that the Society should make an initial contribution of £25 (*V.H.F.*). The Euro-Oscar Fund is to help finance a European Amateur Radio satellite.

Membership

The Council elected 139 new members (113 Corporate, 26 Associate) and approved 17 applications for transfer from Associate to Corporate grade. The subscriptions of two applicants were waived on the grounds of blindness. Consideration was also given to waiving the subscriptions of two members on the grounds of serious disability, subject to satisfactory supporting evidence.

Affiliation

The Council granted affiliation to the following:

Fylingdales Radio Club
University of Essex Amateur Radio Club
King's Lynn and District YMCA Amateur Radio Club
Bahamas Amateur Radio Society.

Council Member for Zone D

It was agreed to hold a ballot for the election of a new Council Member for Zone D and to publish a notice to members in the Zone to vote on postcards. (The notice was published on page 251 of the April issue of the RSGB BULLETIN.—EDITOR.)

Mullard Award 1966

It was agreed to appoint Mr R. F. Stevens, Mr E. W. Yeomanson and Mr J. A. Rouse to represent the Society at the meeting of the Mullard Award Committee at which nominations received for the 1966 Mullard Award would be considered.

Publications

A second printing of the 1966 Edition of the Society's *Call Book* was authorized.

The General Manager was also authorized to accept quotations for two other Society publications now in preparation.

Region 2 Representative

Acting on the advice of the Membership and Representation Committee the Council appointed Mr Skethaway, BRS20185, to the vacant office of Region 2 Representative until 31 December, 1968.

MINUTES OF COMMITTEES

The Council accepted as reports the minutes of the following meetings of Committees: Education (22.1.66), V.H.F. (24.1.66), Mobile (26.1.66), V.H.F. Contests (2.2.66), Scientific Studies (4.2.66), IARU Working Group (7.2.66), Technical (11.2.66), Finance and Staff (14.2.66), H.F. Contests (17.2.66).

The Council was in session for 3½ hours.

Wired Television

Members who are experiencing, or have experienced, interference difficulties associated with wired television systems are asked to write to the GPO Liaison and TVI Committee giving full details including the name of the relay company concerned and the distribution frequency. The Committee is interested in information both on systems which are susceptible to interference and on systems which cause interference by radiation in authorized amateur bands.

Transistor Dip Oscillator

In the article describing the construction of G3HBW's dip oscillator, published in the April issue, an error appeared in the wiring diagram, Fig. 4, on page 224. One lead to the battery is drawn attached to the positive terminal of the meter, when in fact it should be soldered to the adjacent earth tag.

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
145·10 Mc/s	9.30 a.m.	Beaming north from London
	10.00 a.m.	Beaming west from London
145·8 Mc/s	10.15 a.m.	Beaming south from Belfast
145·30 Mc/s	10.30 a.m.	Beaming north west from Sutton Coldfield
	11.00 a.m.	Beaming south west from Sutton Coldfield
145·50 Mc/s	11.30 a.m.	Beaming north from Leeds
	12 noon	Beaming east from Leeds

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.

Rules for the RSGB 21/28 Mc/s Telephony Contest, October 15-16, 1966

Radio amateurs throughout the world are again invited to take part in the annual RSGB 21/28 Mc/s Telephony Contest to be held this year on October 15-16.

1. **Duration:** The contest will start at **07.00 GMT** on Saturday, 15 October, and end at **19.00 GMT** on Sunday, 16 October, 1966.

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

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

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

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

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

7. **Entries:** Entries (*a*) should be clearly typed or written on **one side only** of foolscap or International A4 size paper; (*b*) must be ruled in columns headed (in this order) (i) Date/Time (GMT); (ii) Call-sign of station worked; (iii) I sent him; (iv) He sent me; (v) Band; (vi) Bonus Points; (vii) Total points claimed; (*c*) must be addressed to the **Contests Committee, Radio Society of Great Britain, 28 Little Russell Street, London, WC1, England,** the name of the contest being clearly shown on the top left hand corner of the envelope, which must be postmarked not later than 31 October, 1966. Log sheets are available from RSGB Headquarters.

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

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

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

9. **Awards:** In the Single Operator Section, the **Whitworth Trophy** will be awarded to the leading British Isles entrant. In addition, **certificates** will be awarded to the leading station in each of the other five British Isles countries, and to the runner-up in the Trophy winner's country. Certificates will be awarded to the leading station in each overseas country, VE, VK, W/K, ZL, and ZS call areas counting separately as in Rule 8, provided the log contains 20 or more valid contacts.

SAMPLE COVER SHEET

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

15-16 October, 1966 **Call-sign**.....

Name .....

Address .....

Transmitter .....

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

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

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

Failure to sign the declaration may involve disqualification of the entry.

Rules for the RSGB 21/28 Mc/s Telephony Receiving Contest, October 15-16, 1966

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

2. **Duration:** The contest will start at 07.00 GMT on Saturday, 15 October, 1966, and end at 19.00 GMT on Sunday, 16 October, 1966. The RSGB 21/28 Mc/s Telephony Contest for transmitting amateurs will take place during the same period.

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

(*b*) Entries should be set out on **one side only** of foolscap or International A4 size paper, must be postmarked not later than 31 October, 1966 and must be addressed to the **Contests Committee, Radio Society of Great Britain, 28 Little Russell Street, London, WC1, England.** The name of the contest must be shown clearly at the top left hand corner of the envelope. Log sheets are available from RSGB Headquarters.

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

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

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

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

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

Overseas Entrants. Each complete log entry relating to a British Isles station heard will score **5 points.** In addition a bonus of **20 points** may be claimed for the first station heard in each British Isles country-numeral prefix on each band, i.e. G2, G3, GM4 etc., as listed in Rule 8 for the transmitting contest.

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

6. The Council of the RSGB reserve the right, on the recommendation of the Contests Committee, to reject any entry that is consistently inaccurate.

★ ★ ★

The closing date for posting entries is 31 October, 1966.

Letters to the Editor

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

QSL Managers

I should like to take exception to Mr A. O. Milne's letter in the January issue of the BULLETIN.

Mr Milne states that QSL cards are supplied by QSL Managers " without the logs being checked or that the QSO ever took place." Mr Milne seems to indicate that there is " cheating " between the QSL Managers and stations receiving the cards. This I take exception to, since I speak for myself if not for the majority or all of the QSL Managers throughout the world.

I was QSL Manager for ZK1AK, FG7XC, FG7XG and FO8AU for a number of years and I'd like to advise Mr Milne that not a single card went out of my QTH without first checking and confirming the QSO in the logs received from the aforementioned stations. I have several good friends who are DX'ers who never worked these countries and consequently they never received a card. Not from me anyway.

Those of us in Amateur Radio who love the hobby and are QSL Managers would not think of doing anything underhanded to hurt the hobby. Possibly there are a few who cheat but you will find a rotten apple in a barrel of good ones too.

It costs a lot of money to send QSL cards from foreign amateurs especially when they are in remote places and I see no fault with amateurs giving a helping hand. I think, it is absurd as Mr Milne points out, however, G's having an American QSL Manager. This *is* going to far.

Mr Milne also forgets that a rare DX station compiles thousands of contacts during a year and this can become a chore in filling out QSL cards, so consequently many are not even sent out, as well as thinking of the expense involved in getting thousands of cards printed and mailed. Perhaps Mr Milne has been working too much in the handling of the QSL Bureau?

JOHN F. WOJTKIEWICZ, W3GJY

Conway, Pa., USA.

I am one of the lazy so-and-sos referred to by Mr A. O. Milne (January, 1966 BULLETIN) but I feel that I must make an effort to challenge his remarks. I would suggest that QSL managers have come to be not so much from any precedent of Mr Milne's but rather from their inherent necessity to the sheepskin brigade.

I have operated for some time from two places where I was the only active amateur station. The QSL problem in such cases is a tiresome chore I tackled grudgingly and inefficiently. Due to a misplaced sense of responsibility I refused several offers of QSL management but as the pile of outstanding correspondence grew higher and the sense of guilt grew deeper I eventually accepted, despite the wishes of the XYL who collects stamps but will not write out QSLs! What a difference it made to life! No longer was I in fear of switching on the rig for thoughts of writer's cramp. Those stations who called me purely to elicit my " card for DXCC " would be satisfied whilst I had more time to oblige the DX hunters and to pursue my own particular operating interests—three birds with one stone!

If we can believe the rumours of the extraordinary methods adopted by some stations to acquire credit for a QSO that may not have been legitimate then the unfortunate QSL manager is a weak link in a chain of heavy suspicion, and I agree with Mr Milne, it smells! However, it is untenable to consider that making out one's own QSL should be a necessary responsibility of holding a licence. Two-way radio communication is the object and two-way postal communication is superfluous and should be left to the discretion of the operator.

G. D. WILSON, G3NUF, CX9AAN

Montevideo, Uruguay.

Having been a member of the RSGB for little over one year I have spent many hours devouring your fine articles, but I would like to make a comment if I may regarding a letter you printed in the January issue by Mr Milne.

I handle QSLs here for only seven DX stations and one of them is a run-of-the-mill GW, if that's the term. I only handle cards for all USA/Canadian QSOs, *nothing* else, and this system has worked well. It gives a relief of time consuming QSL card writing to hundreds of W/K/VE/VO stations and accomplishes two things: first it allows more operating time for the DX operator and, secondly, it guarantees 100 per cent chance of getting a DX QSL for the USA/Canadian amateur. As for the run-of-the-mill GW, I can flatly state that more than half of his QSLs received here say " You're my first GW QSO." As you know more and more new operators are coming to the ranks in North America and many European contacts are their first QSOs, but I certainly would not call them run-of-the-mill. I can agree that Mr Milne has a problem on routing QSL cards for a station that has an American QSL Manager for all of his contacts but not so here.

My only hope is that the DXers who read Mr Milne's letter will consider it carefully, and if they need the assistance of an American QSL Manager, to try the system I do and do their own DX QSLing themselves, and any cards that go through the RSGB Bureau should be sent directly to the G station involved and nowhere else.

JOSEPH ARCURE JR. W3HNK

Norwood, Pa., USA.

National Field Day

May I bring to the attention of all forthcoming participants in National Field Day that the Famagusta group of the Cyprus Amateur Radio Society will as usual be operating a station during the contest with the sole intention of competing for the award of a certificate to the Commonwealth station providing most points to participating portable stations in the UK. We shall be using the call-sign ZC4SS and will operate under strict portable conditions. We hope to contact as many G/P's as possible. Operation will be on all bands 3·5 Mc/s up and we shall have a Vee beam pointing directly at G.

In addition to attempting to gain the above mentioned award we shall also be trying to retain the Cyprus Field Day Cup, which is awarded to the Cyprus portable station giving most points to participating G's. There will probably be at least one other station on the air during the period also portable and attempting to gain the Cup and RSGB certificate.

As the Government of the Republic are still not licensing radio amateur stations we will be operating from within the bounds of the Sovereign Base Area—hence the ZC4 call. However, should licence restrictions be removed within the Republic we shall be on the air with the call-signs 5B4SS.

We look forward to June and would like to stress that it's *twelve points* for working a Commonwealth Portable Station.

N. F. HOBBS, ZC4CK/G3CKK

Famagusta, Republic of Cyprus.

Service

Some time ago I purchased a crystal from Henrys Radio. When it arrived, however, it was inoperative, and when the holder was opened it was found that the edges of the crystal were chipped.

I informed the firm of this, and they immediately shipped me another one without any question whatsoever, and without further charge.

It is indeed a pleasure to have proof of the reliability of the firms which advertise in your periodical.

H. H. GLOSTER, VE3IT

London, Ontario, Canada.

Japanese Panel Meters

I have purchased, over the past year, about 100 of the Japanese meters (mainly 50 μA and S meters) sold by advertisers in your journal. About 20-25 per cent of these have been faulty, usually exhibiting a very high internal impedance sometimes in the order of Megohms. In every case, the supplier has replaced these faulty items without question—members buying single meters may not be quite so fortunate.

If you consider this experience worth passing on I would suggest that the members test the instrument by measuring the resistance of the instrument as soon as possible after purchase. The least this will do is to save a considerable amount of time in fault finding later.

J. BAYS, G3KFX

Bentley, near Ipswich.

Spark

It would appear that Mr Thomas Toth, BRS26680, is under some misapprehension with regard to maritime communication. The answer to question 498 in his little book of 1924 is not nearly so out-of-date as he and his friends seem to think. Even today, c.w. is not used for this purpose which would be impracticable for ship-to-ship and ship-to-shore services on the international frequency of 500 kc/s—600 metres—for the simple reason that many calls, including distress signals would, no doubt, be missed due to zero beat and/or slightly off frequency transmissions. In order to overcome this, m.c.w. or i.c.w. has taken the place of spark.

C.w. was used in those days, but only by passenger carrying liners for traffic clearance to GKU—then Devizes Radio—and intership working.

Regarding Mr Toth's comment—" in these days of s.s.b. and other modern rigs," I wonder whether he is aware that s.s.b. was in use—not by amateurs perhaps—when spark was still going strong!

I did, however, get a smile from his letter but not for the reason intended.

H. T. Longuehaye, G8KC
(formerly 2KC)

Tokers Green, near Reading.

EFI

Having been involved with electric fences for the past dozen years the following may be useful. As the fencer in question is almost certainly causing TVI full co-operation with the farmer is suggested and he will almost certainly be most grateful to you for curing his own TVI.

First disconnect the fencer unit from the electric fence itself and switch on, when it will almost certainly be found that the noise has disappeared indicating that the faults are on the electric fence. Should the noise persist check the capacitor across the points of the fencer, frequently 0·1 μF as well as its series resistor of about 50 ohms. Make sure the earth return is made from the fencer to a cold water pipe or earthing stake and not the mains neutral or earth. Check that the connection is sound and not corroded, which it very frequently is. Clean up and tape joint to prevent future corrosion.

With the fence wire reconnected and the fencer switched on walk beside the fence wire checking that the fence wire has not jumped out of insulators and is actually touching an iron stake. Also check any porcelain insulators for cracks as well as insulators made out of old rubber tubing, milking machine teats, etc. If faulty, point out that the rubber was probably perished before the tube was used as an insulator, for which purpose it is now useless as it merely allows the spark to find an easy path to earth instead of via the cattle or pigs enclosed. Before handling the fence wire, earth it with a battery crocodile clip first connected to an earthing stake unless you like shocks. Check actual joints on the fence wire, which should be made by twisting the wire double for at least an inch on either side of the joint as for soldering. If joints are made by looping the wire only, rust frequently occurs at the joint causing bad contact. If the fence consists of several sections connected together by insulated wire make sure the insulation is sound on the insulated wire. In one case the writer found such a wire running along the top of a piece of iron fencing. The insulation was perished and audible sparks were jumping across from the fence wire to the iron fence. Interference on the BBC Home Service was so bad that not even the news could be heard properly. Removal of the wire cured interference completely. If fence wire is very long round several fields it may be easier to locate the fault by disconnecting sections of the fence at a time.

G. Brammer, BRS181

Hitchin, Herts.

Subscriptions

While in no way taking a diametrically opposite view to G2HR (letter, RSGB Bulletin, April, 1966) concerning the subscription rate for young people, I think it would be in order to consider the true state of affairs. At £2 10s. the Corporate subscription is still less than one shilling per week, and virtually all boys and students I know who have Amateur Radio stations, spend more than this on other technical magazines alone. They have paper rounds or help from parents (who appreciate the great value of their hobby, and the Society, on educational grounds) which usually amounts to some £50 a year. No, I feel that most young people who reach call-sign status, after (again, usually) being nurtured as subsidized " A " members, are keen to support the Society fully. Those who are unwilling are the less interested ones anyway.

K. Smith, G3JIX

Walthamstow, London, E17.

1·8/3·5 Mc/s Transmitters

Many simple 10 watt transmitters covering Top Band and 80m suffer from the shortcoming that if a simple wire aerial is fed direct from the pi-tank circuit on 80m, considerable radiation can occur on the v.f.o. frequency in (or just outside) Top Band. This is because most of these sets have a single broad-band tuned circuit in the buffer/doubler stage which gives little rejection of unwanted frequencies. A pi-tank circuit also gives little attenuation to frequencies lower than its resonant frequency.

In my experience a good aerial tuning unit will sufficiently attenuate the spurious signal on Top Band. The circuit will depend on the aerial being fed and large components are not necessary with low power. In cases where the p.a. tank coil has too much inductance on 80m, tapping down may also improve matters.

Given a good aerial and a.t.u., many enjoyable contacts may be had on 80m using one of these 10 watt rigs without embarrassment due to radiation on Top Band. Unfortunately, constructional articles on these transmitters do not generally mention the need for an a.t.u. on 80m, with the result that many newly licensed amateurs find out the hard way.

P. J. Patrick, G3TWG

Lee Green, London, SE12.

Radio in the ATC

I am in complete support of G3COY, whose timely letter on the above subject appears in the March, 1966 RSGB Bulletin.

The first of a series of articles I am writing on Radio in the ATC for *Air Cadet*, the official journal of the Air Training Corps, will appear in the April edition. In this first article I have advised squadron staff to use the RSGB Call Book as an aid to locating radio clubs and individual amateurs who could be approached for their advice and assistance.

May I appeal to all amateurs who are so approached to offer to help, be it in a purely advisory capacity or for a Morse or Technical Instructor.

The ATC W/T network, operating on frequencies between 3·2 and 5·8 Mc/s provides the basis for much useful work in this too often neglected area of cadet activities and could produce new blood for the Amateur Radio movement.

J. B. Armstrong

Parcllyn, Cardigan.

TVI

While in no way wishing to detract from the novel suggestion made by G3CDE for provision of a TVI vehicle—it might well prove of use in low TV signal areas—his letter prompts me to make one or two observations on this vexed problem.

I am quite sure that many amateurs tend to make " too much of a meal " of TVI—indeed I must confess it took the writer some time to see the sensible approach! The fact is that the GPO Liaison and TVI Committee secured an understanding with the GPO some years ago, the essence of which is that where it can be proven that interference is due to the TV receiver design the onus lies with the set owner.

The obvious starting point is one's own TV receiver, having first ensured that one's own equipment is above suspicion. On this latter point I agree with Mr Jackson entirely!

Once one can show that TV reception in one's own home is unaffected on all bands then the viewer problem can be tackled with confidence, and this is where I feel many amateurs fall down. Either they are anxious to avoid upsetting neighbours (I do not relish this myself!), or they fail to carry the matter to a successful conclusion in an organized and forthright manner; tact and pleasantness, of course, play their part. Space here does not permit a detailed account of the manner in which I tackled the viewer problem but a forthright campaign has produced results. If one is not prepared to undertake this aspect there is little point in TVI proofing one's gear.

The h.f. bands transmitter at G3ABZ is a single-ended Elizabethan, 75 watts input with 100 per cent plate and screen modulation, having a coax stub at the pi-network, a three section filter before the s.w.r. bridge, and a four section filter immediately following it into the " Z " match feeding folded dipoles. This is all rather ancient but is nevertheless efficient! There has never been a vestige of interference to BBC TV on our 17 in. Ekco

receiver and GPO investigating officers were not only satisfied, but almost embarrassingly high in their praise of the complete adequacy of precautions taken. The one or two viewers who elected to call them in were left in no doubt as to where the fault lay, and the trouble was cured by one of the quite excellent GPO high pass filters, believed to be type F.S.36.A.

A final word is due on the technical aspect. Beware of the phenomenon where in many of the newer TV receivers with very high gain front-ends, severe overloading can result in the production of spurious responses which are difficult to distinguish from transmitter harmonic radiation.

TVI can be cured given forthright action and a straight approach to the matter, but it's too easy to get side-tracked!

A. H. J. WARNER, G3ABZ

Maidstone, Kent.

School Radio Societies

Noting the number of schools with club stations which are now on the air we feel it would be helpful to us if we could know the times when these stations are most likely to be active.

If school radio clubs would be prepared to let us know early next term the full name of the school, call-sign and most likely time of activity together with an s.a.e., Magnus would be willing to list, duplicate and return a copy to each school. Schools with only listening equipment would also be welcome to a copy on application.

Magnus Grammar School
Radio Society, G3PAW

Newark-on-Trent, Notts.

V.H.F. NFD Rules

Congratulations to the Contests Committee for striking yet another blow against v.h.f. progress. I refer to the rules for the 1966 V.H.F. NFD published in the March issue of the BULLETIN in which the use of more than one receiver is prohibited.

If an interest in taking part in contests is to be maintained surely it is necessary that each year produces a performance better than the last. With the present high level of activity during v.h.f. contests and the prevailing technical standard—on the average little different from 15 years ago—the only way to improve performance is to make more contacts and this means each contact must take less time. At present the time per contact is dictated by the rate of which a band 2 Mc/s wide can be effectively tuned listening for replies—at least so long as the present prehistoric operating procedures are perpetuated. Multiple receivers merely reduce the time which can be wasted and do not offer any other advantage. You can't have more than one contact at a time!

This decision would appear to have been made to even up the performance put up by the well organized and well equipped groups with good operators, when compared with the more modest efforts of less experienced or efficient groups who should surely be given an incentive to improve. Even with the rules of last year several top placings were remarkably close in the total scores. The new rule is going to make the results even closer.

I could of course be charitable and suggest that the introduction of the rule was aimed at encouraging technical progress, etc., s.s.b., v.f.o's, common channel operation, quick contacts without interminable calling all over the band, etc. Somehow I don't think that this is the case!

I am less incensed but nevertheless critical of the decision to stay with a 25 watt power limit. The GPO permits 150 watts input, and so why should we be deprived of another 8db. You might just as well restrict aerials to dipoles!

An opportunity to produce compact high power portable equipment and associated power supplies would produce some interesting technical developments which are badly needed.

So long as the IARU Region I V.H.F. Contest runs concurrently with our V.H.F. NFD I suggest that the Society advises IARU that British stations will not participate. The restrictive practices imposed by the Contests Committee are such that no self-respecting group will submit an entry and show up the poor standard of V.H.F. competence here compared with our European neighbours.

It doesn't need much thought to devise a receiver which infringes the spirit of the rules while satisfying the wording!

G. S. BRACEWELL, G3EGK

Hale, Cheshire.

I would refer Mr Bracewell to the results of a questionnaire concerning V.H.F. NFD Contests, published in the March, 1966 issue of the BULLETIN. From this he will observe and understand the general tenor of the feelings of V.H.F. NFD participants, concerning the way they would like this contest to be run.

With regard to the penultimate paragraph, I really cannot understand this statement. According to the results list for the 1965 IARU Contest (February BULLETIN), UK amateurs occupied fourth and sixth position in the portable section, and fourth position in the fixed section, the entries in each section running into hundreds! Surely proof of technical and operational ability?

J. C. FOSTER, G2JF
Chairman, V.H.F. Contests Committee.

I think that the V.H.F. Contests Committee has made an error of judgment in conceding to a small majority (possibly 16 small groups) regarding the new V.H.F. NFD rule " only one receiver per band may be used."

This rule is in direct conflict with good operating practice and is calculated to inhibit progress in the art and science of radio communication. It says, in effect, " you should listen on the band before transmitting, but do not attempt to listen too well! " It says, " do not use every endeavour to make it easy for the other chap to work you, make him clutter up the band with needlessly long drawn out calls."

I would like to know what justification there is for this retrograde rule which seems to be designed to discourage efficient use of the v.h.f. bands as we now know them? If it is meant to encourage single channel v.f.o. working as I think it will, then the committee should say so. It can be sure that keen groups will always find the most efficient way to make contacts and will use all means to this end.

Furthermore, it is obviously unfair to restrict by decree the number of people who can usefully enjoy participation at any one time. Many an SWL has had the thrill of his life by just listening on the second or third receiver. Why pick on receivers in this arbitrary manner? If the reason is a levelling up process why not a straightforward handicap for talent, enthusiasm and initiative?

It is just possible that this silly rule will lead to another rule defining a receiver, because my group intends to build a new one for this season. It will be large by ordinary standards, and have many knobs.

G. N. ROBERTS, G3ENY,
Chairman, Severn Valley ARC

Bridgnorth, Shropshire.

Reciprocal Licensing

As possibly the first British amateur to receive a FCC permit to operate an amateur station in the United States, may I offer my thanks to all those concerned with the setting up of reciprocal licensing between the UK and the USA.

Most people are probably not concerned or interested, but one day perhaps they may find themselves in a foreign land where, thanks to the hard work performed by the RSGB and several amateurs, they will be able to obtain a permit without any difficulty, and not, like myself, have to sit for two and a half years without one.

Again, to all concerned my sincere thanks.

R. DAVID GYNN, G3SBP/KV4, VP2VD, ex-5N2RDG

St. Thomas, US Virgin Islands.

Hertz

May I be permitted to reply to Paul Harris, G3GFN (April, 1966 issue) on his so-called anachronism in the use of the term " Hertz."

To call the term cycle/second is meaningful in itself presupposes the definition of both cycle and second just as Ampere requires the definition of Coulomb and second. To suggest the use of the terms Whittles, Bells, etc., is quite irrelevant as these men he lists were all inventors whereas Hertz did discover the phenomenon of electromagnetic emission or radio waves for short. Without his discovery we may even now be without our hobby and indeed radio communications in general.

In these days of suggested conversion to the decimal system there are many arguments on each side, but surely the strongest is to remove duplicity and forget our " National Pride." Many British terms and standards are accepted internationally, let us reciprocate occasionally and in this case use the term Hertz as used on the Continent. I for one shall use it henceforth.

D. H. DOTESIO, B.Sc.,
BRS26622

Bradford-on-Avon, Wilts.

NEWS . . .

Collated by John Clarricoats, O.B.E., G6CL

US Amateurs and ARRL Members

Federal Communications Commission figures showed approximately 270,000 amateur station licences and 262,000 operator licences in force in the USA at the end of 1965, both figures being up by about 6000 compared with those for the end of 1964. About 14,000 Novice licences were in force and about 17,500 new licences were issued during the year, roughly the same as for 1964, but much lower than the range 28,000–35,000 new licences issued, during each of the previous five years. Voting membership of the ARRL at the end of 1965 was 81,289, compared with 81,969 a year earlier. Total League membership at 31 December 1965, was 101,046 against 102,063 at the end of 1964.

Issue of US Amateur Licences Drops

February *QST* records a serious reduction over the past two years of the number of newcomers to Amateur Radio. Up to 1963 the number of new amateur licences issued by the FCC had been running at about 33,000 a year. During 1964 and 1965 the number fell to about 20,000 a year. No single reason can be attributed for the decline but it will be interesting to see whether the trend is followed in Europe.

Amateur Licences

In the year between 31 January, 1965, and 31 January, 1966, the number of Amateur (Sound) Licences (A) increased from 11,015 to 11,543. Phone-only Licences (B) almost doubled from 164 to 324 and Mobile Licences shot-up from 1749 to 1966. The number of Amateur Television Licences remained almost static at 173, an increase of only five during the year.

WAC Awards

A total of 1474 WAC Awards were issued during 1965. Of this figure, 921 were for c.w. or mixed modes, 143 for phone-only and 410 for s.s.b. Twenty-two endorsements were issued for c.w./mixed and ten for s.s.b. operation on 3·5 Mc/s. One special endorsement was issued for Top Band work. The 1965 figure was 300 up on the previous year.

Slade Radio Society

Mr George Brown, G5BJ, has agreed to enlighten the Slade Radio Society on the strange, primitive and probably dangerous methods of communication in the early days. The Church House, High Street, Erdington, Birmingham 23 should provide an appropriate setting for G5BJ to tell some hair raising stories on 10 June.

ITU Meetings

ITU Administrative Council, will meet in Geneva from 9 May to 4 June, and the XIth Plenary Assembly of the International Radio Consultative Committee (CCIR) from 22 June to 22 July in Oslo. The African LF/MF Broadcasting Conference will open in Geneva on 19 September and end on 7 October 1966.

World Maritime Mobile Conference

World Administrative Radio Conference to deal with matters relating to the maritime mobile service is to be held in Geneva during the second quarter of 1967 and will run for a period of eight weeks.

Off-shore Radio

Radio 390, which claims to have the most potent signal of all the British off-shore pirate broadcasters, has commissioned KW Electronics Ltd. to carry out a survey to determine strength and reception characteristics of its signals in different parts of the United Kingdom.

MOBILE RALLIES

8 May.....**Thanet Mobile Rally**
Cliff-top site, by the Viking Ship, Pegwell Bay, Ramsgate.
(See below)
Organized by the Thanet Radio Society

30 May.....**Saltash Mobile Rally**
Calstock Playing Fields, near Plymouth
(See page 236, April)
Organized by the Saltash and District ARC

12 June.....**RSGB National Mobile Rally**
It is regretted that this date has been found unsuitable, but a new date for the second RSGB rally this year may be announced later.

26 June.....**Longleat Mobile Rally**
Longleat Park, on the Frome-Warminster Road, A362
Organized by the Bristol RSGB Group

26 June.....**Hunstanton Bucket and Spade Party**
G3JEC's Brookes Refreshment Rooms, the car park, opposite the railway station

10 July.....**Hurn Airport Mobile Rally**
Hurn Airport, Bournemouth
Organized by the Wessex Amateur Radio Group and BAC Radio Club

10 July.....**South Shields Mobile Rally**
Organized by the South Shields and District ARC

14 August.....**Derby Mobile Rally**
Organized by the Derby and District ARC

29 August.....**Peterborough Mobile Rally**
Riverside, near the swimming pool, Peterborough
(See below)
Organized by the Peterborough and District ARS

4 September.....**Swindon Mobile Picnic**
Lidiard Park, near Swindon
Organized by the Swindon and District ARC

11 September.....**RSGB National Mobile Rally**
Organized by the Radio Society of Great Britain

Thanet Mobile Rally, 8 May, 1966

Cliff-top site by the Viking Ship, Pegwell Bay, Ramsgate

Talk-in stations: G3DOE, 160m; G3JMB, 4m; G3BAC, 2m

Attractions will include a display by the Royal Signals TA. Refreshments will be available.

Organized by the Thanet Radio Society

Peterborough Mobile Rally 29 August, 1966

The Riverside, adjacent to swimming pool

Talk-in stations: G3DQW, 1980 kc/s; G3RED, 4m; G3EEL, 2m.

Ample free parking and picnic space will be available. There is no entrance fee. Further details may be obtained from D. Byrne, G3KPO, Jersey House, Eye, Peterborough.

Organized by the Peterborough and District ARS

CONTEST NEWS

RESULTS — REPORTS — RULES

Second 144 Mc/s Contest (Open) 1966

By a large margin of points, GW3RUF/P commands the leading position in the Second 144 Mc/s Contest held on 5 and 6 March and proves what can be done from a good position, in what must be an isolated part of the United Kingdom, given reasonable propagational conditions and good activity. However, one must not lose sight of the fact that equipment must likewise be performing at optimum efficiency, a point which is sometimes overlooked. Special note should be made of G3JTW/A, who, in their second entry have been placed second. From Staffordshire, G4JJ/P managed to occupy third place. Congratulations to the leading stations whom it will be noted come from widely separated parts of the country.

General Comment

GW3RUF/P obtained six contacts around the 350 km mark, his most distant QSO being with F9NJ (Lille) at 450 km. This contact represents the best achievement during the contest.

G3JTW/A worked DJ9DL at 439 km and DL0VB at 407 km. They also had 17 contacts with PA0 and produced a truly excellent log. They comment favourably on the rules and would like to see more use made of the QRA locator system.

G3MDH/P expresses similar sentiments about the QRA locator system and has a favourable word to say about the use of transistors for portable work.

G3KAC, like a number of other contestants, records his protest about the rule which requires a statement of frequency on the reverse side of the declaration. This point has been noted for consideration at a future date, but meanwhile the contestants as a whole should remember that these requirements, which occur from time to time, are the result of popular opinion and not just a whim of a few individuals. Your Contests Committee organizes what you require! G3TR and G3PTM comment favourably on the rules. G3TXW, Sheffield, wonders why he did not hear any GM stations. G2WS considers that the band plan was fairly strictly observed but thinks that the QRA locator complicates the issue.

Notes and comments from G3KMI, G3SHZ, G3JXN, G2AUD, G3SHK, G3USR, G3UKV, GW3TSH/P, G3TCG and G3GBU/A are all acknowledged with thanks.

A perusal of all logs shows that there was no activity at all between the hours of 02.00 and 06.00, therefore the Contests Committee will consider closing down at midnight and re-opening at 06.00. Comment on this change will be appreciated.

Check logs from G2DHV/P, G2BQ and G3EHR are acknowledged with thanks.

Listeners' V.H.F. Contest, 1966

Mr R. A. Ham, BRS15744, who established himself as the Listener Champion for 1965 has made an excellent start in the 1966 Championship by taking first place in the March event. Mr D. A. R. Poulter, A4048, who came third in last year's event

RESULTS

Position	Call-sign	Location	P.A.	Input (Watts)	Aerial	Receiver	Best QSO km	No. of QSOs	Points
1	GW3RUF/P	Nr. Pandy, Mon.	3-20A	25	10 ele	6DS4	450	189	30,457
2	G3JTW/A	Danbury Hill, Essex	6-40A	100	4 × 9 ele	E88CC	439	165	19,943
3	G4JJ/P	Nr. Leek, Staffs.	3-10	10	5 ele	Trans	345	147	18,677
4	G3OXD/A	Nr. Dudley, Staffs.	6-40A	80	6/6	6CW4	412	156	18,142
5	G3TQZ/P	Nr. Evesham, Worcs.	3-20A	25	10 ele	EC88	437	155	17,645
6	G3MDH/P	Nr. Shaftesbury, Wilts.	3-20A	25	6/6	Trans	359	115	17,540
7	G3HRH	Nr. Welwyn, Herts.	C1108	150	8/8/8/8	6CW4	478	152	14,015
8	G3TEK/P	Nr. Newbury, Berks.	3-20A	20	4/4	6CW4	370	117	13,923
9	G2AUD	Nr. Bletchley, Bucks.	6-40A	100	2 × 10 ele	6CW4	356	106	12,296
10	G3LAS	Berkhamstead	6-40A	90	10 ele	6CW4	330	115	10,604
11	G2XV	Cambridge	6-40A	100	3 × 3 × 3	6AM4	321	88	9552
12	G3KAC	Bristol	3-10	18	8/8	6CW4	275	59	8679
13	G3SHK	Ruislip, Middlesex	4CX250B	100	10/10		258	114	8351
14	G3AHB	Slough, Bucks.	6-40A	80	6/6	6CW4		112	8281
15	G3PNA	Bletchingley, Surrey	6-40A	70	6/6	E88CC	352	112	8277
16	G3PTM	Solihull, Warks.	3-20A	40	6/6	6CW4	324	90	8245
17	G3TR	Nr. Crawley, Sussex	QQV07/50	120	10 ele	6CW4	310	97	7754
18	G3TXW	Leeds, Yorks.	6-40A	90	8 ele	6CW4	330	54	7244
19	G3ORL	Nr. Bristol, Somerset	3-20A	15	4/4	6CW4	269	53	6676
20	G3KMI	Nr. Southampton, Hants	3-20A	25	8/8	E88CC	220	68	6672
21	GC2FZC	Guernsey	6-40	60	8/8	ECC88	285	30	6641
22	G3SHZ	Harrow, Middlesex	6-40A	90	10 ele	Trans.	250	105	6415
23	G3RXK/P	Clun, Shropshire	3-20	30	6/6	6CW4	320	49	6155
24	G5DF	Reading, Berks.	6-40A	90	16 ele collin	—	290	62	6013
25	G3JXN	Nr. Charing X, London	6-40A	100	6/6	6CW4	280	94	5784
26	G3EDD	Cambridge	6-40	120	6 ele	E88C	226	52	5703
27	G3RIM/A	Reigate, Surrey	3-20A	40	10 ele	6CW4	310	83	5690
28	G3USR	Nr. Warlingham, Surrey	3-10	10	8 ele	6DS4	288	103	5213
29	G3UKV	Cheltenham, Glos.	3-20A	35	8 ele	6CW4	216	49	3976
30	G3UFQ/P	Licky Beacon, Worcs.	3-10	15	5 ele	6CW4	189	50	3949
31	G3RCV	Sidcup, Kent	3-20A	25	5 ele	—	342	68	3747
32	GW3TSH/P	Nr. Haverfordwest	6-40	68	8 ele	—	320	26	3576
33	G3TCG	Upminster, Essex	—	120	6/6	6CW4	225	59	3148
34	G2WS	Nr. Coventry, Warks.	6-40	60	4/4	AF139	169	36	2903
*	G3GBU/A	Stoke-on-Trent	3-20A	20	4 ele	ECC88	142	46	2831
35	G3PYC	Horsham, Sussex	6-40A	90	8 ele	A2521	209	35	2780
36	G3PKV	Welwyn, Herts.	832	23	4/4	E88C	195	38	1810
37	G5UM	Knebworth, Herts.	3-20A	25	6/6	6CW4	209	23	1569
38	G3TRB/A	Nr. Solihull, Warks.	3-10	20	4/4	6CW4	128	34	1502
39	G3JDM/P	Nr. Gailey, Staffs.	832	15	5 ele	6CW4	217	16	1345
40	GM3TFY/P	Nr. Dunbar, East Lothian	2-6	9	8 ele	Trans	381	11	1112
41	G3SZS	Nr. Gloucester, Glos.	5763	10	4 ele	ECC84	83	19	1018
42	G3TSZ/A	Bletchley, Bucks.	—	5	3 ele	—	95	12	622
43	G3THM	Luton, Beds.	832	25	4 ele	AF139	69	16	561
44	G3UIK	Nr. Barnet	832	12	4 ele	6CW4	65	23	523
45	G5BB	Potters Bar, Middx.	832	20	4/4	6AK5	204	8	424

* No signed declaration

moves up to second place, followed by Mr R. W. F. Thomas, in third place.

All contestants appear to have enjoyed themselves and seem to find the rules satisfactory.

Congratulations to the leading stations.

RESULTS

Pstn.	Name	BRS/A	Rcvr.	Aerial	Counties	Stations	Points
1	R. A. Ham	BRS15744	AF114	4/4	29	106	2450
2	D. A. R. Poulter	A4048	6CW4	8 ele.	19	112	1915
3	R. W. F. Thomas	BRS15822	6CW4	5 ele.	22	84	1600
4	G. Swan	A3696	6CW4	8 ele.	17	67	1535
5	A. G. Baker	A4248	6CW4	2 ele.	17	81	1530
6	E. J. Harland	A4388	6CW4	halo	16	89	1485
7	D. J. Barlow	A3768	E88CC	6 ele.	14	32	730
8	A. A. Goacher	A3942	—	4 ele.	12	89	680
9	D. J. Butler	A4242	6CW4	halo	9	45	645
10	S. Williamson	A4743	6CW4	6 ele.	8	30	540
11	S. L. Berry	BRS27482	A2521	dipole	8	30	530

First 70 Mc/s Contest (Open) 1966

One hundred and eighty-four call-signs appeared in the logs received for this contest held on 13 February. This total included one GC, 10 GW and 14 GIs. Once again Section B produced the overall winner G3OXD/A, the station of Albright and Wilson ARS, operated by G3NZS, G3PXZ, G3TGL and G3UEY. Thirty contacts at over 100 miles accounted for almost half their score. G3OUF/P, operated by G3OUF, G3TVL and G3UDV of Ealing and District ARS was second with 11 contacts over 100 miles and one (G3RIK/P) over 200 miles. Leader in Section A was G3IMV of Bletchley who changed places with G3JHM/A, last year's winner. Check logs were received from G2DHV, G3LAS, G3SPY, GC3OBM, BRS15744, A4048, A4242 and A4743.

Subject to Council's approval, miniature cups will be awarded to G3OXD/A and G3IMV and Certificates of Merit to G3OUF/P and G3JHM/A.

The areas of greatest activity were the Home Counties and Lancashire and Cheshire with patches of activity in the Midlands, Devon, Northern Ireland and the Southampton area.

Equipment

Twelve different types of p.a. valve were used, with the QQV03-20A the most popular. There were one each 807, 815, 5763, 5B/254M and QV04-7. The Nuvistor is still the most widely used r.f. stage. Almost half the competitors used 4 element Yagis but there were four 4-over-4s and one 7 element.

Comments

The operators of G3KMI (Southampton) suggest that dipoles are now compulsory as the use of reflecting and repeating devices is not allowed! G3KAC (Bristol) and G3EDD (Cambridge) feel that there are many stations only equipped for local contacts,

RESULTS

Call-sign	Position (section A)	Position (section B)	Points	Contacts	Power (Watts)	Location
G3OXD/A		1	6639	85		Worcs.
G3OUF/P		2	5949	111	25	Sussex
G3IMV	1		4407	81	50	Bucks.
G3JHM/A	2		3740	62	25	Sussex
G3PPG		3	3458	48	50	Worcs.
GW3RUF/P		4	3267	32	15	Brecon
G3OJE		5	3095	95	40	Bucks.
G5FK		6	2952	100	50	Middx.
G3KMI		7	2872	55	20	Hants.
G3SUV	3		2830	40	20	Essex
G3KAC	4		2754	34	30	Glos.
G3PXP/P		8	2733	39	10	Leics.
G3RIK/P		9	2440	48	10	Lancs.
G3TXB	5		2417	83	20	London
G3RCV		10	2329	82	25	Kent
G3RIN/A		11	2157	74	30	Surrey
G3EDD	6		1889	27	40	Cambs.
G3HRH		12	1805	38	20	Herts.
G3GVM	7		1683	36	20	Hants.
G3TJW/P		13	1524	29	50	Devon
G3OHH	8		1389	39	50	Cheshire
G3RDQ	9		1343	40	45	Surrey
G3PMJ	10		1255	40	30	Lancs.
G3TCT	11		1236	27	25	Surrey
G3ABM/P		14	1209	32	4	Cheshire
G3UGJ/A	12		1162	26	10	Oxford
G3PLX	13		1041	36	50	Lancs.
G3RLE	14		797	20	35	Yorks.
G2WS	15		748	14	20	Warks.
G3HWR	16		606	22	50	London
G3JMB	17		590	9	8	Kent
G3UTY	18		581	34	28	London
G3RWM/P		15	568	28	14	Lancs.
GW3UED/A	19		531	15	9	Denbigh.
G3JDM/A	20		469	11	15	Staffs.
G3UQG	21		454	11	5	Essex
G3UOV	*		408	14		Sussex
G3JKY	22		203	19	10	Kent
G3RUV/P		16	193	9	10	Devon
GI3TLT	†		191	12	10	Co. Down
G3IYG	23		144	11	8	Devon

* No Cover Sheet † No Locations logged

while G3JMB (Margate) points out the disadvantage of being isolated from the centres of activity and thus neglected by other stations' beams. His nearest contact was at 28 miles.

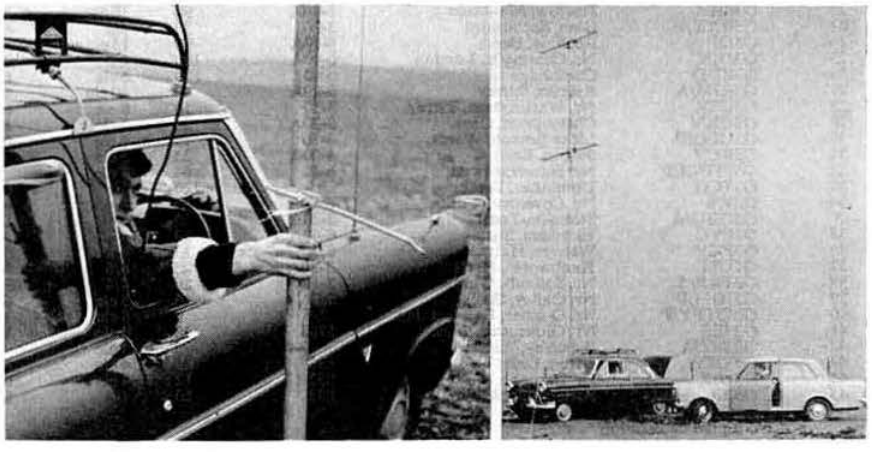
G3RLE (Cleckheaton, Yorks) heard several carriers from the south which could have given him more contacts if they had been keyed.

G3HWR asks that operators should not change the form of location sent when asked for a repeat. This could lead to errors if part of the QTH was copied on the first transmission.

G3GVM suggests that all contacts should be logged even if incomplete. This assists in checking. There were no comments on the rules.

Logs

It appears that errors are more likely to occur when copying the logs than when operating, e.g., bearings and distances missing



Placed second in the First 70 Mc/s Contest was the Ealing and District Amateur Radio Society who entered under the call G3OUF/P. Seen in the photograph is G3TVL using the Armstrong method to rotate the 30 ft. mast—guyed with string—supporting the 4-over-4 element aerial. *(Photo by G3UDV)*

on S9 contacts or call letters transposed. G2AIH appeared as G2AIF in one log and as G2IAH in another! Contestants are reminded that log and cover sheets may be obtained from RSGB Headquarters by sending a s.a.e.

First 1·8 Mc/s Contest 1966

The first Top Band contest of 1966 took place on Saturday and Sunday, 19 and 20 February, and attracted a slightly better entry than the previous contest.

Once again D. G. Alexander, G3KLH, is the winner by a wide margin over the runner-up, G3NOQ (operating under the call-sign G3OWM of Newcastle University Radio Club). These two stations were the only ones to achieve scores of over seven hundred.

In third place is I. T. Cashmore, G3BMY, which is yet another call-sign that is regularly near the top of the table.

Conditions seem to have been good without being spectacular, although one or two stations comment that later in the morning the trans-Atlantic DX was coming through. G3IGW mentions that he worked ZD7RH just after the end of the contest.

RESULTS

Position	Call-sign	County	Score
1	G3KLH	BE	779
2	G3OWM (op. G3NOQ)	ND	737
3	G3BMY	SE	677
4	G3IGW	YS	669
5	G3PWU	BE	617
6	G3JEQ	SY	566
7	G3SMI	CH	555
8	G3RXO	BD	520
9	GM3NYY	AY	516
10	G3LIV	DH	498
11	G5RP	BE	495
12	G3JVJ	SX	487
13	G3SYS	SX	481
14	GM3KHH	BF	458
15	G3TIR	SX	442
16	G8AB/A	EX	440
17	G2DC	HE	435
18	GM3FXM	FE	421
19	G3SZF	HF	418
20	G3TLH/A	YS	413
21	G3RWF	NM	401
22	GM3KMR	MN	396
23	G3NNW	LE	395
24	G3ERN	EX	389
25	G3RSD	LN	367
26	G3CBW	HF	362
27	GW3GWX	CV	361
28	G3TJD	SD	358
29	G3SFR	HE	321
30	G3BTU	NM	310
31	G3SJP	BE	307
*	G3RSO	EX	290
32	G3ITF	HE	281
33	G3ULF	NK	280
34	G3RFT	LE	257
35	G3OYU	KT	254
35	G8JM	LD	254
37	G3UFY	SY	252
38	G3SKC	MX	249
39	G3RSF	EX	240
40	G3FVW	YS	228
41	G3TNN	LE	226
42	G2XP	SY	222
43	G3UQL	EX	220
44	G3TAA	LD	218
44	G6HD	KT	218
46	G3RYJ	CD	213
46	G3NQT	EX	213
48	GI3OIC	AM	201
†	G3BY	LE	192
*	G3TMY	SF	190
49	G3NKX	EX	180
50	G3PYC	SX	175
*	G3IWL	SX	173
51	G3TUM	EX	171
52	G3HZL	MX	165
53	G3TIE	LD	163
54	G3PPE	CH	155
55	G3TLF	EX	151
56	G3UHO	MX	147
56	G3JKY	KT	147
58	G3KSH	MX	111
58	G3SGF	LD	111
60	G8JD	DH	102
61	G3DGN	EX	95
62	G3OFX	HE	52
62	G6OO	LN	52
64	G3HVT	NM	42
65	G2ABK	LN	41
*	G3OHM/A	WK	38

* Multi-Operator † Late entry

Comments from Competitors

There were few comments, but of those that were sent in nearly all revealed their enjoyment of this contest. The standard of operating is nearly always commended, and the only complaint is that some stations seem quite unconcerned about errors and resent the efforts of the receiving station to obtain correct copy. However, in spite of this minority, operating can be summed up in the words of G2DC "... excellent, and it gave me, an old dedicated c.w. operator, great pleasure to hear so many of our young operators handling their keys so efficiently." GM3KMR asks for some details of aerials, and so a table of the aerials in use by a few stations has been prepared. The majority of aerials are either full-wave or half-wave (some bent several times) but it seems on this band that " the more wire the better " is true. One final comment, a cry from the heart, " Usually few stations come back to CQ—this time few stations came back! "

Equipment in use

Call-sign	Aerial	Receiver
G3KLH	Dipole 50 ft. high	13 valve double superhet with 200 c/s filter
G3OWM	268 ft. end fed 50 ft. high	KW77
G3BMY	Half-wave	Converter and CR100
G3IGW	275 ft. semi-vertical	Eddystone 750
G3PWU	Full-wave loaded	Triple conv. " home-brew "
G3JVJ	Inverted-Vee dipole	AR88D
GM3KHH	254 ft. folded dipole	CR100 (modified)
G3NKX	40 ft. top loaded vert.	Home - built double superhet
G3HZL	33 ft. base loaded vert.	HRO and BC453

Check Logs

As always these are very welcome and the following are thanked for sending in logs.

A3942, G3FM, G4VF, G3ABM, OK3KRN, OK2KOI, OK2KMR, OK2VX, OK1DX, OL6AAF, OL5ADK, OL6ACY, OL5ADO, OL7ABI, VO1FB.

CONTESTS DIARY

8 May	-Third 144 Mc/s (Portable) Contest (see page 195, March 1966)*
22 May	-D/F Qualifying Event (see page 338)
22 May	-Cardiff D/F Event
28-29 May	-First 432 Mc/s (Open) Contests (see page 195, March 1966)*
29 May	-1296 Mc/s Contest (see page 195, March 1966)*
4-5 June	—CHC/FHC/HTH QSO Party
4-5 June	—National Field Day (For rules, see page 51, January 1966)
19 June	—D/F Qualifying Event
3 July	—Fourth 144 Mc/s (Portable) Contest * (see page 338)
9-10 July	—1·8 Mc/s Summer Contest (see page 338)
17 July	—D/F Qualifying Event
24 July	—Third 70 Mc/s (Portable) Contest *
31 July	—D/F Qualifying Event
13-14 August	—WAE Contest (C.W.)
3-4 September	—V.H.F. NFD *
10-11 September	—WAE Contest (Phone)
11 September	—80 Metre Field Day
18 September	—D/F Final
16 October	—Second 1296 Mc/s Contest *
15-16 October	—RSGB 21-28 Mc/s Telephony Contest
15-16 October	—Second 420 Mc/s Contest *
29-30 October	—RSGB 7 Mc/s DX (Phone) Contest
12-13 November	—RSGB 7 Mc/s DX (C.W.) Contest
19-20 November	—Second Top Band Contest
4 December	—Fourth 70 Mc/s (C.W.) Contest *

* Qualifying contests for V.H.F./U.H.F. Listeners' Championship

Fourth 144 Mc/s Contest (Portable) 1966

The rules for this contest are similar to those for the May contest. QRA locators only should be exchanged and distances are to be measured in kilometres. The QRA locator map of Western Europe is recommended for distance measurement, on which the scale is exactly 25 kilometres to the centimetre. A description of the QRA locator system appeared in the BULLETIN for March, 1965.

Check logs from listeners are invited and may be credited towards the V.H.F. Listeners' Championship. Any comments on the rules will be welcome and will be considered when the rules for the next similar contest are made.

1. **When:** 10.00 GMT to 18.00 GMT on **Sunday, 3 July, 1966.**
2. The **General Rules** for RSGB contests published in the January 1966 issue of the RSGB BULLETIN will apply except as superseded by the rules of this contest.
3. **Power Supplies.** Power for any part of the station shall not be derived from supply mains, and the input to any stage of the transmitter shall not exceed 25 watts.
4. **Contacts** may be made on any mode permitted in the Amateur (Sound) Licence except A2 (m.c.w.).
5. **Scoring** will be on the basis of one point per kilometre for contacts with fixed stations and two points per kilometre with portable or mobile stations.
6. **Contest Exchanges.** RST or RS reports followed by the contact number and five-character QRA locator.
7. **Entries.** (a) Logs should 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 "; " QRA received "; " Call-sign of operator " (Multi-operator entries only); " Distance in kilometres "; " Points claimed."

(b) The cover sheet must be made out in accordance with the General Rules and the declaration signed. Multi-operator entries should be so marked and the operators listed. The QRA as sent should be recorded.

(c) Entries must be post-marked not later than **Monday, 18 July, 1966.**

8. **Awards.** At the discretion of Council a miniature cup will be awarded to the winner and a Certificate of Merit to the runner-up.

First Summer Top Band Contest

The rules for the First Summer Top Band Contest are as follows:

1. **When:** 21.00 GMT on **Saturday, 9 July,** to 02.00 GMT on **Sunday, 10 July, 1966,**
2. **Eligible Entrants:** The contest is open to licensed amateurs in all parts of the world who must operate in accordance with the terms of their licences. Multiple operator entries will be allowed.
3. The General Rules published in the January 1966 issue of the RSGB BULLETIN relating to RSGB contests will apply.
4. **Contacts:** C.w. (A1) only in the **1·8—2 Mc/s** band.
5. **Scoring:** *UK stations.* 3 points for each completed contact plus a bonus of 5 points for each new county within the British Isles and a bonus of 5 points for each new country outside the British Isles.

Overseas Stations may only claim points for contacts with British Isles stations and will score 3 points for each contact plus a bonus of five points for each new county worked.

6. **Contest Exchanges:** RST reports followed by the contact number starting with 001 and the county code letters given on page 50 of the January 1966 issue of the BULLETIN, e.g., for a contact from Surrey 579005 SY. Overseas stations need only send RST report and serial number. All reports must be acknowledged with " R."
7. **Logs,** (*a*) Must be tabulated in columns headed (in this order): " Time GMT," " Call-sign of station worked," " My report on his signals and serial number sent," " His report on my signals and serial number received," " County code letters received," " Bonus points," " Total points claimed." The county code letters as sent must be entered at the top of each log sheet.

(*b*) The cover sheet must be made out in accordance with RSGB Contests rule 4. The declaration must be signed.

(*c*) Entries must be postmarked not later than **25 July, 1966,**

8. **Awards:** At the discretion of the Council, certificates of merit will be awarded to the winner and runner up in the British Isles and also to the leading entrant in each overseas country.

A certificate of merit will also be awarded to the non-transmitting member submitting the best check log.

Third 70 Mc/s Contest (Portable) 1966

The rules for this event are similar to those for last year.

1. **When:** 10.00 GMT to 19.00 GMT on **Sunday, 24 July, 1966.**
2. The **General Rules** for RSGB contests published in the January 1966 issue of the RSGB BULLETIN will apply except as superseded by the rules of this contest.
3. **Power Supplies.** Power for any part of the station shall not be derived from supply mains.
4. **Contacts** may be made on any mode permitted in the Amateur (Sound) Licence except A2 (m.c.w.).
5. **Scoring** will be on the basis of one point per mile for contacts with fixed stations and two points per mile with portable or mobile stations.
6. **Contest Exchanges.** RST or RS reports followed by the contact number and location (e.g., RST 599001, 4 north Macclesfield, Cheshire). This location must be identifiable without ambiguity on the Ordnance Survey " Ten-mile " map. Alternatively, five-figure QRA locators may be exchanged. It is the responsibility of the receiving operator to obtain the information necessary to calculate his distances correctly.
7. **Entries.** (a) Logs should 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 received "; " Call-sign of operator " (Multi-operator entries only); " Distance in miles "; " Points claimed."

(b) The cover sheet must be made out in accordance with General Rule 4 and the declaration signed. Stations outside the area of the National Grid should show latitude and longitude.

(c) Entries must be post-marked not later than **Monday, 8 August, 1966.**

8. **Awards.** At the discretion of Council a miniature cup will be awarded to the winner and a Certificate of Merit to the runner-up.

D/F Qualifying Event

The following are details of the Slade Qualifying Event:

When: Sunday, 22 May, 1966.
Organizer: M. D. Fowler, G3GKZ, 8 Gleneagles Drive, Great Barr, Birmingham, 22A.
Map: Ordnance Survey, Sheet 129, " Ludlow."
Assembly: 13.00 BST for first transmission at 13.20 BST.
Location: Clee Hill, NGR612766, approached by public road through quarries, leaving A4117 at NGR597755.
Frequencies and Call-signs: To be announced at start.
Tea: George Hotel, Bewdley (OS Map 130).
Entries: Intending competitors should notify the organizer by 14 May, stating the number in their party requiring tea.

Cardiff D/F Event

The following are details of a D/F Contest to be held in Cardiff.

When: Sunday, 22 May, 1966.
Organizer: T. J. Brooke, GW3GHC, 32 Elgar Crescent, Llanrumney, Cardiff.
Map: Ordnance Survey, Sheet 154, Cardiff.
Assembly: 13.40 BST for first transmission at 14.00 BST.
Location: NGR153837, Coed-y-Wennallt, off A469, 4½ miles NNW Cardiff Civic Centre, in car park opposite GPO Microwave Relay Station.
Talk-in Station: GW3KZX/M from 13.00 BST 1980 kc/s.
Entries: Two contests will be held simultaneously:
(a) for entrants on foot to find one station.
(b) for entrants with transport to find two stations.

Frequencies and call-signs will be given at the starting point. Contestants should notify the organizer at the starting point. After contest, re-assemble at start. No refreshments will be available.

CLUBROOM

A Monthly Survey of Club and Group Activities

For further information on membership or the activities of a particular club, application should be made to the person whose call-sign is indicated at the end of the item. Full addresses may be obtained from the RSGB Amateur Call Book.

AERE (Harwell) ARC reports that the new shack is taking shape rapidly, and that a great deal of miscellaneous hoardings have been ousted. On the constructional side, long hours are being spent on a couple of transistorized receivers to replace some heavy old faithfuls. *G2HIF.*

Bedford and District ARC is forging ahead under its new secretary G3VBA. Plans are afoot for a talk-in station for the Texas Instruments Mobile Rally, while plans are being laid for NFD. *G3VBA.*

Blackpool and Fylde RC cleared its AGM in February, and is now formulating plans for the coming year. *G3OCX.*

Brighton Technical College ARS is meeting on the 4 and 18 May and welcomes visitors and prospective members. *G3SKI.*

Bromsgrove and District ARC held a well attended local exhibition on Amateur radio in the Burcot Village Hall on 12 March when both G2CLN/A and G3NOY/A were active. The best DX QSO was a VE on 20m. *G2CLN.*

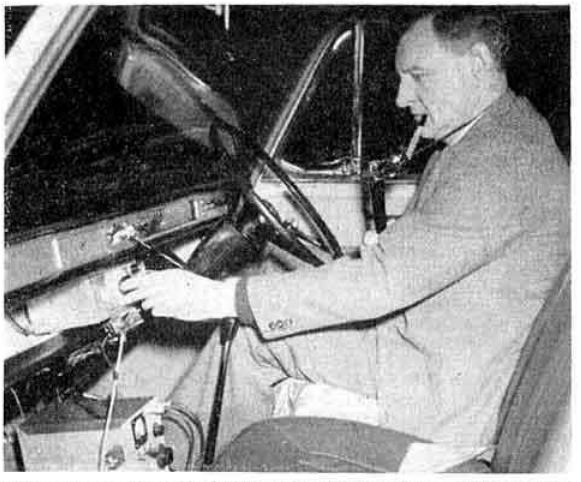
Bristol RSGB Group is having a further visit to the Bristol Evening Post on 6 May to see colour print production. Two stations will be operating during NFD from Tog Hill near Warmley. *G5UH.*

British Amateur Televison Club in its March Newsletter provides a comprehensive run-down on the facilities which it provides for its members. If you are a lone TV wolf you are missing a lot if you do not " belong." *G6OUO/T—G8ADM.*

Chester and District ARS held its Annual Dinner on 22 April, rounded off by a draw the proceeds of which went to bolster the clubs funds. *G3TZO.*

Chippenham and District ARC was formed at a recent meeting of amateurs from Chippenham and the surrounding districts. So far the club has a membership of 44, of whom 21 hold transmitting licences. The club meets each Tuesday at the Chippenham Boys' High School, and visitors and prospective members are assured of a hearty welcome. *G6NV.*

Cornish RAC held its AGM on 1 April, at which it was decided to set aside funds for the purchase of a caravan for Field Day use. In some very pointed, and unfortunately true, remarks, the Chairman observes how some of the licensees who operate commercial equipment, have never even lifted the lid of their gear to see what makes its tick. Like your humble conductor, he is of the opinion that the average amateur can, price for price, and with the co-operation of his fellows, produce an item equal to, and sometimes better than, the commercial equipment, and one which, if well presented, can command a good sale figure. *G3OCB.*



This photograph of G2CLN/M operating his 160m mobile rig was taken on 12 March at an exhibition on Amateur Radio organized by the Bromsgrove Amateur Radio Club. The apparatus is home-constructed, comprising a transistorized receiver and a valve transmitter. A loaded whip is mounted on the rear bumper of the Austin 1100. (*Photo by courtesy of the Bromsgrove Messenger*)

Crawley ARC recently held its sixth Annual Dinner Dance with a crowd of 93. The next meeting is to be held on 11 May. Incidentally, Crawley can boast of three YL members, and asks if this is some sort of a record. Is it? *G3FRV.*

Cray Valley RS has, we hear through the jungle drums, had a fairly large change round in the committee as the old stagers feel that it is time that others had a crack at the whip. Friend " Anon " contributes to the issue of QUA under review under the theme of Goodwill, and to the same good effect as with previous offerings. *G3KYV.*

At the Annual Dinner of the BBC Club Ariel Radio Group held on 18 February, Past President E. R. Radford, G2IM, presented his trophy to D. S. Booty, G3KKQ. Looking on is the Immediate Past President, Cllr. R. C. Patrick, G2BBX, and in the background is Brian Bower, G3COJ, with his wife. The Radford Trophy is awarded annually on the results obtained by BBC Club stations in the RSGB Affiliated Societies' Contest.

Crystal Palace and District RC reports that it had a lively AGM with a good attendance. Of special note was the presentation of the Committee Shield to Mrs Gilmore, XYL of G2VB, for her continued interest in the club over the years, and particularly for the part which she played in helping the club become founded in 1951. *G3FZL.*

Cambridge and District ARC held its AGM late in March. There has been a ruthless clearing out of surplus gear from the shack, and the club station is being given a complete check-up. The new editor of *Cambeam*, G3BBY, invites members to send in articles for inclusion in the next issue as soon as possible. *G2CDX.*

Derby and District ARS has a total of 123 fully paid-up members, and asks that all outstanding subscriptions be settled by 30 June at the latest. In response to the requests made at the AGM, more visits to outside organizations are being arranged. One of the major events will be the Mobile Rally to be held on the 14 August. *G2CVV.*

Dorking and District RS recently had a most interesting lecture by G3OVS on aerials and a.t.u.'s. The club's licensed strength has risen by two, these being G3UZX and G3UZW, and to whom congratulations are extended. *G3UJU.*

Durham City ARS met on 24 March for the results of the DCARS Top Band contest. The ensuing discussion on NFD 1966 was so vigorous and stimulating that it was carried over to the following meeting. *G3PUF.*

Ealing DARS has at last tuned up its 150 watt all band transmitter and is pleased with the results on the DX bands. On 22 March a lecture from J-Beam Aerials Ltd., drew a high attendance. Peter Lindsley, G3UDV, on 5 April gave a talk, illu-

Two well-known "RSGB ladies" at the Crawley Annual Dinner; Mrs Stevens (XYL of G2BVN) left, and Eileen Vaughan (XYL of G3FRV). *(Photo by G3SGA)*

strated with slides, showing his work on close up photography. *G3SGT.*

East London District Group held meetings on 20 February, the subject being "Aerials" by G6NR, and on 20 March when G3NQT talked on construction. As from September, 1966, meetings will be held at Wanstead House, The Green, E11. *G2ABC.*

Echelford ARS goes from strength to strength. In the newsletter under review G3IUL relates a sad tale of leaving a shack "ticking-over" only to return to find it full of black evil smelling smoke, lit by the flames from a power unit. As this was the only power supply unfused, there is indeed a moral to this tale. *G3RHF.*

Glasgow RSGB Group approved the 1966 programme at the AGM in February. The next meeting advised takes place on 27 May under the intriguing title of "Hats Night." An open invitation is extended visitors who are always welcome. *GM3MUY.*

The RSGB President, Roy Stevens, G2BVN, presenting a constructional contest prize to Don Stewart, G3TIR, at the recent Crawley Annual Dinner. *(Photo by G3SGA)*

Magnus Grammar School RS is still as active as ever. Perhaps a highlight was a Junk Sale, the proceeds of which are to be devoted to some good cause. *G3JNK.*

Maidenhead and District ARC meets on the third Tuesday in each month at the East Berks College, Boyn Hill Avenue, and has a membership of about 40. A varied programme covering a wide range of subjects holds the interest of all. On 2 July a visit is to be made to the GPO Radio Station at Bearley near Stratford-on-Avon. Visitors and prospective members are always welcome. *G3FVC.*

Manchester and District ARS meets on Wednesday of each week and offers a varied and interesting programme. Latest to join the licensee clan is G8AOG. Visitors and prospective members always welcome. *G3RTU.*

Midland ARS staged a very successful exhibit at the Birmingham Boat Show and in which the general public showed great interest. Three stations were active, and these were backed up by demonstrations of live and closed-circuit TV. A special QSL card is to be issued for the contacts made during the show. *G3USA.*

Norfolk ARC has a change of HQ to Old Lakenham Hall, Mansfield Lane, Norwich, and this heralds a new era for the club. With comfortable quarters, space for an aerial farm, and a

The judging of equipment for the Torbay Amateur Radio Society's construction cup and other trophies was conducted at the February meeting. The judges, G3NCC and F. Bolton are seen examining a home-constructed s.s.b. exciter.

(Photo by G3LHJ)

beautiful setting, they look forward to a very bright future. A sincere invitation is extended to amateurs and other interested visitors. May meetings will be on the 9 and 23. *G3TLC.*

Northern Heights ARS is getting a few new call-signs in the G3V-series. High activity in relation to a number of demonstration stations has started. On 11 May there will be a Junk Sale, while on the 25th G3GJV will be talking on "Going Mobile." *G3MDW.*

Nottingham ARC meets every Tuesday at the Sherwood Road Community Centre. On Thursdays an RAE class is held, while on Fridays, Morse practice takes place. Prospective members are always welcome. *G3SRX.*

Purley and District RC is meeting on 6 May for a discussion on the NFD arrangements, and they will also have a 4m transmitter on the air. On 20 May, G3GKF will be talking on, and demonstrating s.s.b. equipment. On 3 June an informal meeting will take place. *G3FTQ.*

Radio Amateur Invalid and Bedfast Club is feeling, or so it seems, more than a little relieved that paper has been invented. Perhaps the Postman should be the most relieved. Just imagine humping about large slabs of granite Flintstone style. *G3LWY.*

RAF Lucas (Fife) ARC is a newly formed club and at the moment has ten members, but what it lacks in numbers is more than made up for in enthusiasm. The club's call-sign is GM3UZI. *GM8AOW.*

Reigate ATS has several members who have been helping the local Sea Cadet unit to erect aerials, and to set up its signals section. The 19 May meeting promises to hold special interest for the many mobile operators as it is to be by G3TYR of the South London Mobile Club. *G3NKT.*

Saltash and District ARC is obviously pleased to welcome back

(Continued on page 342)

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. Standing instructions cannot be accepted.

REGION 1

Ainsdale (ARS).—11, 25 May, 8 June. 8 p.m., 77 Clifton Road, Southport.

Allerton (Liverpool) SRHS.—Thursdays, 8 p.m., 3rd Allerton Scout Group Headquarters, Church Road, Woolton, Liverpool.

Blackburn (ELARC).—5 May (Mullard Colour Film Show—" The Transistor; Junction Transistors in Radio Receivers "), 19 May (Second visit to Preston Air Traffic Control), 2 June (Half yearly meeting—NFD), 7.30 p.m., YMCA, Limbrick, Blackburn.

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

Bury (B & RRS).—10 May (Junk Sale), 8 p.m., Old Boars Head (private room), Crompton Street.

Chester.—Tuesdays, 8 p.m., YMCA, except first Tuesday in each month.

Crewe & District.—2 May, 6 June, 8 p.m., Earl of Crewe Hotel, Nantwich Road.

Eccles (E & DRC).—Tuesdays, 8 p.m., Patricroft Congregational Schools, Shakespeare Crescent, Patricroft, Eccles. Thursdays (Club Top Band net at 20.30).

Liverpool (L & DARS).—Tuesdays, 8 p.m., Conservative Association Rooms, Church Road, Wavertree.

(ULARC).—9, 23 May, 6 June, 7.30 p.m., Students' Union, 2 Bedford Street North, Liverpool 7.

Macclesfield.—10, 24 May, 7 June, The George Hotel, Jordangate.

Manchester (M & DARS).—Wednesdays, 7.30 p.m., 203 Droylsden Road, Newton Heath, Manchester 10.

(SMRC).—Fridays, 7.45 p.m., Rackhouse Community Centre, Daine Avenue, Northenden.

Morecambe.—4 May, 1 June, 125 Regent Road.

Preston.—10, 24 May. On the second Tuesday in each month the meetings start with a Morse practice, 7.30 p.m., St. Paul's School, Pole Street.

Southport (SRS).—Wednesdays, 8 p.m., Sundays, 4 p.m. 4 May (Visit to CEGB Sun Station at Penwortham), 8 p.m., Sea Cadets Camp, The Esplanade.

Stockport.—4, 18 May, 1 June, The Blossoms Hotel, Buxton Road, Stockport.

Wirral.—4 May (Junk Sale), 18, 25 May (Pre-NFD Discussion), 1 June, Harding House, Park Road West, Claughton, Birkenhead.

REGION 2

Barnsley (B & DARC).—13 May (" Top Band Transmitter," by F. Robinson, G3FLQ), 27 May (Visit, to be announced later), 7.30 p.m., King George Hotel, Peel Street.

REGION 3

Birmingham (SBRS).—19 May (Junk Sale; Final details for NFD), 8 p.m., The Scout Hut, Pershore Road, Selly Park, Birmingham 29.

REGION 4

Derby (D & DARS).—4 May (Surplus Sale), 8 May (2m Field Day), 11 May (Discussion on NFD), 18 May (SWL Night—B. J. C. Brown, G3JFD; and Committee Meeting), 25 May (D/F Practice Night), 1 June (Surplus Sale), 7.30 p.m., Room 4, 119 Green Lane, Derby.

Heanor (H & DARS).—10 May (Films), 17 May (" Electronic Music " by E. E. West, G3KTP), 24 May (Transmitting evening), 7.30 p.m., Room 14, Heanor Technical College, Ilkeston Road, Heanor, Derbys.

Lincolnshire.—6 May (Junk Sale and Hamfest), 7 p.m., The Bull Hotel, Spilby.

Loughborough (LARC).—Fridays, 8 p.m., Club Room, Bleach Yard, Wards End, Loughborough.

Magnus GS (MGSARS).—Tuesdays, 3.50 p.m., The Junior Physics Lab., Magnus Grammar School, Newark.

Melton Mowbray (MMARS).—19 May (" Electron Tubes," a tape recorded lecture illustrated with slides), 7.30 p.m., St. John Ambulance Hall, Asfordby Hill, Melton Mowbray, Leics.

Newark (NSWC).—Mondays, Thursdays, 7.30 p.m., The Hall, Guildhall Street, Newark, Notts.

Nottingham (ARCN).—Tuesdays, Thursdays, Room 3, Sherwood Community Centre, Woodthorpe House, Mansfield Road, Nottingham.

Peterborough (P & PARS).—Fridays, 8 p.m., Old Windmill (behind Peacock Inn), London Road, Peterborough.

Worksop (NNARS).—Tuesdays (RAE Class), Thursdays (Lecture Night), 7.30 p.m., Club Room, 13 Gateford Road, Worksop.

REGION 5

Bedford (B & DARC).—10 May (NFD Preparations), 26 May (Final NFD Preparations), Westfield School, Queen's Park, Bedford. A Slow Morse Session starts at 7.30 p.m.

Cambridge (C & DARC).—6 May (Informal), 13 May (Design of Club Station—G3IVB and G3USB), 20 May (" Take Your Pick " Quiz), 27 May (" Natter " Evening), 4 June (" Building a TV Camera " by D. Wiles, G3BBY, and W. Thacker, G6PGF/T), Fridays, 7.30 p.m., Club Headquarters, Corporation Yard, Victoria Road, Cambridge.

(CUWS).—No formal meetings during Summer Term. Transmitting sessions from Grange Road Site.

Luton (L & DARS).—Tuesdays, 8 p.m., ATC Headquarters, Crescent Road, Luton, Bedfordshire.

March (M & DRAS).—Tuesdays, 7.30 p.m., rear of Police Headquarters, High Street, March, Cambridgeshire.

Royston (R & DARC).—Wednesdays, 8 p.m., Manor House Social Club, Melbourn Street, Royston, Herts.

Shefford (S & DARC).—Thursdays, 7.45 p.m., Church Hall, High Street, Shefford, Bedfordshire.

REGION 7

Acton, Brentford & Chiswick (ABCRC).—17 May (" Transmitting for Beginners," with demonstrations), 7.30 p.m., AEU Club, 66 High Road, Chiswick.

Ashford (Middx.) Echelford (ARS).—11, 25 May, 7.30 p.m., Links Hotel, Ashford.

Bexley Heath (NKRS).—12 May (AGM), 7.30 p.m., Congregational Hall, Chapel Road, Bexley Heath.

Chingford (SRC).—24 May, alternate Tuesdays, G3RYF, 17 Forest Drive East, Leytonstone, E11.

Croydon (SRCC).—10 May, 7.30 p.m., Blacksmiths Arms, South End.

Dorking (D & DRS).—10 May (Informal Discussion on NFD), 24 May (" Station Co-Ordination " NFD), 8 p.m., Wheatsheaf, Dorking.

Ealing (E & DARS).—Tuesdays, 8 p.m., Northfields Community Centre, Northcroft Road, Ealing, London, W13.

East Ham.—Tuesdays fortnightly—7.30 p.m., 12 Leigh High Road, East Ham.

East Molesey (TVARTS).—First Wednesday each month, Prince of Wales, Bridge Road, East Molesey.

Edgware & Hendon (EADRS).—8 May (D/F Contest), 9 May (Amateur TV by G3RNK/T), 23 May (Preparation for NFD), 8 p.m., John Keble Hall, Church Close, Deans Lane, Edgware.

Gravesend (CRS).—18 May, RAFTA Club, 7.30 p.m., 17 Overcliffe Road.

Greenford (G & DARS).—Alternate Fridays, 6 May, 8 p.m., Greenford Community Centre, Oldfield Lane, Greenford, Middx.

Guildford (G & DRS).—13, 27 May, fortnightly, 8 p.m., Guildford Model Engineering Society in Stoke Park.

Harlow (DRS).—Tuesdays, Thursdays, 7.30 p.m., Mark Hall Barn, First Avenue.

Harrow (RSH).—Fridays, 8 p.m., Roxeth Manor School, Eastcote Lane.

Havering (H & DARC).—11, 25 May, Romford.

Holloway (GRS).—Mondays, Wednesdays, 7.30 p.m. (RAE and Morse), Fridays Club, 7.30 p.m., Room 35, Montem School, Holloway Road.

Hounslow (HADRS).—16, 30 May, Canteen Mogden Main Drainage Department, Mogden Works, Isleworth.

Ilford.—Thursdays, 8 p.m., 579 High Road, Ilford (nr. Seven Kings Station).

Kingston.—12, 26 May, fortnightly, 8 p.m., YMCA, Eden Street. Fridays (weekly Morse classes), 2 Sunray Avenue, Tolworth.

Leyton & Walthamstow.—17, 31 May, 7.30 p.m., Leyton Senior Institute, Essex Road, London, E10.

London U.H.F. Group.—5 May (U.H.F. Aerials), 7.30 p.m., Bull and Mouth, Bloomsbury Way, Holborn, WC1.

London Members' Luncheon Club.—third Friday every month, 12.30 p.m., Whitehall Hotel, Bloomsbury Square, Holborn.

Loughton.—6, 20 May, 7.30 p.m., alternate Fridays, Loughton Hall (nr. Debden Station).

New Cross.—Wednesdays and Fridays, 8 p.m., 225 New Cross Road, SE14.

Norwood & South London (CP & DRS).—21 May (" Crystal filters for SSB " by Charlie Newton, G2FKZ), CD Centre, Catford, SE6.

Paddington (P & DARS).—Wednesdays, 7.30 p.m., Beauchamp Lodge, 2a Warwick Crescent, W2.

Purley (P & DRC).—20 May, 8 p.m., Railwaymen's Hall (Side Entrance), 58 Whytecliffe Road, Purley.

Reigate (RATS).—19 May (" Mobile Operation," by Keith Davis, G3TYR, of South London Mobile Club), 7.30 p.m., George & Dragon, Cromwell Road, Redhill.

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

Scout ARS.—19 May (" Questions and Answers," by S. W. Smith of GPO), 7.15 p.m., Baden Powell House, Queens Gate, South Kensington.

Science Museum.—17 May (Informal meeting, and tape recording on " Two Metres," by W. H. Allen, G2UJ), 6 p.m., Science Museum, South Kensington.

Sidcup (CVRS).—5 May (AGM), 7.30 p.m., Congregational Church Hall, Court Road, Eltham.

Slough (SDR Group).—First Wednesday every month, 8 p.m., United Service Club, Wellington Street.

South London Mobile Club.—J. R. Doughty, 17 Hookham Court, SW8.

Southgate & District.—12 May, 7.30 p.m., Parkwood Girls' School (behind Wood Green Town Hall).

St. Albans (Verulam ARC).—18 May, 8 p.m., Marconi Instrument Service Department, Hedley Road.

Sutton & Cheam (SCRS).—17 May, 8 p.m., The Harrow Inn, High Street, Cheam.

Welwyn Garden City.—12 May (Transistor Symposium), 18 May (Planning for V.H.F. NFD), 8 p.m., Club Cottage, Burnham Green, near Welwyn.

Wimbledon (W & DRS).—13 May, 8 p.m., Community Centre, St. George's Road, Wimbledon, SW19.

Wembley (GECARS).—13 May. Visitors should telephone ARNold 1262.

LONDON MEMBERS' LUNCHEON CLUB

will meet at the White Hall Hotel, Bloomsbury Square, London, W.C.1.

at 12.30 p.m. on Fridays, 20 May, and 17 June 1966

Telephone table reservations to HOL 7373 prior to day of luncheon. Visiting amateurs especially welcome.

REGION 8

Crawley (CARC).—11 May (Informal, for details contact G3FRV), 25 May, 8 p.m., Trinity Congregational Church, Ifield.

Worthing (WARS).—9, 23 May, 8 p.m., Adult Education Centre, Union Place.

REGION 9

Bath.—20 May, 7.30 p.m., RNR Training Centre, James St. West, Bath.

Bristol.—20 May (Talk by Max Brown, G3KUJ), 7.15 p.m., New Lecture Theatre G44, 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 (CRAC).—First Thursday in each month, Staff Recreation Hall, SWEB Headquarters, Pool, nr. Camborne.

(CRAC V.H.F. Group).—First Thursday in each month, 7.30 p.m., The Coach and Horses, Rydar Street, Truro.

Exeter.—First Tuesday in each month, 7.30 p.m., George & Dragon Inn, Blackboy Road, Exeter.

Plymouth (PRC).—Tuesdays, 7.30 p.m., Virginia House, Bretonside, Plymouth.

Saltash (S & DARC).—6 May (Talk and discussion night), 20 May (Final plans for Mobile Rally), 7.30 p.m., Burraton Toc H Hall, Warraton Road, Saltash. 30 May, Whit Monday, Mobile Rally at Calstock Playing Fields near Saltash, Cornwall. Details in Mobile Column.

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.—7 May ("Test Equipment and its Uses," by J. Smith), 4 June (" Transistors," by EMI Representative), 7.15 p.m., New Engineering Block, Technical College, Weston-super-Mare.

Yeovil (YARC).—Wednesdays, 7.30 p.m., Park Lodge, The Park, Yeovil.

REGION 10

Cardiff.—9 May, 7.30 p.m., TA Centre, Park Street, Cardiff.

REGION 11

Llandudno (CVARC).—12 May (" Aerials and Loading," by Mr F. Macfarlane, GW3YR), 7.30 p.m., Cross Keys, Madoc Street.

REGION 14

Auchenharvie (A & DARC).—Tuesdays and Thursdays, 7.30 p.m., Auchenharvie Community Centre, Stevenston, Ayrshire.

Ayrshire.—Third Sunday in each month, 7.30 p.m., Conservative Club, Sturrock Street, Kilmarnock.

Glasgow.—Second and fourth Fridays in each month, 7.30 p.m., in the Christian Institute, Bothwell Street, Glasgow.

REGION 16

Basildon (BDARS).—9 May (NFD discussion), Mayflower Restaurant. 7 June (Social, details from G3IJB).

Chelmsford (CARS).—7 June, 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, Swanston's Road, Great Yarmouth.

Ipswich (IRC).—Last Wednesday each month, 7.30 p.m., Red Cross HQ, Gippeswyk Hall, Ipswich.

Norwich (NARC).—Mondays, 9 May (Film Show), 23 May (Business Meeting), 6 June (Junk Sale), 7.30 p.m., Old Lakenham Hall, Mansfield Lane, Norwich.

LOOKING AHEAD

8 May.—Thanet Mobile Rally, Viking Ship, Cliff Top, Cliffsend, Ramsgate.
14 May.—Midlands V.H.F. Convention.
30 May.—Saltash Mobile Rally, Calstock Playing Fields, Nr. Plymouth.
12 June.—See Mobile Rallies on page 334.
26 June.—Lion Safari Mobile Rally, Longleat Park, Nr. Warminster.
10 July.—South Shields Mobile Rally.
14 August.—Derby Mobile Rally.
3-4 September.—Northern Radio Societies' Convention, Manchester.
11 September.—RSGB National Mobile Rally, Woburn Abbey, Bedford.
9 December.—RSGB Annual General Meeting.

Mullard Mini-books

PRINCIPLES OF ELECTROSTATICS is the first of a series of books produced by the Mullard Educational Service, based on their successful series of film strips and slides which for some years have been standard reference works in the field of electronics. The illustrations in this book are black and white representations of the full colour artwork used in the film strip E113 which bears the same title. The material in this particular Mini-book can be used ideally as illustrated lecture notes for teachers using E113 and as handout material for classes of students seeing the strip. The Mini-book takes the reader through the principles of electrostatics by illustrated descriptions and explanations of Electrification, Insulators and Conductors, the Atom, Ionisation, Electrification Theory, The Gold Leaf Electroscope, Surface Density, Electrostatic Force and Intensity, Electric Potential, Capacitance and Capacitors, Electrostatic Machines and Instruments.

Printed on art paper this 32 page book is available from Dept. RSGB, Mullard Educational Service, Mullard House, Torrington Place, London, W.C.1, price 2s. 6d. J.C.

When the Welwyn Garden City Group held its annual Constructors' Exhibition on 10 March (judged by Jimmy Mathews, G6LL, and Arthur Beattie, head of Bush Murphy Test Instruments) the G3EPK Senior Trophy went to Gerald Gibbs, G3AAZ, for this s.s.b. exciter unit. The G3EPK Junior Trophy was won for the third year in succession by Trevor Baker, G8ANS, for a transistorized frequency marker unit.

(Photo by G5UM)

Clubroom

(Continued from page 340)

G9BO after a terrible adventure, but despite his redoubtable efforts, and offers of left-footed help, the club is busily engaged in preparing for the Mobile Rally at Saltash on 30 May. Meetings prior to this will be on 6 and 20 May. *G2DFH.*

South Birmingham RS will be meeting for the half-yearly Junk Sale on 19 May when all good hoarders loaded with lolly will be cannily welcomed. Time permitting, final details for NFD will also be given. Two good reasons for not missing this meeting. *G3OMG.*

South London Mobile Club is meeting on 7 May for rag-chew followed by a demonstration of a radio-telephone by G3TYR. On 21 May will be the weekend camp at Barford St. John and at which SLMC will operate talk-in stations. *G3LXN.*

Surrey Radio Contact Club held its AGM in the middle of April, and a programme of lectures is showing signs of life. *G3KGA.*

Torbay ARS held its annual Dinner and Dance on 12 March, and by all accounts everybody had a good time. Members and visitors are always welcome. *G3NQD.*

Verulam RC reports that it was " standing room only " when Eric Mollart described his D/F gear at the March meeting. Aside from the technical aspects which were clearly put, it seems that one needs to be a cross between a long distance runner and a wrestler to be a good D/F hunter, and if you have a large fierce dog, the " go find 'em Fido " technique helps no end to winkle the hidden operators out of the most unlikely places. There seems little doubt but that Eric stirred a considerable interest. The club reports that its net on 70·5 Mc/s threatens to outdo the traditional Top Band net. *G3GJX.*

Wimbledon and District RS has a real technical-type advance in receivers in the April issue of its newsletter. Drawing on a combination of space age techniques and a number of inventions overlooked in Stephenson's Rocket, this will finish any beginner before he's even started. May meetings are on the 11 and 27. *G3EPU.*

Worcester and District ARC meets on Saturdays at 8 p.m. at 35 Perdiswell Park, Droitwich Road. All visitors are welcome. A special date to note is 17 July when the club will be holding its Mobile Picnic. Details will be announced later. *G3NUE.*

* * *

Deadline for **June** issue is **6 May,**
Deadline for **July** issue is **10 June.**

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28 LITTLE RUSSELL STREET, LONDON, W.C.1

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Amateur Radio Handbook	36/6
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AMERICAN MAGAZINE SUBSCRIPTIONS	
CQ (*Cowan*) Monthly (p.a.)	44/–
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73 Magazine Monthly (p.a.)	30/–
MISCELLANEOUS PUBLICATIONS	
Dictionary of Electronics (*Penguin*)	8/–
Guide to Broadcasting Stations (*Iliffe*)	5/6
Foundations of Wireless (*Iliffe*)	22/3
Log Book, 150 pages, opens flat (*Martins*)	21/9
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Short Wave Receivers for the Beginner (*Data*)	6/6
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* Reviewed on page 232 of the April *Bulletin*
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TEST GEAR 339A Scope, £8. Heathkit RC Bridge C3U, £6. R.F. indicator, RF40, £2. T.R. switch, ECC84, tunable 80 THRO 10, £4. Transistor tape recorder, complete Mic. tape, £4/10/-. S meter suit Eddystone, £2.—Box W7273, c/o RSGB BULLETIN, 4 Ludgate Circus, London, E.C.4.

3CX100A5 pair, new, £4 each. 4 x 150 Valve holders, pair complete Ceramic Chimneys, £2/10/- each. 1154 Tx power pack. 1200V, 200m/a, lacks bleeder resistor, buyer collects, £5.—May, 7 Parkwood Road, Hastings, Sussex.

LABGEAR Top-bander, little used, £10. Minimitter mobile TX, 7, 3·5 and 1·8 Megs. Complete with Control Box, also Tiger Converter 3·5 and 1·8 to Med. wave Car Rx. 200 to 500 metres, £12.—S. Ellis, (G3JNY), 2 St. Marys Close, Garforth, Nr. Leeds. Phone 3058.

CSE 2A10—See page 274

CR100, sound, £21. Cossor 339 'scope, £10. Transistorized Rx, BC & 160m, £9. " Bitza " VHF Rx, £4. 2m mobile station 144·4 Mc/s, £10. Many bits, valves etc. Want transistorized portable Rx.—116 Parsonage Leys, Harlow.

SPECIAL OFFER of Unmarked Surplus NPN Silicon Transistors 2N 706 at 1/6 each. 2N 708 at 2/- each. 2N 929 at 2/6 each, 2N 696 at 2/- each and 2N 697 at 3/- each. High Speed Silicon Planar Diodes similar to 1N 3063 at 4/- doz. Germanium Transistors Type GT 31, or GT 32 at 50/- per 100. Thyristors. 250 P.I.V. 10 amps. at 9/6 each, 50 P.I.V. 80 amps. at 50/- each. Stud Mounting Silicon Rectifiers. 800, 600, 400, 200, 100 P.I.V. 6 amps. at 4/6 each or 4 for 16/-. Unmarked Wire-ended Silicon Rectifiers. 800 P.I.V. 500 m/A at 3/- each or 30/- doz.—J. Birkett, 9 Steep Hill, Lincoln. Phone 20767.

FOR SALE—contd.

15 ISSUES OF PRACTICAL WIRELESS for sale. Ranging from the issue of October 1963 to November 1965. Apply Box No. W7271, c/o RSGB BULLETIN, 4 Ludgate Circus, London, E.C.4.

£160 WORTH OF 8MM CINE equipment: Bolex P1, Kodak 3 lens, Tripod, Editor, Filters, Lighting and accessories. Exchange for RX equipment or W.H.Y? Also £100 worth OO/HO model railway to clear for £25. S.A.E. for details. Box No. W7274, c/o RSGB BULLETIN, 4 Ludgate Circus, London, E.C.4.

No. 36 SET, TX. (complete equipment) 20M, 15M, 10M—£19. Woden Transformer (oil filled) 230V: 2×1950V at 500MA—£8. TCS 6. TX—£8. R206 Mk II—£28. 2× TX1154 chassis 35/- each. P.S.U.: 2000V at 500MA £18. 19 set P.S.U. 35/-. G3SDK. Phone LUT 55001.

KW-GELOSO CONVERTER. Good condition. Offers? G3RNM, "Wheatley," Martins End Lane, Great Missenden, Bucks.

"AR88LF" (Vintage 1946) good appearance and sound E. & M. condition. £35 o.n.o. G3KFD, 216 Standhills Rd., Kingswinford, Staffs.

HEATHKIT R.A.1 calibrator CL4 and Codar PR30 preselector, all in FB order, £36. Buyer collects, Phillips, G3PXX, QTHR or telephone Neston 2817.

QSL CARDS. Attractive two-colour designs 25/- per 100. Single colour 20/-. S.a.e. samples, Littlewood (G3OYI) 16 Banks, Honley, Huddersfield.

HRO M.X. mint cond. complete with power unit and eight coils, £20.—Tel.: Malmesbury 2281. (G3DRF).

RSGB BULLETINS from September 1964 to April 1966. Highest offers to Box W7267, c/o RSGB BULLETIN, 4 Ludgate Circus, London, E.C.4.

2-METRE PYE PTC115 TX-RX. 2 R/Converters, Speaker, Hand Set, Car-rack, 7 Crystals, Manual, £9/10/0, 10/- carriage o.n.o. or exchange for (160 metre) Tx., or Codar-AT5. G3KTI, Rees, "Blue Pillars," Grove Crescent, Coombs Park, Coleford, Gloucestershire. Sundays, Evenings.

APPOINTED KW AGENT. KW 2000, 2000A, Vespa, KW Linear now in stock. Full Codar range in stock. "Joystick" distributors, trade supplies. National, Eddystone, Eagle, and Lafayette equipment now available. Part exchanges. Panda Cub Tx. £30, HRO, 9 coils, PSU £17.10.0. National 121. £45. KW2000 and AC PSU, £175. KW 600 Linear, £90. Shire 201 microphones, £4.5.0. RSGB publications. Stephens-James Ltd., 70 Priory Road, Liverpool, 4, (ANField 3141.)

S.W.L.'s. Are you thinking of hotting up your receiver by getting a Preselector or Antenna Tuner? We have a Preselector and Antenna Tuner combined. Self powered. All bands, with 25db gain. Modern styling. £6/18/0. S.a.e. for details. Hamgear Electronics, 29 Carlyle Road, Norwich.

EDDYSTONE 680X, £48; Panda Cub, £30; Goodmans Speakers as new; Audiom 60, £10; Midax, £5; Trebax, £5. High quality tape recorder 3¾ and 7½ i.p.s. twin track, £15. G3JDT, 59 Hunt Road, Maghull, Lancs. Tel: 5567. Will deliver 100 miles.

AR88 LF. Excellent performance and appearance, manual and spare valves, £32 o.n.o. 24 Castle Drive, Redbridge, Ilford, Essex. Tel: VAL 7652.

FOR SALE (contd.)

P104 15 valve Rx. 95/155 Mc/s with modification for manual tuning. Good working order, meter, BFO etc. Offers—A4718, 17 Hitherwood Drive, S.E.19.

KW VANGUARD MARK II factory built 160-10m. Consistently good reports, spotless, £50 o.n.o. KW77 including matching speaker, £85 o.n.o. Reason for sale " Chasing ducks " also 100/1000 kc/s Crystal Calibrator built in psu. Also 2-metre converter 28-30 mc/s output. G6CC, QTHR phone evenings Four Oaks 1737.

QRT G2DAF TRANSMITTER, PSU matched, panels, complete and working except filter needs 9 Mc/s type. Brand new parts. 598 dial, Electroniques coils, switches. Both as published circuits. Offers—Box W7272, c/o RSGB BULLETIN, 4 Ludgate Circus, London, E.C.4.

METALWORK.—All types of cabinets, chassis, racks, etc., to your own specifications.—Philpott's Metalworks Ltd. (G4BI), Chapman Street, Loughborough.

MINIMITTER MERCURY, in very fine condition, had little use. £45, buyer collects. G3OEA Wellington (Salop) 2735. Address as call book.

QSL CARDS. G.P.O. approved log books, cheapest, best, prompt delivery. Samples.—Atkinson Bros., Printers, Looe, Cornwall.

CSE 2A10—See page 274

SOLARTRON STABILISED POWER Supply 300V, 50 M/A. S. G. Brown Super K headphones, B.S.R. autochanger with stereo ceramic pickup. Claude Lyons Variac, 0-250V A. Large number of quality components. CRT's and Transformers, etc., B. K. MacDonald, 45 Dunedin Rd, Leyton, London, E.10.

KW.160, as new, £22; Electroniques front end QP.166, £8 and 85 kc/s I.F. transformers as follows: 2-Type DIF/1/85 and 1-type DIF/1/85D, £1 for the three. 3 steel cabinets, 19 in. wide by 10 in. high by 17 in. front to back, rounded corners, two in olive green wrinkle and one in grey wrinkle, £2 each; Eddystone 898 Dial assembly, £2/10/-. Buyers collect large items please.—J. C. Perry (G3OHS), 399 Higham Hill Road, Walthamstow, London, E.17.

KW 500 LINEAR, £50. BC2210 with original charts. AC power supply, £18.10.0. Bazley, Three Willows, Rushock, Droitwich, Worcs.

FOR SALE (contd.)

EXCHANGE EDDYSTONE 940 RECEIVER, list £133, good condition. Wanted, s.s.b. transmitter, good home-brew considered. Alternatively Receiver for Sale, £75 o.n.o.—Firth, G8JD, 7 Deyncourt, Lowesbarn, Durham.

OLD MAGAZINES. Short Wave Vol. 1 No. 1-2-3 (1935). S.W.M. Vol. 1 No. 9. Practical and Amateur Wireless 13-11-1937. Popular Wireless 27-11-1937. G3TCG, 7 Gaynes Park Road, Upminster, Essex.

SITUATIONS WANTED

RADIO AMATEUR, age 34, six years Manager in Retail Trade (not Radio), seeks position in Southern England, preferably in Hants or Dorset. Well educated. Willing to learn and take further technical course if required. Hard work no problem to progress. Box No. W7270, c/o RSGB BULLETIN, 4 Ludgate Circus, London, E.C.4.

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Haig Road, Cambridge.
Telephone: Cambridge 51351

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Apply to CROWN AGENTS, M. Dept., 4 Millbank, London, S.W.1, for application form and further particulars, stating name, age, brief details of qualifications and experience, and quoting reference M2R/62781/RC.

MISCELLANEOUS

CORNWALL. Wright G6LV, 1 Parc-an-Challow, Green Lane, Penryn, Nr. Falmouth, Cornwall. Bed, Breakfast.
GW3PMR requires Accommodation (digs, flat, W.H.Y.?) in Coventry, from July 11th for two months. Jubb, 1 Friars Terrace, Bangor.
PATENTS AND TRADE MARKS. Booklet on request. Kings Patent Agency Ltd. (B. T. King, G5TA, Mem. RSGB, Reg. Pat. Agent).—146A Queen Victoria Street, London, E.C.4. (Phone: City 6161.) 60 years' refs.
HOLIDAYS IN MALTA. Accommodation offered. Transport to and from airport inclusive. Ron Meachen, 9H1R, 1 Jasmine Path, Santa Lucia, Malta.

INDEX TO ADVERTISERS

RSGB Slow Morse Practice Transmissions

The following Slow Morse Practice transmissions are sponsored by the RSGB. Alterations and additions to this list should be sent to the Honorary Organizer, M. McBrayne, G3KGU, 25 Purlieu Way, Theydon Bois, Essex.

Time	Call-sign	kc/s	Town
Sundays			
09.30 †	G3KZZ / G3TNF	1920	South Shields, Co. Durham
10.00	GW3TMH	1980	Rhyl, Flints.
10.00	G3TTK	1860	Coalville, Leics.
10.15	G3CGD	1875	Cheltenham
10.30	GI3JEX	1860	Belfast
11.00	G2FXA	1900	Stockton-on-Tees
12.00	GM3HBY	1903	Glasgow
12.00 †	G3HVI / G3OGD	1890	Stoke-on-Trent
12.00	G3SVD	1870	Reading, Berks.
12.00	G3TJD	3575	Stafford
12.00	G3SZF	1825	Broxbourne, Herts.
18.00	GW3TMP	1980	Mold, Flints.
18.30	G3NCZ	1920	Blackburn, Lancs.
19.00	G3NPB	1875	Hexham, Northumberland
21.00 †	G3LKT / G3PLQ	1892	Salisbury, Wilts.
21.30	G3NQR	1875	Harrow Weald, Middx.
Mondays			
18.00	G3SWR	1980	Middlesbro', Yorks.
18.30	G3NCZ	1920	Blackburn, Lancs.
19.00	G3NPB	1875	Hexham, Northumberland
19.30 †	G2ATM / G3KTP / G3OKX / G3ONB / G3RTO / G3RUB / G3RWN	1890	Heanor, Derbys.
19.30	G3SRY	1920	Cheam, Surrey
20.00	G3HJG	1980	Manchester
20.00	G3IBJ	1910	Southampton, Hants.
20.00	G3SAZ	1845	Ashford, Middx.
20.30	G3TOF	1915	Harlow, Essex
20.45	G3SUU / G3UCZ	1900	Bradford, Yorks. Pudsey, Yorks.
21.00 †	G3IRM / G3MWO / G3PHW	1981	Bury St. Edmunds
21.00 †	G3LKT / G3PLQ	1892	Salisbury, Wilts.
21.30 †	G2BSW / G3TBW	1865 / 1865	Studley, Warks. / Redditch, Worcs.
Tuesdays			
19.00	G3NPB	1875	Hexham, Northumberland
19.00 †	G3PPE / G3PXX	1875	Wallasey, Cheshire / Neston, Cheshire
19.00	G3NUE	144·26 Mc/s	Worcester
19.30	G3RFL	1910	Great Harwood, Lancs.
19.30	G3TAG	1970	Cambridge
19.30	G3RPB	1860	Porthcurno, Cornwall
20.00	G3RZO	1865	Redditch, Worcs.
20.00	G3PJI	1910	Southampton
20.30	G3NKX	1915	Loughton
21.00 †	G3LKT / G3PLQ	1892	Salisbury, Wilts.
21.30 †	G3HZG / G3TNI	1865 / 1865	Redditch, Worcs. / Bromsgrove, Worcs.
22.00	G3HZM	1925	Manchester
Wednesdays			
18.30	G2FXA	1900	Stockton-on-Tees
19.00	G3GBS	1865	Moseley
19.00	G3GBJ	1870	Redditch, Worcs.
19.00	GW3CJR	1930	Newbridge, Mon.
19.30 †	GM3NQB / GM3UBK	3510	Thurso, Caithness
19.30	GM3HBY	1903	Glasgow
20.00	G8QU	1950	London N.22
20.00	G3SAD/A	1980	Stevenage, Herts.

Time	Call-sign	kc/s	Town
Wednesdays			
20.15	G3HZL	1845	Isleworth, Middx.
20.30	G3KGU	1915	Theydon Bois, Essex
20.30	G3SJE	1870	Harrow, Middx.
20.45	G3SUU / G3UCZ	1900	Bradford, Yorks. Pudsey, Yorks.
20.30	G3AGN	1875	Felixstowe
21.00 †	G3HVI / G3OGD	1890	Stoke-on-Trent
21.00 †	G3LKT / G3PLQ	1892	Salisbury, Wilts.
21.00	G3POU / G3SFO	1850	Doncaster, Yorks.
21.00	G3RIS	1980	Cromer, Norfolk
Thursdays			
18.00	G3SWR	1980	Middlesbro', Yorks.
18.30	G3NC	1968	Swindon
18.30	G3TMI	1840	Canterbury, Kent
19.00	G3NUT	1875	Wallesey
19.00	G3NPB	1875	Hexham, Northumberland
19.30 †	G2ATM / G3KTP / G3OKX / G3ONB / G3RTO / G3RUB / G3RWN	1890	Heanor, Derbys.
19.30	G3RFL	1910	Great Harwood, Lancs.
20.00	G3NHR	1900	Hounslow
20.30	G3RSF	1915	Harlow, Essex
20.30 †	G3KAD / G3LLZ	1850	Swindon, Wilts.
21.00 †	G3IRM / G3MWO / G3PHW	1981	Bury St. Edmunds
21.00 †	G3LKT / G3PLQ	1892	Salisbury, Wilts.
21.30 †	G3EVT / G3TOI	1865	Redditch, Worcs.
Fridays			
18.30	G3NZC	1920	Blackburn, Lancs.
19.00	G3NPB	1875	Hexham, Northumberland
19.30 †	GM3NQB / GM3UBK	3510	Thurso, Caithness
19.30	G3PWU	1850	Reading, Berks.
20.00	G3SAZ	1845	Ashford, Middx.
20.30	G3TLF / G3TXI	1925	Harlow / Nazing, Essex
21.00 †	G3LKT / G3PLQ	1892	Salisbury, Wilts.
21.00	G3PKE	1920	Dorking, Surrey
21.00	G3RIS	1980	Cromer, Norfolk
21.30	G3TJD	3575	Stafford
21.30 †	G3RZI / G3TQD	1865 / 1865	Redditch, Worcs. / Droitwich, Worcs.
21.30 †	G3UCZ / G3SUU	1900	Pudsey, Yorks. / Bradford, Yorks.
Saturdays			
10.00	G3TTK	1860	Coalville, Leics.
12.00	G3TJD	3575	Stafford
13.00	G2FXA	1900	Stockton-on-Tees
14.00	GI3JEX	1860	Belfast
14.00	G3SVD	1870	Reading, Berks
15.30	G3RFL	1910	Great Harwood, Lancs.
18.00	GW3TMP	1980	Mold, Flints.
19.00	G3NPB	1875	Hexham, Northumberland
20.00	G3KPO	1980	Peterborough
20.30	G3TLJ	1925	Roydon, Essex
21.00 †	G3LKT / G3PLQ	1892	Salisbury, Wilts.

† *Alternately*

Many more operators willing to make Slow Morse Practice transmissions to a regular schedule are required to ensure a country-wide coverage. Members willing to assist should contact the Hon. Organizer at the address given above. Reports from listeners to these transmissions will be welcomed by the operators concerned.

Radio Society of Great Britain

(Incorporated 1926)

Patron: H.R.H. THE PRINCE PHILIP, DUKE OF EDINBURGH, K.G.

Application for Corporate Membership

Radio Society of Great Britain
28 Little Russell Street
London, W.C.1

I hereby apply for election as a Corporate Member of the Society and enclose a remittance for £2. 10s. 0d. being the amount of my first annual subscription.

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

Date..... *Signed*.....

PERSONAL DETAILS TO BE COMPLETED BY THE APPLICANT

Surname (BLOCK LETTERS).....

Christian Names in full (BLOCK LETTERS).....

Address for all correspondence (BLOCK LETTERS).....

.....

Nationality..... Age (if under 21).....

Current Call-sign (if any).....

Details of previous membership (if any).....

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I wish to propose.....for Corporate Membership.

Proposer's Name (BLOCK LETTERS).. .....

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

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CV71	3/-	EF41	6/-	KTW63	2/-	SU2150A	10/-	1C5GT	6/-	6AS6	4/-	6SN7	3/6	50L6GT	8/-	VCR138	30/-
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CV102	1/-	EF52	6/-	KTZ63	5/-	TD04-20	70/-	1E7G	7/6	6AS7G	20/-	6SS7	2/-	57	6/-	VCR517	35/-
CV103	4/-	EF53	4/6	M8100	9/-	TP22	5/-	1F2	3/-	6AT6	4/-	6U4GT	9/6	58	6/-	VCR517B	40/-
CV4004	7/-	EF55	8/-	M8142	12/-	TP25	15/-	1G6GT	6/-	6AU6	7/-	6V6G	5/-	59	6/-	VCR517C	40/-
CV4014	7/-	EF71	7/6	M8161	7/-	TT11	5/-	1L4	2/6	6AX4	8/-	6V6GT	7/6	75	5/6	3FP7	45/-
CV4015	5/-	EF72	5/-	MH4	5/-	TT15	35/-	1LA6	6/-	6B7	6/-	6V6M	8/-	76	5/-	3EG1	40/-
CV4025	10/-	EF73	5/-	MHLD6	10/-	TTR31	45/-	1LC6	7/-	6B8G	2/6	6X4	3/6	77	6/6	5CP1	30/-
CV4049	6/-	EF74	4/-	ML6	6/-	TZ0520	4/-	1LH4	4/-	6BA6	5/-	6X5G	5/-	78	5/-	5FP7	12/6
CY31	6/6	EF80	5/-	N78	15/-	TZ20	16/-	1N21B	5/-	6BA7	5/-	6X5GT	5/3	80	5/6	88D	40/-
D1	1/6	EF85	4/6	NE17	7/-	U81	8/-	1N43	4/-	6BE6	4/3	6Y6G	6/-	81	9/-		
D41	3/3	EF86	6/6	OA2	6/-	U12/14	8/-	1N70	4/-	6BJ7	7/-	6-30L2	10/-	82	8/-	**Photo Tubes**	
D61	6/-	EF89	5/-	OB2	6/-	U17	5/-	1R5	3/6	6BR7	9/-	6Z4	5/-	84	8/-	CMG8	5/-
D77	3/3	EF91	3/6	OB3	7/-	U18	6/-	1S4	5/-	6BW6	9/-	7B7	7/6	85A2	8/-	GS16	12/6
DA30	12/6	EF92	2/-	OC3	5/-	U25	11/-	1S5	4/6	6C4	2/-	7C5	10/-	210VPT		931A	55/-
DAF96	6/-	EF93	5/-	OD3	5/-	U26	11/-	1T4	3/-	6C5G	2/6	7C6	7/-	7-pin	2/6	6097C	350/-
DD41	4/-	EF183	8/-	OZ4A	5/-	U27	8/-	2A3	5/-	6C5GT	6/-	7C7	6/-	2158G	6/-		
DET3	8/-	EF184	8/-	PC86	9/-	U50	4/6	2B26	8/-	6C6	4/-	7H7	7/3	220PA	7/-	**Special Valves**	
DET20	2/-	EH90	7/6	PC88	9/-	U52	4/6	2C26	7/-	6C8G	3/-	7Q7	7/-	220TH	4/-	ACT6	£8
DET25	15/-	EHT1	300/-	PC900	12/-	U191	11/6	2C26A	3/-	6CH6	4/6	7Y7	5/-	225DU	9/-	K301	£4
DF73	5/-	EL32	3/9	PCC84	5/-	U801	18/-	2C34	2/6	6C21	30/-	7Z4	4/6	307A	5/6	KRN2A	£3/10/-
DF91	3/-	EL34	10/-	PCC85	7/-	UABC80	6/-	2C45	22/6	6CL6	9/-	9D2	2/6	313C	25/-	1B24	25/-
DF92	3/-	EL35	5/-	PCC89	10/-	UAF42	9/-	2C46	30/-	6D6	3/-	9D2	3/-	350B	8/-	2P22	10/-
DF96	6/6	EL37	16/-	PCF80	7/-	UBC41	6/-	2C51	12/-	6E5	6/-	9D2	3/-	357A	70/-	2J54	£3
DH63	5/-	EL38	17/6	PCF82	6/6	UBF80	5/6	2D21	5/-	6F5G	5/3	10F9	9/-	368A	5/-	417A	30/-
DK92	8/-	EL41	8/-	PCF84	6/-	UBF89	6/6	2X2	3/-	6F5GT	5/9	12A6	2/6	393A	15/-	3J/92/E	£37/10/-
DK96	8/6	EL42	8/-	PCF86	9/-	UBL21	11/-	3A4	4/-	6F6G	4/-	12AH7	5/-	446A	8/-	714AY	£4
DL92	4/-	EL50	8/-	PCF802	11/-	UCC85	6/6	3A/108A	20/-	6F7	6/-	12AH8	11/-	703A	30/-	725A	30/-
DL93	4/-	EL81	8/-	PCL81	9/-	UCH42	8/-	3A146J	35/-	6F17	5/-	12AT7	4/-	705A	10/-	726A	19/-
DL94	5/9	EL83	6/3	PCL82	7/-	UCH81	6/-	3A/167/M	25/-	6F8G	6/6	12AU7	5/-	715B	60/-		
DL96	7/-	EL84	5/-	PCL83	8/6	UCL82	8/-	3D6	4/-	6F12	4/6	12AX7	6/-	717A	3/-	**Transistors**	
DL810	8/-	EL85	8/-	PCL84	7/-	UCL83	10/-	3B7	5/-	6F13	5/-	12AY7	10/-	724A	15/-	OC16	20/-
DL819	15/-	EL91	4/6	PCL86	9/-	UF41	8/6	3B24	5/-	6F32	4/-	12BA6	5/6	801	6/-	OC22	22/-
DY86	7/6	EL95	5/-	PEN25	4/6	UF89	6/-	3E29	50/-	6F33	3/-	12BE6	7/-	803	22/6	OC25	12/-
E80F	22/-	EL360	20/-	PEN46	3/-	UL41	6/-	3Q4	6/-	6G6G	2/6	12BH7	7/-	807	8/-	OC44	6/-
E88CC	12/-	EM80	6/-	PEN220A	3/-	UL84	5/6	3Q5GT	7/6	6H6M	1/6	12C8	3/-	808	8/-	OC45	5/-
E90CC	10/-	EM81	7/6	PFL200	17/6	UU5	7/-	3S4	5/-	6J4WA	10/-	12E6	2/-	811	22/6	OC71	4/6
E1148	2/6	EM84	6/3	PL36	9/-	UU9	8/6	3V4	5/9	6J5	6/-	12E8	2/-	813	65/-	OC72	6/-
E1232	9/-	EN31	10/-	PL38	16/-	UY21	7/6	4C27	35/-	6J5G	2/-	12F5GT	2/6	815	35/-	OC73	10/-
E1266	50/-	ESU74	80/-	PL81	7/-	UY85	5/-	4D1	4/-	6J6	3/6	12J7GT	6/6	829B	50/-	OC81M	7/-
E1415	30/-	ESU208	6/-	PL82	5/-	V1120	4/-	5A173G	5/-	6J6W	6/-	12K7GT	2/-	830B	4/-	OC82	10/-
E1524	12/6	EY51	5/6	PL83	6/-			5A174G	5/-	6J7G	5/-	12K8M	10/-	832A	45/-	OC122	16/-
EA50	1/-	EY86	6/6	PL84	6/6			5B/251M	25/-	6J7M	8/-	12Q7GT	3/3	832A	15/-	OC200	10/6
EA73	7/-	EY91	3/-	PL500	15/-			5B/253M	15/-	6K6GT	5/6	12SA7	7/-	832	5/-	XC141	10/-
EABC80	5/9	EZ40	6/6	PM24A	5/-			5B/254M	40/-	6K7G	2/-	12SC7	4/-	843	14/-	XC142	15/-
EAC91	3/6	EZ41	6/6	PT15	10/-							12SG7	3/-	866A	10/-	XC155	20/-
EAF42	8/-	EZ80	5/6	PT25H	7/6							12SH7	3/-	884	4/6	XC156	22/6
EB34	1/6	EZ81	3/6	PT25M	7/6							12SJ7	5/-	954	2/6	2N247	9/6
EB91	3/-	F/6057	5/-	PX4	14/-							12SK7GT	3/-	955	2/-	2N502	47/-
EBC33	6/-	F/6061	5/-	PX25	9/-							12SN7GT	5/9	956	2/-	2N585	10/6
EBC41	8/9	F/6063	4/-	PY33	9/6							12SR7	5/-	957	5/-	2N1090	20/-
												12Y4	2/-	958A	4/-	2N1091	29/6
												14L7	7/-	1612	5/-		
												15D2	6/-	1616	3/-		
												19E2	15/-	1619	5/-		
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