RSGB BULLETIN

MARCH 1964
VOL. 40, No. 3

G2DAF S.S.B. TRANSMITTER

JOURNAL OF THE RADIO SOCIETY OF GREAT BRITAIN

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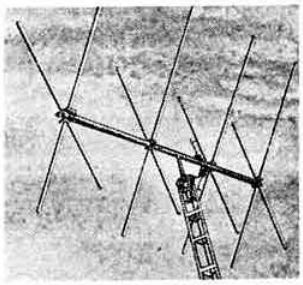
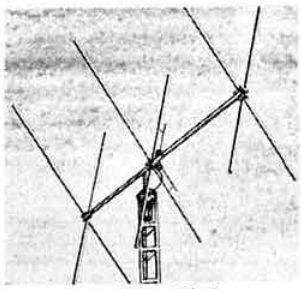


Gain 13 times. 26ft. Boom



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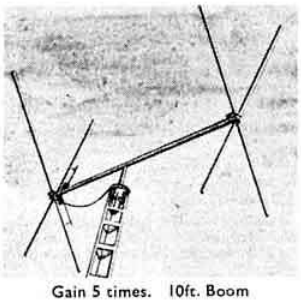

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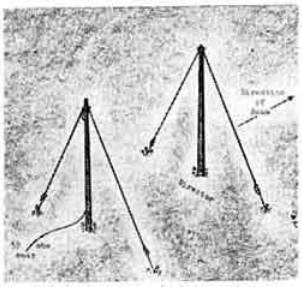
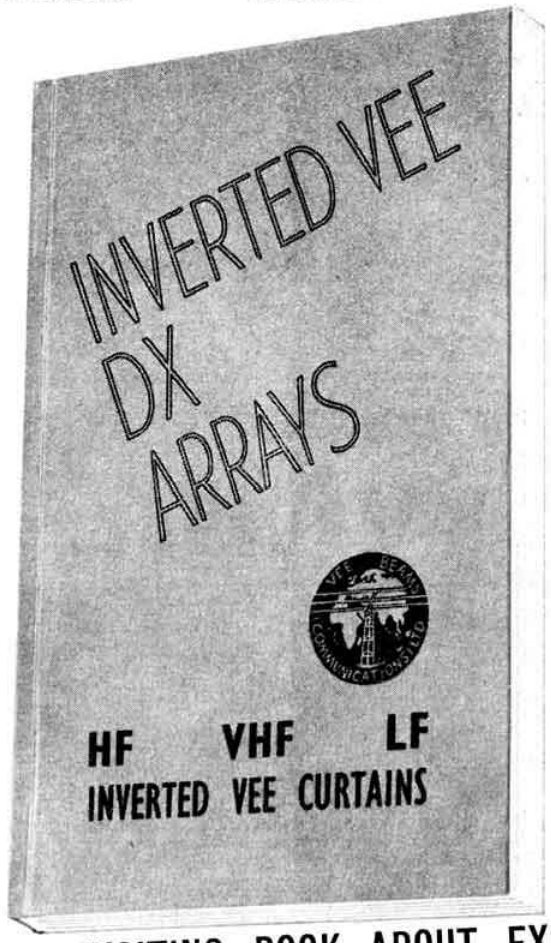


Gain 8 times. 80/40 metres



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Volume 40 No. 3

March 1964

3/- Monthly

R.S.G.B. BULLETIN

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Front Cover: The illustration on this month's cover shows the Mark 2 version of the G2DAF S.S.B. Transmitter, the description of which starts on page 140.

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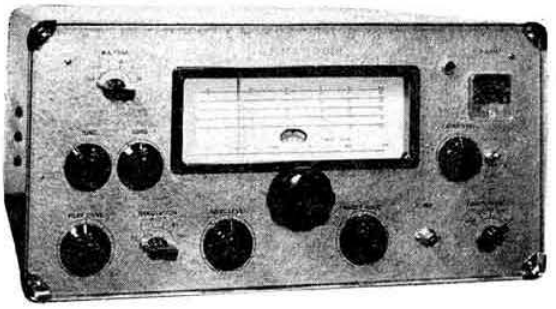
Mosley Commando II

○AM, SSB, CW TRANSMITTER○



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Current Comment

discusses topics of the day

Let the Buyer Beware

EVERY so often one reads in the Press of an action brought by a purchaser of goods against his supplier in an attempt to obtain redress for defective or otherwise unsatisfactory articles. We cannot recollect having come across any such action in respect of Amateur Radio equipment, but one does hear of instances where an apparently " rogue " piece of gear has got past the manufacturer's final inspection and given nothing but trouble to its unfortunate purchaser. Inevitably, in such a close-knit community as that of radio amateurs this sort of thing produces a power of adverse publicity for the manufacturer concerned.

A recent case reported in the national Press concerned an action brought by the purchaser of a motor car against the manufacturers for damages because he alleged that his car-hire business had suffered as a result of the continued defective operation of the car he had bought. He lost his case because the manufacturers proved to the satisfaction of the court that they had done everything that could reasonably be expected of them to remedy the admitted defects and had gone beyond the strict requirements of their warranty in so doing. A remark made by the Official Referee during the course of this case in regard to the latter document highlighted the generally unsatisfactory and one-sided nature of sale warranties and is applicable to many other classes of goods than motor cars. He said " The sales contract gives no undertaking, or guarantee, except the usual one—and that is as much good as a sick headache. The Suppliers have removed any possibility of being liable, except that they would send you a spare part to be fitted at your own expense. The public thinks it is getting a magnificent document in a warranty. In fact, it is getting nothing."

One is tempted to ask whether suppliers would not be well advised in those cases where an obviously sub-standard product has got into the hands of a customer, to replace the article without further ado. There is a well-known chain of stores which prides itself on changing any of its goods on application without requiring any proof whatsoever as to their defect and it has not noticeably suffered as a consequence of this enlightened attitude.

There is no doubt whatever that the effect of just one dissatisfied client can set at nought a great deal of expensive advertising, while a customer who has received unexpectedly generous treatment can do a great deal towards furthering a firm's goodwill.

In the absence of co-operation from the supplier the purchaser, having exhausted his patience and still being in possession of an unsatisfactory article, may consider litigation.

The Sale of Goods Act, 1893, gives considerable protection to a buyer but even where the Act applies (and its operation can be excluded by a seller) it will not always help a buyer who finds himself saddled with unsatisfactory goods. If, for instance, a purchaser relies on a description of goods in, say, an advertisement and, having bought the goods, he discovers that a leaflet packed with them contains claims as to performance which are more far-reaching than those in the advertisement the law will not help him in the event of those claims not being justified because as he had no knowledge of them when he made his purchase they could have had no bearing upon his decision to buy. The agreement was fixed before he knew of their existence.

Nor should a purchaser pay over-much attention to the usual sales talk whereby the seller commends the article to the purchaser as a paragon of all the virtues. The law takes sales talk for what it is and expects the purchaser to do likewise.

The question of price in relation to that of other goods of a similar nature and stated performance is another matter to be borne in mind. No prudent buyer should reasonably expect to get for £50 something of the same quality as that for which other manufacturers ask £100, and such a consideration is often important in any action which a dissatisfied buyer may bring against a seller.

One need go no further to see that the circumstances in which a buyer can obtain the protection of the Sale of Goods Act are not exhaustive but they do exist. Take, for example, the case where a buyer informs a supplier that he requires an article for a certain purpose and does it in such a way as to show that he relies on the supplier's skill and judgment to sell him something which is reasonably suitable for that purpose. If it is subsequently established that the article is unsuitable for that purpose, then the buyer will have a claim for

(Continued on page 186

The G2DAF S.S.B. Transmitter Mk. 2

Optional H.F. or L.F. Exciter—180 Watts P.E.P. Input

By G. R. B. THORNLEY, G2DAF *

THE original G2DAF single sideband transmitter was developed and the prototype built during the latter part of 1958. Subsequently the design and constructional articles were published in the September, October and November, 1959 issues of the BULLETIN. A considerable number of these transmitters have been made and are giving their owners ample reward for the effort and constructional work involved.

There is, however, an ever changing pattern—call it fashion if you like—even in radio equipment. The tendency today is to go smaller and lighter without sacrificing performance, while providing in the one unit an output power sufficient to work any station in the world—subject only to suitable propagation conditions at the time. Additionally, as the surplus FT241 low frequency crystals have become more difficult to obtain, there has been increasing interest in the possibility of using the more readily available FT243 high frequency crystals in a bandpass filter with characteristics suitable for single sideband application. Finally, the original BULLETIN articles are now out of print, and during the period of more than four years since they were published the interest in single sideband has grown very considerably.

During October and November, 1960, the writer undertook some experimental work to determine just what results could be expected using FT243 h.f. crystals in a bandpass filter, constructed under the conditions and with the amount of test equipment to be found in the average amateur shack. From this it became evident that a simple filter using a total of four crystals was capable of an unwanted sideband suppression of 45db or better.

About this time G2DAF was invited to give a talk and a single sideband demonstration at the April, 1961 Blackpool RSGB ORM. In view of the satisfactory results that had been obtained with the h.f. filter and the need for a self-contained transmitter with a greater power output than the original 1959 design, the decision was made to construct a Mk. 2 transmitter embracing those constructional features currently considered desirable. These include

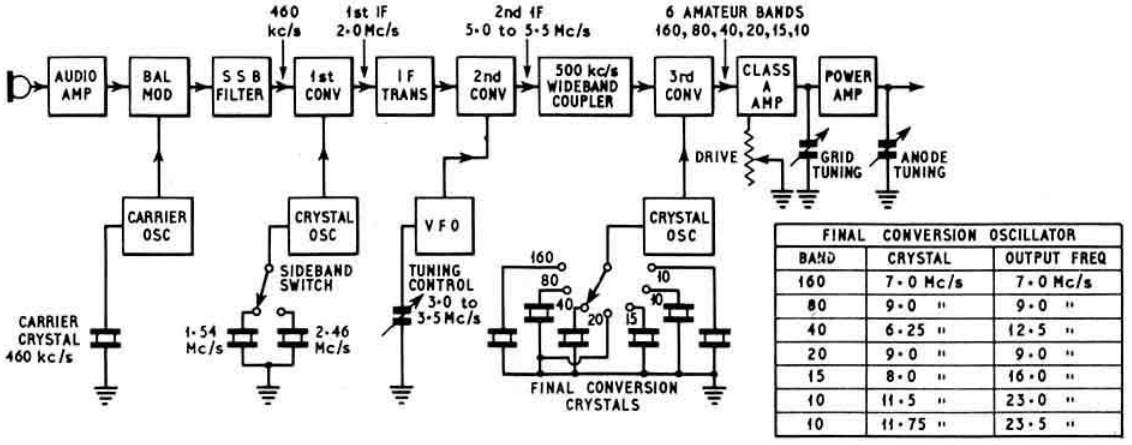
(i) a pair of 6146 valves in the amplifier at 180 watts p.e.p. input;
(ii) sectionalized chassis construction with smaller overall dimensions;
(iii) a reduction in the total number of valves and valve types;
(iv) the use of easily obtainable standardized coil formers and screening cans;
(v) simple " press to talk " control;
(vi) clean layout with good accessibility and professional appearance;
(vii) an interchangeable audio and sideband generating section giving the constructor choice of either an h.f. or l.f. bandpass filter.

The transmitter was completed and subsequently demonstrated at the Blackpool meeting. Since that date it has replaced the Mk. 1 model and been used continuously from the home station. This has given the necessary opportunity to prove the design, and incorporate a number of minor modifications further to improve the performance.

* 5 Janice Drive, Fulwood, Preston, Lancashire.

DESIGN CONSIDERATIONS

Nothing has arisen since 1958 to cause the writer to change his original ideas in regard to the advantages of using a tunable s.s.b. output on a neutral frequency before final conversion to each of the required amateur bands, or to cause any change in the choice of 5·0 to 5·5 Mc/s as a satisfactory tunable frequency range. The original design used three frequency translation processes between the filter



FINAL CONVERSION OSCILLATOR		
BAND	CRYSTAL	OUTPUT FREQ
160	7·0 Mc/s	7·0 Mc/s
80	9·0 "	9·0 "
40	6·25 "	12·5 "
20	9·0 "	9·0 "
15	8·0 "	16·0 "
10	11·5 "	23·0 "
10	11·75 "	23·5 "

Fig. 1. A block diagram showing the frequency conversion processes in the original G2DAF Mk. 1 transmitter, which incorporated a filter operating at a nominal frequency of 460 kc/s.

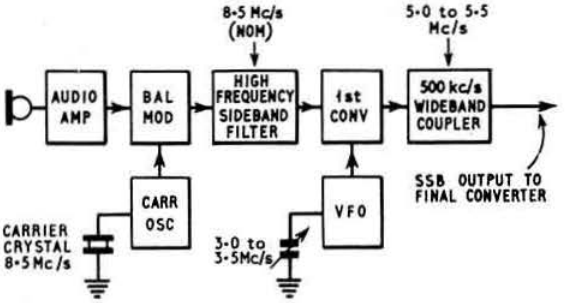


Fig. 2. This diagram shows the method of heterodyning the output from a high frequency sideband filter directly with the v.f.o. to produce a tunable sideband output of 5·0 to 5·5 Mc/s.

and the final output stages as shown in Fig. 1. This gave the following advantages:

(i) Output on the six amateur bands from 160 to 10m.
(ii) 500 kc/s tunable coverage on each range.
(iii) Automatic selection of the correct sideband (i.e., low for 160, 80 and 40 and high for 20, 15 and 10m.)
(iv) The use of a wideband coupler at the tunable sideband frequency resulting in a reduction of the required tuning controls to a total of three in number.
(v) Each frequency translation process within a ratio ($F_{in} : F_{out}$) of less than 5·5 : 1, resulting in a greater discrimination against unwanted converter products.
(vi) " Easy " final conversion with a simple harmonic oscillator using standard crystal frequencies (with the exception of 9·0 Mc/s) obtainable from surplus sources.
(vii) The use of push-pull frequency conversion throughout, giving a high discrimination against breakthrough of the heterodyning frequency, and a clean output with a low order of distortion products.
(viii) A v.f.o. operating on a relatively low frequency range giving a high degree of frequency stability, and in addition a tuning range of 500 kc/s over the full traverse of the main tuning dial.
(ix) Full band coverage from 1·5 to 29 Mc/s with six conversion crystals only.
(x) Selection of either upper or lower sideband transmission by panel control.

In addition to the advantages enumerated, this method of frequency translation has stood the test of duplication by a large number of s.s.b. operators without any major difficulties becoming apparent. It has also stood the test of satisfactory operation by these amateurs on all bands over a considerable period of time. From this it follows that the use of an h.f. crystal sideband filter would only be incorporated within the framework of the existing frequency translation processes.

It was necessary in the original design to use two conversion processes between the sideband generator on 460 kc/s and the wideband coupler in order to keep each frequency translation within the limit of 6 : 1. With the use of an h.f. filter this limitation no longer applies and it is possible to heterodyne the initial sideband output from the filter directly with the v.f.o.—operating over the same range as before—to produce the required tunable output of 5·0 to 5·5 Mc/s. This arrangement is shown in Fig. 2 and at first sight it would appear to be most attractive, eliminating the need for one of the balanced converters and its associated heterodyning oscillator.

However, before accepting any frequency combination as a workable proposition it is most important to realize that in addition to the wanted sum or difference frequency, ($F_1 + F_2$) or ($F_1 - F_2$), the converter output will contain the harmonics of F_1 and F_2 and also the third, fourth, fifth and higher order products.*

If an h.f. filter is constructed giving a sideband output at a nominal frequency of 8·5 Mc/s the v.f.o. can tune the original range 3·0 to 3·5 Mc/s to give a difference frequency output over the required 5·0 to 5·5 Mc/s band. As the sum products are far removed from the wanted output (i.e. the lowest is 11·5 Mc/s) they can be ignored. However, the fifth order difference product ($4F_2 - F_1$) will also give an output over the range 3·5 to 5·5 Mc/s, and over a quarter of the traverse of the main tuning dial this spurious output will cover the range 5·0 to 5·5 Mc/s and will be accepted by the wideband coupler. It will also move four times as fast as the wanted output and in the opposite direction and will also produce an inverted sideband. This is shown in diagrammatic form in Fig. 3. While the level is likely to be at least 40db down in relation to the wanted $F_1 - F_2$ frequency, the danger is that when beating the transmitter into the receiver to net on to the required operating frequency it would be quite easy to inadvertently select the spurious output and then tune the following p.a. grid and anode circuits to it. Obviously this simple frequency translation process of heterodyning the h.f. filter output on 8·5 Mc/s directly with the v.f.o. is not in practice acceptable.

If the filter frequency is lowered to say 8·25 Mc/s the v.f.o. will be tuning 2·75 to 3·25 Mc/s, the fifth order product will

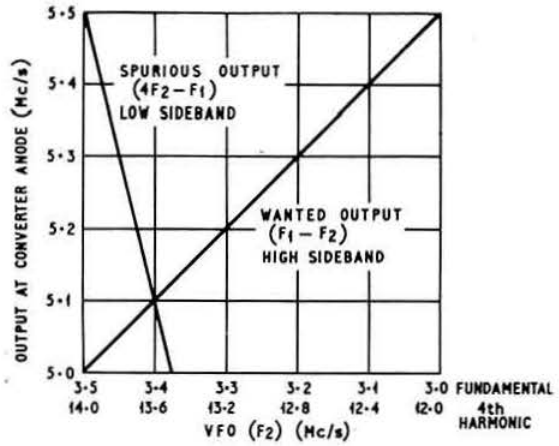


Fig. 3. A graph indicating how the spurious converter product ($4F_2$-F_1) moves in the opposite direction to the wanted output, (F_1-F_2) and at one particular v.f.o. setting actually produces an inverted sideband at the required operating frequency.

cover 2·75 to 4·75 Mc/s and will be outside the passband of the w.b.c. circuits. Unfortunately the second harmonic of the v.f.o. is now tuning down to 5·5 Mc/s and will be accepted by these circuits. From this, it is clear that " all band " coverage with a simple double translation process is not in practice a working proposition. Direct conversion of the h.f. filter output with the v.f.o. also means that the original sideband switching facility is no longer available.

Because of these considerations the decision was made to heterodyne the h.f. filter output down to the original first i.f.

* *CONVERTER PRODUCTS*

Fundamental	*Second Order*	*Third Order*	*Fourth Order*	*Fifth Order*
F_1	$F_1 \pm F_2$	$2F_1 \pm F_2$	$3F_1 \pm F_2$	$4F_1 \pm F_2$
F_2	$2F_1$	$2F_2 \pm F_1$	$3F_2 \pm F_1$	$4F_2 \pm F_1$
	$2F_2$	$3F_1$	$2F_1 \pm 2F_2$	$3F_1 \pm 2F_2$
		$3F_2$	$4F_1$	$3F_2 \pm 2F_1$
			$4F_2$	$5F_1$
				$5F_2$

of 2·0 Mc/s, so that all frequency conversion processes from this point are the same as in the original transmitter. This also enables the Mk. 2 design to be offered with an optional interchangable h.f. or l.f. sideband generating section.

Automatic or Manual Control

Contrary to a widely held belief, a voice operated (vox) control system is not an essential part of a single sideband transmitter. Automatic voice control—in practice—does not prevent simultaneous transmission (doubling) and may develop bad operating habits such as speaking in an unnaturally loud voice in order to get the vox system to work without clipping syllables, and fast gabbling in order to stop relay clattering on pauses between words. It is quite true that these limitations can be overcome with a fully electronic vox system, but this in turn means the provision of a special negative voltage power supply and the use of a T/R switch. In turn the T/R switch can cause TVI, introduce hash into the receiver from mercury vapour rectifiers feeding the p.a., adversely affect the receiver signal-to-noise ratio, and at the best necessitate the receiver input circuits being tied to the pi-tank circuit in the transmitter.

For the last four years the writer has used a simple " press to talk " push button control and finds this method of operating highly satisfactory with the added advantage of simplicity, no setting up or adjustment needed, and 100 per cent reliability. Quite frankly, the additional valves, components and complication needed for a vox system is not worthwhile. In the Mk. 2 transmitter all necessary switching has been provided with a standard two pole change-over relay, taking its energizing current directly from the existing 300 volt h.t. rail. One set of contacts controls the muting bias and the other set is brought out to a terminal block on the rear chassis apron for external connection to a separate aerial change-over relay.

H.F. or L.F. Filter

The choice of filter—whether to build high frequency or low frequency—is largely a matter of personal preference. It has been the writer's experience over the years that where difficulty was experienced in the construction of the original design it was nearly always in the manipulation of the FT241 crystals and the correct alignment of the associated i.f. transformers in the l.f. bandpass filter. This difficulty can be avoided by the use of a mechanical filter and at the current market prices these filters offer so many advantages to the home constructor that the use of l.f. crystals is no longer worthwhile. As a guide the relative advantages and disadvantages can be summarized as follows:

Mechanical Filter Advantages

(i) Small physical size and easy installation.
(ii) Individual choice of filter bandwidth.
(iii) Above average sideband and carrier suppression—in most cases better than a two half-lattice crystal filter.
(iv) No alignment or adjustment necessary.
(v) Correct carrier crystal frequency is easily obtained from the response curves.

Mechanical Filter Disadvantages

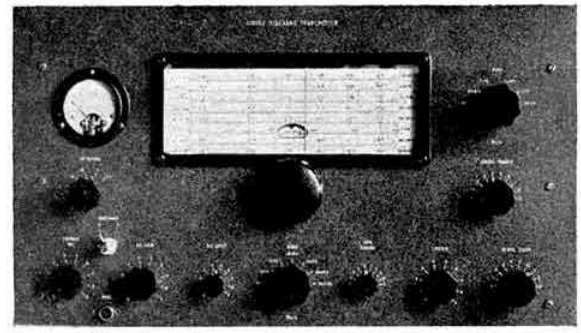
(i) Higher initial cost than a filter using surplus FT241 crystals.

H.F. Filter Advantages

(i) Excellent shape factor and sideband suppression of 45db obtainable with four crystals only.
(ii) No associated tuned circuits and no alignment necessary.
(iii) Long term stability is that of the crystals, and is therefore very high.
(iv) Carrier frequency can be moved up or down the passband and positioned for the most satisfactory " on the air " reports by adjustment to a pre-set trimmer across the carrier crystal.
(v) As the input and output impedance is low there is less possibility of leakage across the sections.
(vi) Suitable crystals are available in the surplus FT243 range at low initial cost.

H.F. Filter Disadvantages

(i) For satisfactory crystal manipulation it is necessary to use etching techniques.
(ii) A small test rig has to be constructed to enable the crystal frequencies to be measured with sufficient accuracy, using a BC221 frequency meter on its *low frequency* range.



Front panel view of the Mk. 2 transmitter.

Carrier Oscillator

It is normal practice to provide a cathode follower fed from the carrier oscillator anode coil to provide a relatively low impedance output to feed a " carrier insertion " potentiometer. This is required so that the carrier can be inserted for netting purposes and also for tuning the p.a. grid and anode circuits to resonance and to produce either single-tone or two-tone input (second tone from audio oscillator) for linearity checks and power measurement. The usual practice is to combine the carrier oscillator and cathode follower valves in one double triode envelope.

During experimental work with the mechanical filter it was noted that there was some output of the carrier frequency at the anode of the EF89 filter amplifier that could not be balanced out with the modulator balancing control. Because this filter normally has the carrier frequency some 20 to 25db down the filter slope, the theoretical carrier suppression should have been 60db or better. The first procedure was to remove the r.f. feed into the mechanical filter. As the leakage of carrier into the amplifier persisted it could only be occurring via common feed lines. Accordingly the 150 volt regulated h.t. rail and the two heater connections at the carrier oscillator were bypassed to chassis with 0·01 μF capacitors. This gave some improvement and a further reduction in leakage was obtained by connecting bypass capacitors at each of the filter amplifier valve heater connections. However, values as high as 0·1 μF did not effect a complete cure and it was obvious that an appreciable amount of r.f. was being introduced into the heater wiring.

To verify this the feed into the cathode follower grid was disconnected—the carrier leakage then completely disappeared. It was then obvious that leakage was taking place across the cathode-heater capacity of this valve. One possible way out of this difficulty would have been to introduce an equal and opposite " leakage " through a small " neutralizing " capacitor connected to a suitable point on the carrier oscillator circuitry. However, it was felt that a more practical and

satisfactory cure would be to eliminate the cathode follower stage altogether—provided that it was possible to arrange some alternative method of carrier re-insertion for netting and tuning up purposes. This is not an easy thing to do when the required control is a variable potentiometer which must be connected in such a way that it will neither upset nor " pull " the carrier oscillator.

The circuit finally adopted meets these requirements and if required gives sufficient carrier insertion to drive fully the p.a. valve. As there is now only one triode valve in use, the circuitry of V1 is simplified and in fact the 12AU7 could be replaced by a 6C4. As this would entail an additional valve type and the necessity to carry a spare, the 12AU7 is left in service with the two sections strapped in parallel.

Sideband Filter

A transmitter is quite rightly judged by the signal it puts out over the air, and in this respect the degree of unwanted sideband (and carrier) suppression is all important.

The h.f. filter on a nominal frequency of 8·5 Mc/s uses four FT243 crystals in two pairs, tightly coupled with a centre tapped inductance, bifilar wound on a ferrite ring core. The filter circuitry is basically very simple and associated coupling transformers are not necessary because at the high frequency used the pole zero spacing of the crystals is sufficiently wide to give the required 3·0 kc/s passband without artificial manipulation by shunt *LC* circuits resonant at the operating frequency. In fact, the filter response characteristics are directly determined by the crystals (a *small* manipulation of the dip in the passband centre and the shape of the response shoulders is possible by adjustment of the number of turns on the bifilar winding). Once these have been etched to give the required crystal spacing and the filter response plotted, that is it, and there is nothing more the constructor can do.

The h.f. filter is capable of an unwanted sideband suppression, at 1 kc/s or higher, of better than 55db and under voice conditions the suppression available approaches 45db. It was felt that the l.f. filter should have a similar performance and this can be obtained with either the Collins or the Kokusai 455 kc/s mechanical filters. With both types of filter the carrier frequency is normally 25db down the passband slope, and as there is a further 40db of carrier attenuation available in the diode balanced modulator, the total carrier suppression is better than 60db. The unwanted sideband attenuation of all modulating frequencies in the range 300 to 3000 c/s is adequate for amateur requirements and should be of the order 40 to 45db.

It will be noted that good sideband suppression has not been obtained at the expense of audio quality using a narrow passband. The h.f. filter has been designed to pass the full audio range of at least 3·0 kc/s and gives a very acceptable single sideband voice quality. Mechanical filters with a 3·0 kc/s bandwidth (6db points) are now readily available.

Filter Amplifier

Owing to the low output from the diode modulator and the insertion loss of the filter, the filter amplifier is required to give a high order of amplification. It must, however, do this with a high degree of stability—not only under static conditions but under peak speech conditions as well. Any tendency towards self-oscillation will completely ruin the sideband signal and must be avoided at all cost.

The amplifier valve for the h.f. filter is the pentode section of an ECF82, and this valve is completely stable under all circumstances due to the heavy grid swamping provided by the filter load resistor of 2K ohms in value.

In regard to the amplifier following the 455 kc/s l.f. filter the operating conditions are quite different. The Kokusai mechanical filter requires a higher impedance load; additionally the greater dynamic resistance of the anode tuned circuit at 455 kc/s results in a higher stage gain. Because of this, high slope valves of the EF80 or EF183 class must not be used. A very suitable valve in the current Noval base series is the EF89. This has a medium slope and as a further safety precaution and an aid towards stability the valve is screen neutralized by a feed-back bridge in the anode circuit.

Sideband Switching Oscillator

In the original 1958 transmitter the sideband switching oscillator was a 12AU7 valve in a Butler oscillator circuit. This was used because adjustment of the dust cores in the two output circuits allowed the crystals to be " pulled " in frequency by a small amount (100 c/s or so) to maintain the transmitter output frequency (suppressed carrier) constant on either sideband.

It is possible to simplify this oscillator and eliminate the two anode tuned circuits by arranging the valve as two separate single triode Pierce oscillators. A further added advantage with this circuit is that the switching need not be at r.f. The required valve can be switched on or off at d.c. by a switch positioned directly on the front panel. The necessary "pulling" of the crystals is obtained by 50 pF pre-set capacitors from the grid of each valve to chassis earth. It is not possible in the Pierce circuit to pull the crystals to the same amount as with the Butler oscillator and it is therefore necessary to grind them to the correct frequency with a little more accuracy and use the pre-set capacitors only for final adjustment within the range ± 50 c/s or so. In practice it is felt that this is a small disadvantage that is more than outweighed by the simplification possible in the associated circuitry, and the Pierce oscillator arrangement has been adopted in the Mk. 2 l.f. sideband generator.

In regard to the h.f. sideband generator, the smaller physical dimensions of the h.f. filter and associated components enable a chassis layout to be obtained with a clear space down the underneath chassis centre line. It is then possible to position the sideband switch against the valve and the crystal holders, switch at r.f. and carry the controlling shaft in line to the required panel control knob. As the oscillator need only be a single triode valve, the function of filter amplifier and sideband oscillator can be combined in one envelope using an ECF82 triode pentode valve.

The 500 kc/s Wideband Coupler

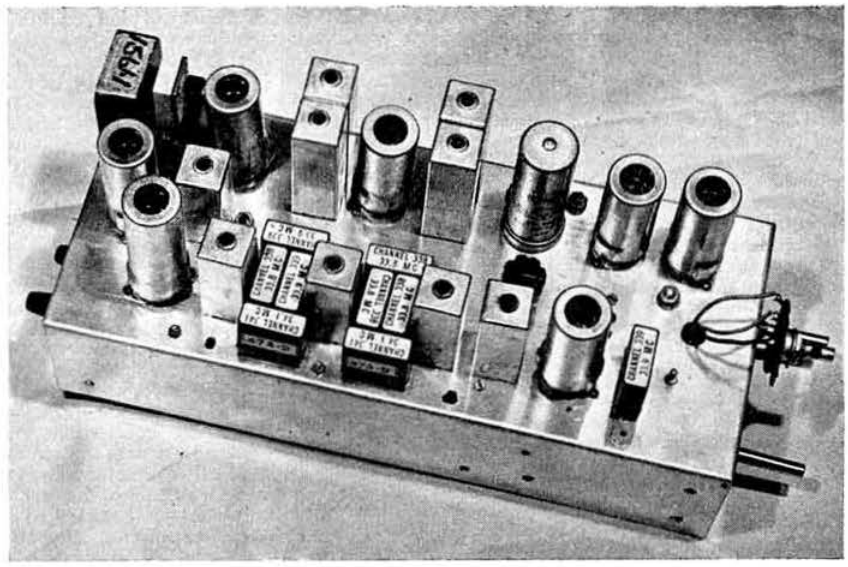
The tunable sideband output over the range 5·0 to 5·5 Mc/s is fed from the anodes of the second balanced converter into a wideband i.f. transformer that has a passband width at the 3db points of 500 kc/s. This eliminates the need for tuned circuits that would require re-adjustment each time the operating frequency was changed. This wideband coupler is required to pass all frequencies within the second i.f. tuning range (5·0 to 5·5 Mc/s) with as little attenuation as possible, but to have reasonably steep skirts on the response curve so that there is at least 35db rejection to any unwanted frequency within 500 kc/s of the passband.

In the original transmitter the required characteristics were achieved by making use of the can and former of a surplus Sickles i.f.t. by removing the original 465 kc/s windings and replacing it with a single-layer wound primary and secondary with a critical coupling between coils of $\frac{1}{4}$ in. Some constructors of the transmitter failed to get the drive voltage figures quoted in the original article, or alternatively had sufficient drive in the centre band position but a falling output at each end of the 500 kc/s tuning range. This was usually due to the use of some other type of former with differing dimensions and a dust core material with different electrical and magnetic properties.

In the light of this experience it is obviously of considerable

importance that all potential constructors should be able to get the same coil and i.f. transformer cans, formers and dust cores as those used by the designer. Therefore, in the Mk. 2 transmitter the readily available range of Neosid or Aladdin miniature cans ($2\frac{1}{4}$ in. × $\frac{13}{16}$ in. × $\frac{13}{16}$ in.) and 0·3 in. formers with 0BA dust cores have been used throughout. This has been done, first to reduce the chassis size, and secondly to ensure that every builder can exactly duplicate the resonant circuit characteristics obtained in the original transmitter.

It was also felt advantageous in the wideband coupler to use two separate coils—each in its own screening can—and have some external means of coupling so that the constructor could make any necessary adjustment to the passband characteristics during final alignment with the coils *in situ*. As the primary and secondary are balanced windings (i.e. coupling the two anodes of a balanced converter into the two grids of a following balanced converter) it is necessary to have a form of variable coupling that will not unbalance the circuits during alignment. As often happens in Amateur Radio (and professional too) many different arrangements were tried and found wanting—yet the final circuitry that gave the right results is inherently simple and requires only the addition of two small pre-set trimmer capacitors.



The low frequency sideband generating section of the G2DAF S.S.B. Transmitter Mk. 2 before the Kokusai mechanical filter was installed.

The same procedure of using two separate, individually screened coils, has also been used in the 2 Mc/s i.f.t. In this case both primary and secondary circuits are peaked at the first i.f. and the coupling does not require any adjustment. In regard to the attenuation of unwanted conversion products, those likely to produce spurious signals within the passband of the following circuits are either higher order or the fundamental of the 6·5 or 10·5 Mc/s crystals used in the h.f. sideband generator. As the reactance of a capacitor becomes less as the frequency goes higher the design value of mutual coupling that gives optimum selectivity at 2·0 Mc/s would provide an " easy " path for those higher spurious products it is required to attenuate to a low value. For this reason it is necessary to use a method of coupling between primary and secondary windings that has negligible capacity and is almost fully inductive. Therefore " top " capacity coupling as used in the wideband transformer is not employed, and the coupling in this stage is a simple link winding wound round the centre of each main coil at the point of lowest impedance and the electrical centre of the circuit.

Final Conversion Oscillator

In the final translation process the tunable sideband signal on 5·0 to 5·5 Mc/s is converted into the required amateur band. Under normal drive conditions the signal at the converter grid is between 0·5 and 1·0 volt r.m.s. It is important that the converter operating conditions are chosen so that there is no distortion of the modulating waveform. This requires that the heterodyning, or switching, voltage is much greater in amplitude than the peak signal input. These conditions are given with an oscillator input into the converter of between 5·0 and 10·0 volts r.m.s. This is well within the capabilities of an EF80 pentode with fundamental or second harmonic operation of the crystal.

It will be appreciated that the oscillator output will be greater on the lower frequency bands and less on the higher frequency bands. For this reason it is permissible to simplify the required circuitry and use a single coil, with the band change switch selecting the right value of capacity to tune the output circuit to the required operating frequency. With this arrangement the L/C ratio is lower on the low ranges and therefore the dynamic resistance of the circuit and the oscillator voltage developed will also be lower. This is compensated by the greater output with the lower frequency crystals used on the fundamental, and the smaller output with the band 5 and 6 crystals used on the second harmonic, and should result in a reasonably constant amplitude of output voltage throughout the six bands required.

Final Conversion

The serious short-coming of the simple single ended converter lies in its inability to discriminate against the unwanted energy from the heterodyning oscillator if the s.s.b. signal is to be raised in frequency by a ratio of more than four or five to one. For instance, when operating on the 10m band the heterodyning input will be 23 Mc/s. A single tuned circuit of good quality (high Q) tuned to 28 Mc/s will present approximately ten times the impedance to the wanted signal as it will to the steady off-tune oscillator signal. However, the oscillator input voltage will be five to ten times the amplitude of the peak s.s.b. input (this is necessary in any converter to prevent distortion of the modulating waveform) so despite the selective effect of the output tank circuit, the steady oscillator voltage across it will be just about the same as the peak s.s.b. voltage. Under these conditions it would be quite easy to tune up the following p.a. grid and anode circuits to the 23 Mc/s output frequency instead of the required 28 Mc/s s.s.b. signal. Even if care were taken to ensure that the p.a. circuits were correctly resonant in the 10m band, enough energy at 23 Mc/s could leak through to produce an appreciable spurious signal outside the amateur bands.

Fortunately, it is easy to reduce the amplitude of the heterodyning voltage in the converter output circuit by a system of phasing or balancing in which the converter is

made a double valve with a push-pull anode tank circuit and the oscillator voltage is fed into the two grids in parallel. The oscillator current in one half of the anode circuit is balanced or attenuated by the current in the other half. Approximate equality is obtained by balancing the two valves with a potentiometer in the cathode circuits. It will be appreciated that the valve is a converter, and the anode circuit is tuned to either the sum or difference of the two input frequencies. The obtainable attenuation (using a simple balancing potentiometer) is not as great as it would be in a balanced modulator. In practice 20 to 25db is the most that can be expected. However, this is sufficient to reduce the unwanted energy from the heterodyning oscillator to a lower value than the peak s.s.b. signal and enable the *Q* of the tuned tank circuit to provide drive to the following stages, that is—on the wanted frequency—more than ten times stronger than any other spurious output.

In the original transmitter the feed to the following class A amplifier was taken through a small fixed capacitor from one end of the converter anode coil. A number of RSGB BULLETIN readers queried this on the grounds that it would be impossible to balance the converter valves. This possibly arose from consideration of push-pull audio amplifiers where the speaker is connected to a secondary winding on the output transformer, and any attempt to take the output from one end of the transformer primary would result in a loss of half the available power and a single ended output signal. However, in r.f. applications these considerations no longer apply because of the tank circuit *Q*. It is perfectly permissible to take the output from one end of the circuit, and in fact a series of experiments undertaken by the writer in which the " break-through " of the heterodyning voltage was measured on a valve voltmeter, taken either from one anode, or from a centrally disposed secondary winding, showed that there was nothing to choose between either method.

This matter has been dealt with in detail because the current circuit has been changed and the output from the final converter is now taken from a secondary winding. The added complication of an additional switch bank to select the required secondary winding on each range is offset by the advantage of being able to adjust the secondary turns ratio to give a step-down or a one to one ratio as required to keep the drive voltage into the following amplifier grid more nearly constant throughout the six amateur bands from 160 to 10m. (This is necessary because the method of r.f. drive control now used gives a change in gain—from minimum to maximum—of 10db, as against 20db in the original transmitter.)

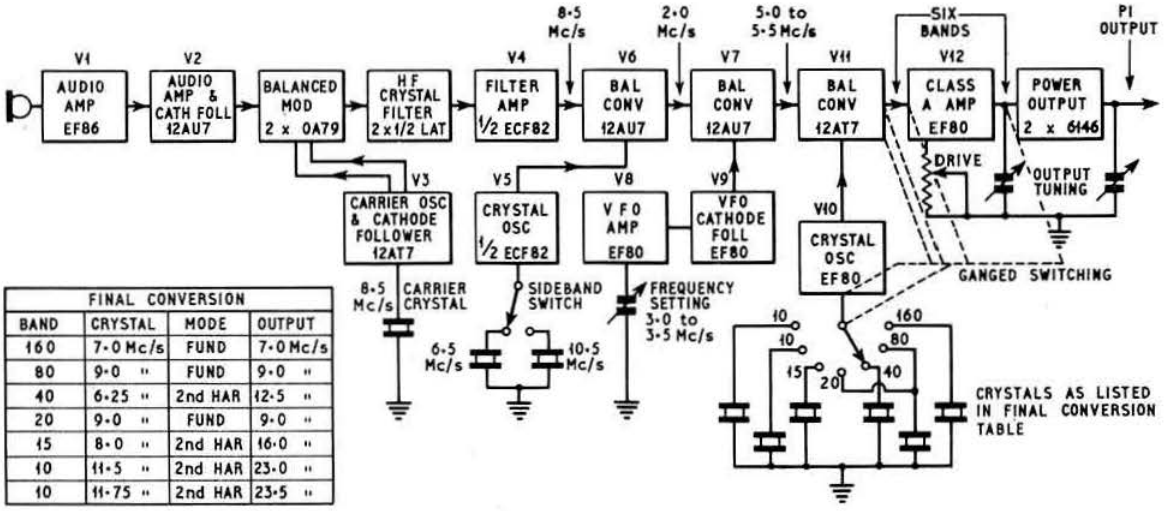
Output Stages

A perfect single sideband transmitter would do exactly what the title describes and radiate a single sideband containing only the required voice modulating frequencies. The attenuation of the carrier and the unwanted sideband would be infinitely great. In fact, the transmitter output signal would be truly a single sideband signal. In practice this ideal state of affairs is not obtainable, and an amateur s.s.b. transmitter is considered to be in the top class if the carrier suppression approaches 60db and all signals in the vestigial sideband are 40db down or better.

Most prospective constructors of single sideband equipment will have sufficient knowledge to know that non-linearity in the final class A amplifier and class AB output stages produces intermodulation distortion products that appear close in on either side of the nominal carrier frequency and are not attenuated by the selectivity of the tuned output circuits. Under correct operating conditions the distortion products on the wanted sideband are masked by the output signal. However, on the other side of the suppressed carrier they appear to the receiving station as a distorted (completely unintelligible) sideband that is much greater in amplitude than the true (clean and readable) remnant sideband that has not been completely suppressed in the crystal or mechanical bandpass filter.

Obviously, there is no point whatsoever in building a filter that will attenuate the unwanted sideband to a level 45db down, and then allowing this sideband to be put back again in the following stages in the form of distortion that is at a much higher level.

The final class A amplifier stage is required to provide an output of 50 volts peak to drive fully the p.a. valves. It is most important that while it is doing this it is operating in the most linear manner, over the straight part of its characteristic



FINAL CONVERSION			
BAND	CRYSTAL	MODE	OUTPUT
160	7·0 Mc/s	FUND	7·0 Mc/s
80	9·0 "	FUND	9·0 "
40	6·25 "	2nd HAR	12·5 "
20	9·0 "	FUND	9·0 "
15	8·0 "	2nd HAR	16·0 "
10	11·5 "	2nd HAR	23·0 "
10	11·75 "	2nd HAR	23·5 "

Fig. 4. Block diagram of the G2DAF Mk. 2 transmitter. This version uses a filter with a nominal frequency of 8·5 Mc/s.

curve. However, the achievement of good linearity is made difficult in practice because it is also necessary to be able to control the total voltage amplification from this valve. In general, control of gain by alteration of bias or screen potential shifts the operating point and this is not compatible with a high order of linearity. A simple solution would be to put the RF DRIVE control in some other part of the transmitter circuit. There are, however, good reasons for controlling the amplification of the sideband signal in the band-switched circuits following the final conversion process. These will now be considered in detail.

All amateurs with past constructional or transmitting experience know that it is much more difficult to get voltage amplification and sufficient drive to the p.a. on 10m than it is on 160 or 80m. This occurs because the circuit losses become greater as the frequency goes higher. These losses are due to a number of factors:

(i) the reduction in dynamic resistance of the tuned circuits;
(ii) greater losses due to absorption by stray coupling;
(iii) lower conversion efficiency of the converter valve;
(iv) increased input damping losses in the p.a. valves.

These losses add up to quite an appreciable amount, and taking the drive voltage into the p.a. on 80m as a reference level, switching to the 10m band will show a drop of approximately 20db. It follows that the total gain requirement in the transmitter—from the microphone input to the p.a. grids—can vary over a ratio of 10 to 1. Therefore, when changing bands it is necessary to have some manual control to set the total amplification to a value that will give the correct drive into the p.a. grids. This is the RF DRIVE control and as the variation in circuit loss is taking place in the band-switched stages the logical place for a drive control is in the circuitry associated with the class A amplifier stage following the final frequency conversion process.

It is important to remember that in a single sideband transmitter all stages in front of the final converter are running with a constant peak sideband input and with a constant heterodyning input that is not affected by the position of the band-change switch. A good design will provide the optimum operating conditions to obtain the best signal/spurious product and the best signal/distortion ratio in the balanced modulator and the following converter stages. The audio gain control should never—repeat *never*—be used as a drive control. Its function is to enable the operator to set the audio level to suit the microphone in use and the characteristics of his voice to obtain optimum working conditions in the balanced modulator. Too much audio gain will cause over-modulation, and too little will impair the ratio of peak signal/resting carrier in the modulator and the available carrier suppression will suffer. Once the audio gain control has been set correctly, it should not be touched again.

In the original Mk. 1 transmitter the RF DRIVE control was a 10K ohm variable potentiometer in the EF80 (or EF85) cathode return circuit. While this is not theoretically the most elegant way of doing the job, it was adopted because it was simple, gave a wide range of control (20db), and worked well in practice. However, during a series of experiments in which the amplitude of intermodulation distortion products was being measured at differing signal levels, it became evident that intermodulation was taking place in the voltage amplifier at a signal level that was lower than the distortion point in the 6146 p.a. valves. The distortion became worse at lower drive control settings where the valve operating point was being carried down towards the curved part of the characteristics curve. Accordingly, the drive control circuit has been modified so that the valve operating point remains on the straight part of its characteristic curve and gain is controlled by negative current feed-back across the RF DRIVE potentiometer.

It is necessary to mute at least one stage in the output side of the transmitter to prevent feed-back into the receiver. As the grid return path of the EF80 amplifier is now taken to the top of the drive control potentiometer, it is no longer possible to apply muting bias to this valve. Accordingly, the muting potential is taken to the bottom end of the bias setting potentiometer in the p.a. bias supply. The two 6146 valves are therefore held at cut-off during transmitter standby periods, and allowed to take their normal standing current when the " press to talk " button is depressed for transmit.

The distortion product level in the p.a. stage is also kept to the lowest practicable level by:

(i) a " stiff " bias supply;
(ii) generous stabilization of the screen voltage;
(iii) correct choice of L/C ratio in the pi-tank circuit giving the optimum value of anode load;
(iv) a " stiff " h.t. supply with good dynamic regulation.

Under these conditions with the p.a. correctly loaded (i.e. a maximum signal (under single tone conditions) screen current of 15mA for both valves) on the air reports indicate that the overall distortion product level from the transmitter is 40 to 45db below the wanted sideband level. Note that this figure can only be obtained with correct driving of the p.a.—that is strictly in class AB1. Overdriving is fatal to a clean signal, and 6146 valves have been specifically designed to be driven without grid current.

A block diagram of the complete transmitter is shown in Fig. 4.

(*To be continued*)

Television Masts for U.H.F. Television

The two highest television masts in Europe are to be built for the Independent Television Authority. They will be 1,250 ft. high and a contract for the construction of these and one 1,000 ft. mast has been signed with E.M.I. Electronics Ltd.

The masts will be for the joint use of ITA and the BBC at stations that have been designated as sites for future 625-line u.h.f. networks. They will carry the aerials for these as well as the existing 405-line v.h.f. services.

The 1,000 ft. mast will be built at the ITA's Winter Hill station, in Lancashire, and the 1,250 ft. masts at Emley Moor, in Yorkshire, and at the new station in East Lincolnshire that is at present under construction for the Authority. Each mast will have provision for 350 ft. of aerials, capable of radiating four 625-line u.h.f. services, two 405-line services of the existing type and one f.m. sound programme.

The type of construction of these masts will also be new. Unlike the usual kind, which is built of a lattice of steel girders, each will consist of a steel tube 9 ft. in diameter, with a lift inside to give access to the aerials for maintenance purposes.

The Television Society's Silver Medal Award

The Television Society has announced that in future two Silver Medals will be presented annually for outstanding artistic achievement in television, both in front of, and behind the camera.

432-434 Mc/s ACTIVITY NIGHT
SATURDAYS at 7 p.m.

Some Notes on Portable Operation

By P. PENNELL, G2PL *

THIS article is primarily concerned with portable operation on the h.f. bands from 1·8 Mc/s to 30 Mc/s, although some remarks may also be applied to the v.h.f. bands. The design, as well as the operation of the station, will be discussed as it is hoped that there are still a few amateurs who prefer to " roll their own " rather than buy ready made equipment. In planning the necessary portable units it has been assumed that there will be no help available for such tasks as erecting aerials.

Some of the features which make portable operation so attractive may be summarised as follows:

(a) Operation is possible out of doors in pleasant rural surroundings, perhaps in the sun, or if the normal English weather prevails, in a tent or even in a caravan or car.
(b) The possibility of trying out a " dream " site. Amateurs with average size gardens find certain limitations in erecting aerials.
(c) Experience is obtained in setting up a station quickly, as might be required in an emergency or for NFD.
(d) The ability of continuing to enjoy Amateur Radio contacts while away from the home station.
(e) The challenge of making contacts using low power. There is a far greater feeling of satisfaction in making a DX contact with a battery powered 10-15 watt transmitter than with a 150 watt transmitter from the home station.
(f) Aerials can more easily be tried than under home conditions and, unlike mobile operation, the equipment can be carried to places which are inaccessible by car.

Equipment

Commercial equipment for portable operation is available to the amateur, but the writer has no personal experience of such equipment and is therefore unable to offer helpful guidance in its selection. For the home constructor there is a challenge in making the equipment as small and as light as possible.

The equipment can be made in two forms, either as an integrated unit with the transmitter, modulator and power converter in one case, or in a series of easily portable units. The latter form is preferred by the writer. The use of transistors is necessary both for reasons of compactness and low power consumption. The separate portable units have been adopted primarily because it is useful to have the portable receiver as a stand-by for the main station receiver. This portable receiver is completely transistorized as is the modulator, electronic keyer and power converter.

When constructing portable equipment extra care must be taken to avoid dry joints and also to avoid careless tightening of nuts and bolts which should either be driven up tight or locked with varnish.

The writer's equipment is as follows:

Receiver. This uses a double superheterodyne circuit with intermediate frequencies of 465 and 2250 kc/s. The tuning is electrically bandspread, covering the 1·8, 3·5, 7, 14, and 21 Mc/s bands. The 28 Mc/s band was omitted because a switch having only five positions was available when the receiver was built. Furthermore at the present time in the sun spot cycle it was not considered to be worthwhile. The receiver has however been tested at 28 Mc/s using alternative coils in place of those for 1·8 Mc/s.

The second oscillator is crystal controlled and a variable oscillator ($\pm$ 3 kc/s) is used for the b.f.o. at 465 kc/s. The batteries are internal, and a small monitoring loudspeaker is provided.

After more than two years' use it is obvious some improvements could be made. For example, the overall size could be reduced to almost half. The i.f. skirt selectivity could also be improved. In this respect ceramic i.f. transformers or mechanical filters might be worth considering.

A word of warning must be given to those who wish to use a receiver having transistors in the first r.f. amplifier stage. Make sure that protective diodes are strapped across the aerial input circuit and also that any aerial change-over relay or switch provides a good short circuit to r.f. voltages at the receiver input when transmitting. Some of the present day transistors have a breakdown limit of 4 volts peak.

A helical wound rod receiving aerial is satisfactory for 7, 14, and 21 Mc/s and was made by winding 300 turns of 24 s.w.g. enamelled copper wire spaced $\frac{1}{8}$ in. between turns on a $\frac{1}{2}$ in. diameter former of 40 in. length. The feed impedance is a compromise for 7/14/21 Mc/s but the performance is superior to a whip of the same length.

A ferrite bar aerial gives a reasonable performance on 1·8 and 3·5 Mc/s. It will even provide a crude indication of directivity. This aerial consists of 80 turns of Litz wire spaced $\frac{1}{16}$ in. between turns wound on a $5\frac{1}{2} \times \frac{3}{4}$ in. ferrite bar. A two-turn link enables the co-axial cable to be coupled into the aerial and a small concentric trimmer of 3-30 pF allows it to be peaked for optimum performance at a particular frequency. The sensitivity is excellent, loudspeaker reception having been obtained from Continental stations on 3·5 Mc/s during the afternoon with the receiver located at ground floor level in the living room.

The acquisition of a discarded fishing line spool provided a convenient method of storing a reasonable length of flex. This can be thrown out of a hotel bedroom window to check propagation conditions.

When the receiver forms part of the portable station, the same aerial is used for transmitting and receiving.

Transmitter. This was built three and a half years ago and

The all-transistor communications receiver used by G2PL for portable work.

* 122 Foresters Drive, Wallington, Surrey.

could no doubt be modernised. It uses four stages: v.f.o., multiplier/buffer amplifier, multiplier/buffer amplifier and power amplifier. The l.t. requirement is 12 volts at 0·9 amp. The heaters of three EF91 valves, in parallel, are connected in series with an 807 in the power amplifier. Commercially this would not be considered good practice, but there have been no valve failures to date. A pi-network tank circuit is used and the maximum r.f. output is approximately 10 to 12 watts. For c.w. operation the cathode of the p.a. valve is keyed.

The v.f.o. covers 3·5 to 3·65 Mc/s. For 1·8 to 2 Mc/s there is a separate v.f.o. which can be plugged into the first EF91 valveholder. The modulator uses transistors throughout and delivers up to 12 watts output. The microphone and two stage transistorized amplifier are housed in a separate container and connected to the modulator by a screened cable.

Fuses for the modulator and 12 volt supply are provided. This is an essential precaution to protect the battery.

Keyer. The keyer is fully transistorized and uses a multivibrator for generating pulses to form dots and dashes. This is followed by a bi-stable pulse counting multivibrator stage producing pulses at one half the rate of the basic pulse generator. Associated transistors control the pulse generator, pulse counter and keying relay. This relay could have been replaced by a power transistor but a convenient high speed relay was available. The degree of bias distortion introduced by the relay is insufficient to affect amateur c.w. keying. The paddle mechanism was made from an old bug key.

Power Converter. The use of transistors and a toroidal transformer with a bridge rectifier circuit makes it unnecessary to use either a vibrator or rotary converter, both of which have limitations in efficiency and life. The toroid was wound by hand using a hand shuttle: expert knitters will find this easy! A power output of 350 volts at 150mA is available, and the efficiency at full load is over 80 per cent.

An additional 600 volt 100mA transistor converter has recently been built. By the addition of a simple patch board in the anode feed for the transmitter p.a. either the 300 or 600 volt supply may be selected. The 600 volt supply can be used for c.w. only, to allow a d.c. input of up to 50 watts. This cannot be used on phone as there is insufficient audio power from the modulator. This unit is self-contained and therefore need not be carried with the equipment when operating on 'phone.

L.T. Accumulator. This, of course, is the heaviest and least portable unit forming the station. A 12 volt 40 A.H. accumulator was chosen as the best compromise between weight and life. A complete day's operation is possible without the need for re-charging the battery. Arrangements have been made for connecting this battery in parallel with the car battery so that it can be charged during the journey to the site. A simple carrier and handle have been provided for transportation. A small trolley would be useful but could only be used where the terrain was smooth.

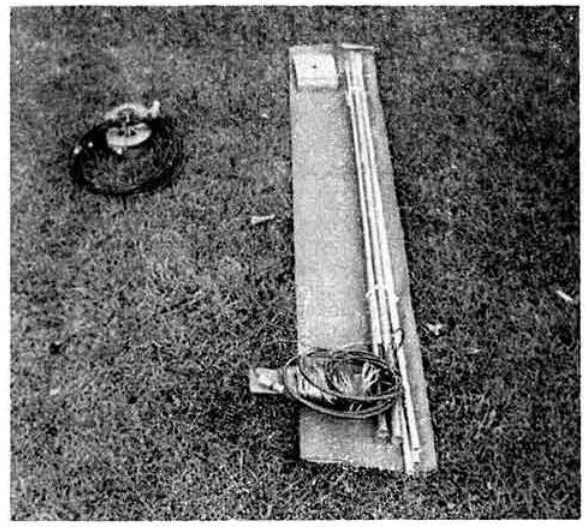
Aerials

The scope for portable aerials is very wide but there seem to be certain basic requirements:

(i) The aerial system must be reasonably easy to erect and dismantle. It must also be capable of being broken down to a small size for transportation.

(ii) The use of trees or poles on a site should not be considered. All the aerials to be described are self supporting, and it is not necessary to risk life and limb climbing trees or rousing the wrath of their owner.

A variety of aerials are used by the writer. The selection of one particular system depends on the time available for portable operation and the site conditions. The following have all been used at one time or another:



Portable aerials. Left, inverted V dipole for 3·5 and 7 Mc/s reeled up; right, ground plane for 14, 21 and 28 Mc/s ready for transportation. Its plastic carrying case is underneath the tubes.

(a) A ground plane for 14, 21 and 28 Mc/s.
(b) A ground plane for 7 Mc/s which is also employed on 3·5 Mc/s with centre loading. On 1·8 Mc/s a capacity hat is used in addition to the loading coil.
(c) An inverted V dipole for 14 and 21 Mc/s.
(d) An inverted V dipole for 1·8 and 3·5 Mc/s.
(e) Two-element beam for 14, 21 and 28 Mc/s.

The ground plane is sectionalised and requires little space for erection. The radials, six of which are used, are coiled up and can be spread out quickly. They can either be used as guys to support the vertical section or allowed to droop if the aerial is mounted alongside the car when space is limited. A heavy base is provided to prevent the aerial from slipping.

The aerial is mounted approximately 12 ft. above the ground and the radials are fanned out at approximately 60° spacing subtending an angle of approximately 45° from the vertical. A length of 52 ohm cable feeds power to the vertical section/radials. An s.w.r. of less than 1·3 : 1 has been measured over the 14 Mc/s band. The degree of mismatch will vary according to the positions of the radials. With the short length of feeder the loss is negligible even if the s.w.r. is high. However, this may present difficulties in loading the output circuit of the transmitter. A distinct improvement in two/three band performance can be obtained by inserting a simple jumper block 11 ft. 9 in. from the feed point. This allows the use of the correct length of radial for 14 or 21 Mc/s. Similarly, if 28 Mc/s is used, a further jumper block could be inserted at 8 ft. 3 in. Low angle radiation is the biggest advantage of this type of aerial. The performance has been excellent when situated above a moist soil. The 7 Mc/s version of the sectionalised vertical aerial is another ground plane with 33 ft. radials. On 3·5 Mc/s a low loss inductor consisting of 34 turns 6 in. long on a 2¼ in. former is connected across an insulating rod at the centre of the 33 ft. whip. On 1·8 Mc/s a large round tin is supported immediately above the loading coil as a capacitor and an additional inductor is added at the feed point to bring the aerial into resonance. A short length of 52 ohm co-axial feeder is used to connect the aerial to the transmitter. On 1·8 and 3·5 Mc/s the radials reinforce an earthing spike which is driven into the ground. On 7 Mc/s the aerial has low angle radiation and is

good for DX but is poor for local or short skip contacts where high angle radiation is required. On 1·8 and 3·5 Mc/s the results are dependent on the efficiency of the earthing.

Two inverted V dipoles are employed to cover 3·5/7 Mc/s and 14/21 Mc/s. Each has a link strap which can be opened or closed to preserve a quarter-wavelength on each band per leg of the dipole. The ends are connected to a length of terylene string for anchoring. Each length is then fastened to a small drum which is used for winding up the dipole when it is not in use. A 30 ft. length of twin 75 ohm cable is used as a feeder.

The centre is supported on a sectionalised duralumin mast which can be erected very quickly. The apex angle should be adjusted to approximately 90° but this is not critical. The ends of the dipole can be orientated at right angles to the optimum direction of radiation. This type of aerial has both horizontal and vertical polarization, and radiation along the line of the aerial appears to be greater than for a normal dipole. Operational experience has shown that inverted V dipoles are excellent for local contacts as well as for long distance communications. They are not as dependent on the sub-soil as are vertical aerials for DX working.

In the case of the 14/21 Mc/s aerial the ends are some distance above the ground and the normal formula for the length of the dipole can be used. For the 3·5 Mc/s dipole the physical length will be found to be 10 ft. less than that given by the formula for a normal half-wave dipole*. This is because the ends of the aerial come down to the ground and capacity loading is very considerable. If space permits, a similar type of dipole could be used for 1·8 Mc/s. Comparisons have been made between the performance of a ground plane aerial and an inverted V dipole on 14 Mc/s DX signals, and it would appear that the optimum aerial depends on propagation conditions. Possibly the inverted V has a slightly higher angle of radiation but a broader lobe in the vertical plane.

A two-element beam for 14, 21 and 28 Mc/s is made from sectionalised duralumin. The boom, driven element and director are built up from short lengths of tubing, the ends of which push into each other. The driven element has an overall length of 32 ft., and the director lengths are 16, 22 and 32 ft., according to the required band of 28, 21 or 14 Mc/s. The driven element is fed with a 300 ohm elliptical feeder of American origin: the impedance of this cable is unaffected by rain. A small tuning unit is used to couple the feeder to the transmitter output circuit. The idea of using this method of feed was obtained from the G4ZU systems.

The beam is supported at the centre by a mast made of a combination of wood and duralumin and breaks down into convenient lengths for transportation. This aerial takes longer to erect than those previously described and three guys have to be used to support the mast; these should be anchored by pegs driven into the ground. It is advisable to put a white rag in a prominent place around the guys so that no member of the public can stumble over them. Although the aerial takes about twelve minutes to erect, the results compensate for the effort as DX working is greatly facilitated. The aerial is only 22 ft. high, yet the performance on 14 Mc/s is not too adversely affected. It has been quite exciting to receive reports that the signal has been S8 to S9 on telephony in New Zealand and Australia using only 10 watts input.

Site

This must depend on the type of locality which has been selected for the operation. In general, wooded areas should be avoided, particularly for the h.f. bands where the absorption is high. Telephone or power lines should also be avoided. Ideally a site should be on top of a hill with the sides falling away in all directions. Sandy terrain should be avoided, and it is preferable to choose a damp soil.

Some practical experience has been obtained using the ground plane above a salt marsh area in Hampshire where the surrounding terrain was flat for at least a mile in all directions. The results obtained on 14 Mc/s were quite amazing and convinced the writer that the importance of a good location is no myth. Signal strength reports were equivalent to those obtained at the home station with a three element beam and a transmitter running at 150 watts input, allowing for comparable propagation conditions.

Sometimes the results will not conform to expectations. Whilst in Snowdonia, a remarkable contact was made with Eritrea with the aerial firing through a mountain. Possibly the signals were travelling over the long path, yet the propagation conditions existing at the time make it seem unlikely.

Public Relations

In these days, although passers-by are curious, they do not think that an operator is a spy; many think that it is something to do with broadcasting or television. Such was not the case over ten years ago when G2PL/P was in operation at the edge of the sea on the Essex coast. At a discreet distance of about a hundred yeards a member of the public was observing the operator. No particular notice was taken as the individual did not approach the station. In due course the local policeman arrived on his bicycle, complete with notebook. The observer had reported that there was " spy " activity in the area. Fortunately the policeman knew one of the local amateurs and after examining the licence went to explain the circumstances to the complainant. This is unlikely to happen nowadays but it is a wise precaution to carry the licence with you.

A more recent experience in North Wales caused some anxious moments. A RAF helicopter flew over the site at a low altitude and it seemed as if the legs of the inverted dipole must become entangled with the rotor blades. However, the pilot had satisfied his curiosity and disappeared without causing any damage.

When carrying out portable operations avoid arousing the ire of farmers. Do not leave gates open, do not trample on crops and do not leave litter around.

Operating

For those who are interested in working DX under portable conditions with low power, a successful contact will provide greater satisfaction than from the home station. The reports which are received are often surprisingly good. The raising of DX is not very difficult, and over 100 different countries have been worked from G2PL/P in a comparatively small amount of operating time. Perhaps the chosen site surpasses that of the home station. The following are a few operating hints:

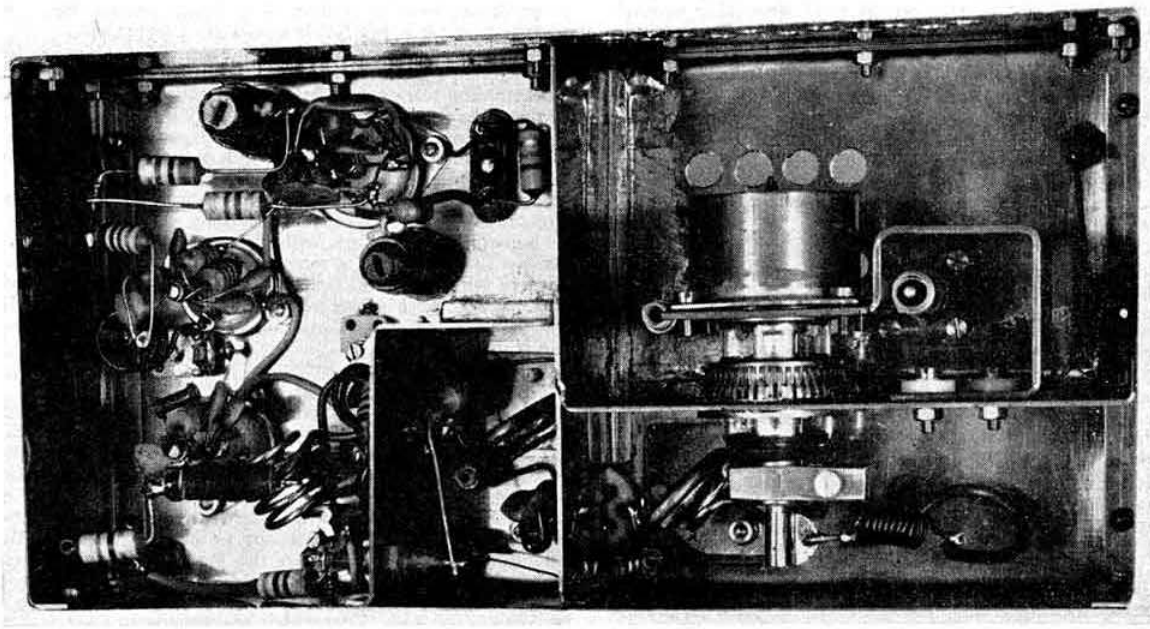
(a) Do not call CQ and expect everyone to call you, unless you are operating from some exotic location in the Pacific.
(b) A short break at the end of another station's QSO is permissible and often effective. This will require a reasonably stable v.f.o. and receiver to allow for accurate netting.
(c) Ensure that the transmitter has good crisp communication speech quality and a clean, sharp keying characteristic.
(d) Do not tackle a pile-up, but QSY 2 or 3 kc/s either side of the frequency.

DX working is not the only purpose of portable operation. Maintaining a schedule with an old friend while on holiday is both satisfying and useful.

Operation on the lower frequencies is interesting although

(Continued on page 172)

* *Amateur Radio Handbook*, page 363.



An under-chassis view of the transmitter. The components may be identified by reference to Fig. 2.

A 430 Mc/s 10 Watt Transmitter using a Grounded Grid Amplifier

By H. L. GIBSON, A.M.I.E.E., B.R.S.1224 *

IT is common practice to use double tetrode valves such as the QQV03-20A/TT20 for transmitters operating in the frequency range 200-500 Mc/s. Towards the upper frequencies, the driving power requirements for such valves rise rapidly, complete stability is not easy to achieve and the balanced anode circuit is often an inconvenience. An alternative approach is to use grounded grid triodes which are inherently more stable and which give an equally good power gain above 400 Mc/s. The pin-based A2521 is readily usable in this arrangement and a trebler amplifier unit giving 2·5 watts at 430 Mc/s was described in *Four Metres and Down* in February, 1963.

The transmitter now described uses a pair of A2521 in this manner followed by a DET24 disc seal valve to raise the output power to 10 watts when anode modulated or 15 watts on c.w. Disc seal valves are normally used with co-axial circuits, but at frequencies up to 500 Mc/s extremely simple lumped circuits may be used.

Circuit Description

The crystal controlled multiplier uses three valves to produce 750 mW at a frequency of 144 Mc/s from an 8 Mc/s crystal oscillator. Series tuning of the N78 (V3) anode allows more latitude in the construction of the coil than would be possible with parallel tuning. The anode coil of the N78 and the cathode coil of the A2521 trebler (V4) are coupled by a single turn of p.v.c.-covered wire pushed into each coil. The anode coil of the A2521 trebler and amplifier stages are identical single turn loops and each is coupled to the following cathode by an untuned loop adjacent to the anode coil. The DET24 (V6) anode circuit consists of a square loop from which the output is taken through a coupling capacitor close to the anode. All three grounded grid stages employ cathode bias; as the heater and cathode of the DET24 are common, this necessitates a separate 6·3V heater supply for this valve.

Since an appreciable part of the power output reaching the aerial is fed through from the A2521 amplifier, it is necessary to anode modulate both the DET24 and the A2521 amplifier (V5) and to bypass the cathode resistors of both stages to audio as well as radio frequencies. The anode supply to the A2521 from the modulated h.t. line should include a resistor to reduce the voltage to 160V at 18 mA. If anode modulation is not applied, then the A2521 may be fed directly from the 250V h.t. line and the DET24 anode

* 132 Pine Gardens, Eastcote, Ruislip, Middlesex.

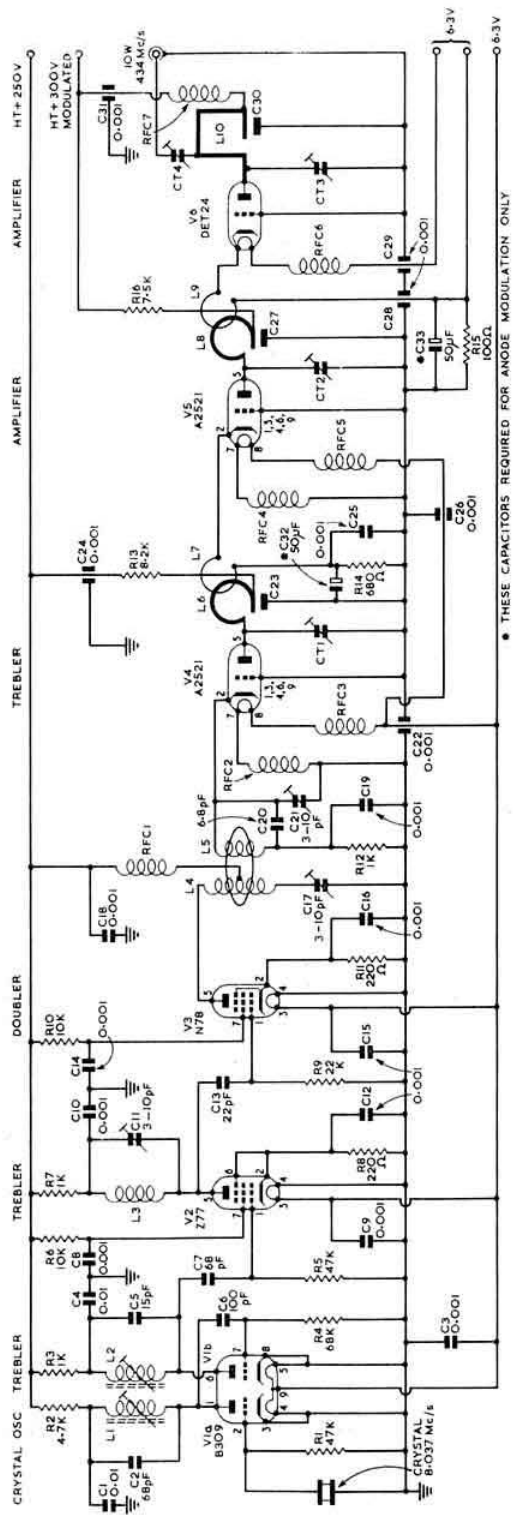
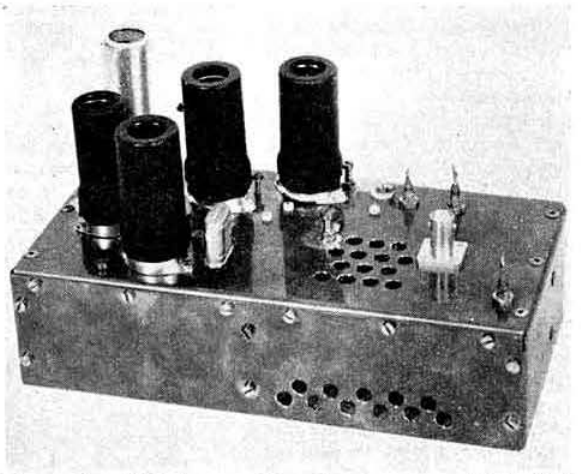


Fig. 1. Circuit diagram for the 10 watt transmitter for 430 Mc/s. An alternative valve for V1 is the 12AT7, and for V2 the EF91 or 6AM6.



The complete 420 Mc/s transmitter. Components may be identified by reference to Fig. 2.

supply may be increased to 400V. The A2521 anode current should never exceed 18 mA, nor the grid current 6 mA.

Typical performance figures for the DET24 output stage are:—

Class C Telegraphy

V_a	350	300	250	V
I_a	92	81	73	mA
I_g	38	39	40	mA
P_{load}	15·0	12·8	10·3	W

Class C Telephony anode modulated (carrier conditions)

V_a	300	250	V
I_a	77	68	mA
I_g	30	34	mA
P_{load}	10·9	8·8	W
P_{mod}	11·6	8·5	W
Z_{mod}	3·9	3·7	K ohms

(Continued on page 152)

COMPONENT INFORMATION

CT1, 2, $\frac{3}{8}$ in. length of $\frac{1}{8}$ in. bore copper tube soldered to anode loop. The tube is internally lined with $1\frac{1}{2}$ turns of 0·005 in. p.t.f.e. tape; an earthed 6BA screw is inserted for tuning.

CT3, $\frac{1}{2}$ in. length of $\frac{3}{16}$ in. bore copper tube soldered to anode mount. The tube is internally lined with $3\frac{1}{2}$ turns of 0·005 in. p.t.f.e. tape, and an earthed 4BA screw inserted.

CT4, $\frac{3}{16}$ in. length of $\frac{1}{4}$ in. bore copper tube mounted on a $\frac{3}{16} \times \frac{3}{16}$ in. copper bracket and soldered to the anode mount. The tube is internally lined with $2\frac{1}{2}$ turns of 0·005 in. p.t.f.e. tape, and a $\frac{3}{16}$ in. copper slug threaded on 8BA studding inserted. The studding is soldered directly to the centre pin of a chassis mounted BNC socket.

L1, 26 turns, 26 s.w.g. enam., $\frac{3}{8}$ in. diam. former with dust core.

L2, 15 turns, 20 s.w.g. enam., $\frac{3}{8}$ in. diam. former with dust core.

L3, 6 turns, 20 s.w.g. enam., $\frac{3}{8}$ in. diam. self supporting (close wound on $\frac{3}{8}$ in. diam. mandrel).

L4, 5 turns, 16 s.w.g. bare copper, $\frac{1}{2}$ in. diam., air-spaced to $\frac{9}{16}$ in.

L5, $2\frac{1}{2}$ turns, 20 s.w.g. enam., $\frac{3}{8}$ in. diam., air spaced to $\frac{1}{2}$ in.

L6, 8, 1 turn, 10 s.w.g., $\frac{3}{4}$ in. diam., with one end attached to a 1 in. $\times \frac{3}{4}$ in. 20 s.w.g. copper plate to form a capacity of 150 pF to earth using 0·001 in. mica dielectric.

L7, 9, 1 turn, 16 s.w.g. enam., $\frac{3}{8}$ in. diam.

L10, Square form single turn loop of 1 in. $\times 1\frac{1}{8}$ in. internal dimensions with one end integral with anode mounting and the lower horizontal surface spaced from the chassis with 0·001 in. mica. The loop is fabricated from $1\frac{1}{4}$ in. width $\times$ 16 s.w.g. copper strip.

RFC1, 2, 3, 26 s.w.g. enam. wound to cover a 100K ohm Erie type 8 resistor.

RFC4, 5, 11 turns, 26 s.w.g. enam., $\frac{3}{16}$ in. diam., self supporting.

RFC6, 7, $8\frac{1}{2}$ turns, 20 s.w.g. enam., $\frac{3}{16}$ in. diam., air spaced to $\frac{1}{4}$ in.

Construction

The crystal controlled multiplier is conventional and simple to construct, following established principles.

Copper screens are soldered in the positions shown in Fig. 2, and pins 1, 3, 4, 6 and 9 of the two A2521 valveholders should be soldered directly to the appropriate screen. The anode circuits of the A2521 tripler and amplifier are identical. A length of 10 s.w.g. ($\frac{1}{8}$ in. diameter) copper wire is bent around a $\frac{3}{4}$ in. mandrel; one end is straightened over a length of approximately $\frac{1}{4}$ in., and this is soldered to the top surface of a small copper plate measuring $\frac{3}{4}$ in. × 1 in.; the other end of the loop is cranked to allow connection to the anode pin of the valve base and at the same time allow a small copper tube (CT1 and CT2) to be soft soldered to the loop as near as possible to the anode but projecting over the chassis, clear of the valveholder. A hole is then drilled and tapped 6BA through the top of the chassis in line with the axis of the copper tube; a 6BA brass nut is soldered on to the top surface of the chassis, over the tapped hole, to give increased stability to the 6BA screw which forms the tuning control.

The copper plate which forms the bypass capacity to earth (C23 and C27) should be " tailored " to provide clearance

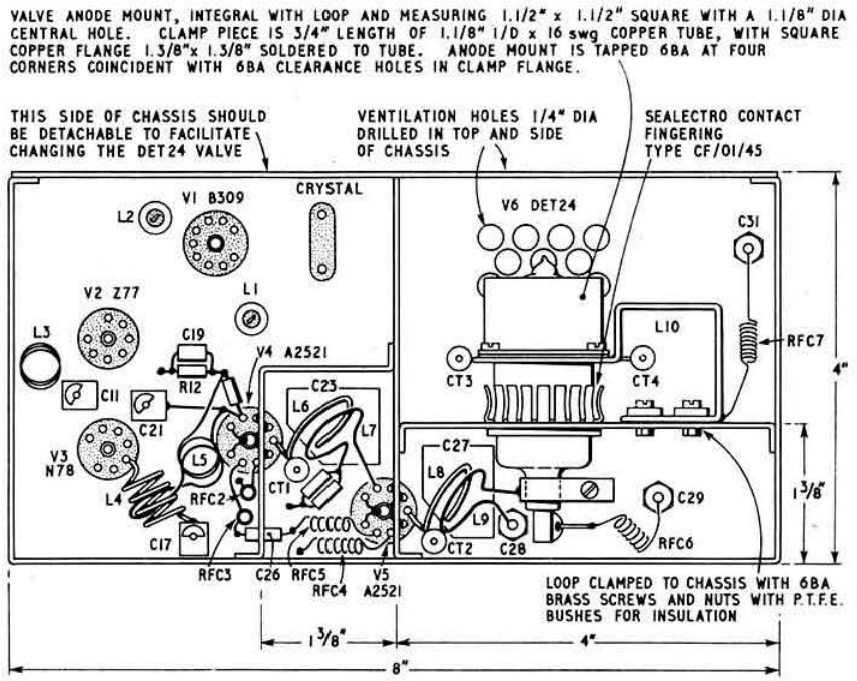


Fig. 2. Layout of the underside of the complete transmitter, showing the positions for coils, associated capacitors and resistors.

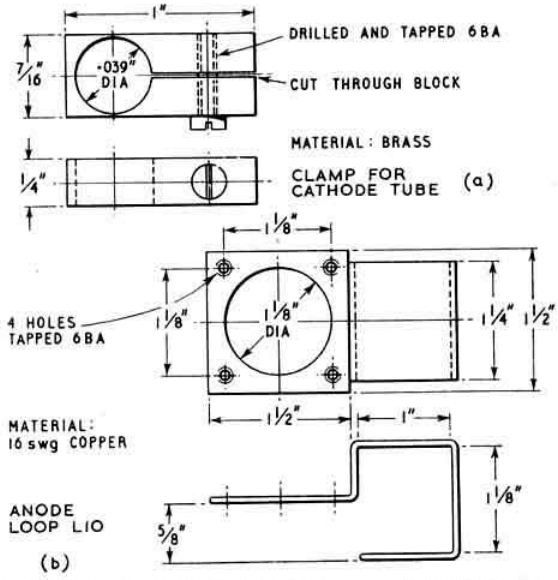


Fig. 3. (a) Cooling clamp for the cathode of V6. (b) Method of bending metal to form L10, the anode loop for V6.

of the valveholder and tuning control. The plate is insulated by a thin mica sheet and fixed to the chassis by two 6BA nylon screws. It is necessary to countersink the 6BA clearance holes on the underside of the chassis to prevent voltage flashover around the edges of the screw holes. In the case of the A2521 amplifier, one nylon screw is replaced by a brass screw and p.t.f.e. bush in the chassis to provide an external connection for the anode supply to that stage.

The DET24 anode circuit is made from a strip of 16 s.w.g. copper (Fig. 3). The anode mount is $1\frac{1}{2}$ in. wide and the strip is trimmed over the length of the loop to $1\frac{1}{4}$ in. wide. The anode flange of the valve seats onto the anode mount and the anode clamp, which acts as an additional heat sink, is fixed to the mount by 6BA screws at each corner. It is essential to keep the temperature of the valve anode seal below 140°C and it is necessary to provide good heat conduction to the chassis; the integral mount and loop of copper together with the use of thin mica for insulation, meet this requirement. Nylon screws are not suitable for clamping the loop to the chassis screens due to the temperature of the chassis, so that it is necessary to use p.t.f.e. bushed holes and 6BA brass screws and nuts. The grid contact is formed by soldering contact fingering directly to the chassis screen and arranged to give firm contact with the grid ring of the valve.

A clamp on the cathode tube of the valve assists in keeping it cool and provides a convenient anchorage for the coupling loop.

It is essential to provide a well-fitting base plate to the chassis in order to prevent direct radiation from the output circuit. One side of the chassis should be made removable so that the anode clamp of the DET24 can be unscrewed if the valve has to be changed.

A Simple Direct-Reading Capacitance Meter

BY T. H. HOLBERT, GM3DXJ *

THE usual methods employed to measure small values of capacitance involve the use of bridge circuits, or substitution in resonant circuits. Examples of these are the Wien Bridge and the *Q* meter. While the accuracy of either method is not in question, both tend to be time consuming in that balance or resonance points must be found by manipulation of controls.

Another method is the direct-reading capacitance meter. This article describes a simple, inexpensive, example having good accuracy and suitable for construction by the amateur. Applications of the device and suggested adaptations are discussed.

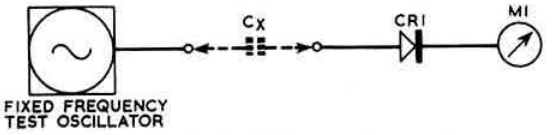


Fig. 1. Basic system of the simple direct-reading capacitance meter.

Basic System

The direct-reading capacitance meter may employ one of two methods:

(a) that which measures the phase difference between a known value standard capacitor and the unknown at a fixed frequency; or

(b) that which is capable of measuring the reactance of the unknown capacitor at a fixed frequency.

For various reasons, the phase-measuring method involves circuitry and non-standard components unlikely to be usable by, or available to, the amateur. The reactance measuring method has therefore been chosen.

The basic system is shown in Fig. 1, where the output of a fixed frequency oscillator is applied to the unknown capacitor C_x. The diode CR1 rectifies the energy after this has passed through C_x, and the meter deflection therefore is proportional to the reactance of the unknown capacitor. By suitable choice of test signal frequency, amplitude, and meter f.s.d., the value of capacitance is directly read off the meter scale.

Practical Considerations

The original design envisaged an *LC* oscillator with a fixed frequency of 20 kc/s. Calculations, however, showed that although this choice of frequency was suitable for high capacitances (0·1 μF upward), it would be necessary to provide an unacceptable amount of d.c. amplification if values down to 10 pF were to be measured.

It is suggested therefore that the higher values are relatively unimportant and that for amateur purposes the range 10 pF-1000 pF is of primary interest. Accordingly a fixed frequency of 2 Mc/s was chosen as being most suitable on the grounds that:

(a) circuit sensitivity is such that the range of primary interest is easily measurable using a simple circuit;

(b) many members possess Top Band crystals which are near enough in frequency to be usable in the practical circuit.

Use of crystal control ensures good frequency stability but amplitude stability of the test oscillator is equally important. A stage of isolation between the oscillator and the relatively low impedance meter circuit is necessary if amplitude variation, and hence inaccurate measurement, is to be avoided. A single amplifier stage is sufficient to perform this function.

Practical System

The practical circuit of the direct-reading capacitance meter is shown in Fig. 2. An OC44 is used in a simple oscillator circuit to provide a frequency-stable test signal. All the crystals tried in this circuit oscillated readily, provided that the oscillator load had sufficient inductance.

Output from the oscillator is amplified by a second OC44 to a level sufficient for satisfactory operation of the meter circuit. More output could be obtained by placing a suitable tuned circuit in the collector of TR2, but in the interests of simplicity this is not thought worthwhile.

From the amplifier collector the test signal is capacity coupled by C2 to the C_x terminals. After passing through the unknown value of capacity, the signal is rectified by the combination CR1, CR2 and decoupled by C3. A d.c. component proportional to the reactance of the unknown is passed to the 1mA moving coil meter.

The diode CR3 in series with the meter helps to improve the linearity of the readings. Nevertheless the scale is non-linear and only at the cost of added circuitry could this be overcome. As a result it is necessary to rescale the meter as described later, or to prepare a graph of meter reading *v.* capacity.

To cope with variations in transistor and diode parameters, and to permit the use of any convenient 1mA meter, two variable meter shunts VR1, VR2 are provided.

Construction

The prototype is built in a conveniently sized box with adequate front panel area to accommodate the 2½ in. dia-

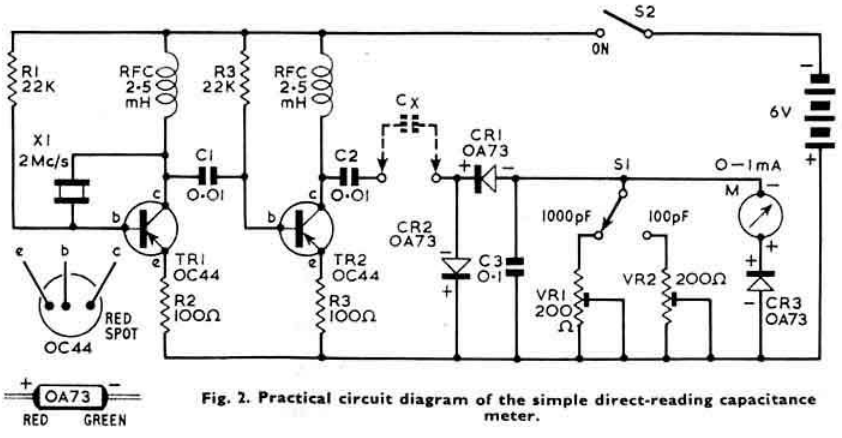


Fig. 2. Practical circuit diagram of the simple direct-reading capacitance meter.

*19 Thomson Drive, Currie, Midlothian.

meter meter and the controls. The circuit components, other than front panel items, are mounted on a small tagboard, and are interconnected by short direct wiring. It is advisable to mount the component board as near as possible to the C_x terminals to avoid excess stray capacity, the symptom of which is a small permanent meter deflection. Low values of capacity tend to be masked by this. A recommended arrangement of components is shown in Fig. 3.

To rescale the meter, it should be removed from its case and the scale from its mounting. Using a compass and sharp coloured pencils, two arcs are then drawn above the existing scale calibration. The scale should be secured to a flat surface by drawing pins or tacks to facilitate drawing the arcs. Red and green are both easily distinguished and contrast well with the usual black of the existing scale. The additions to the meter scale are shown in Fig. 4.

It will generally be necessary to lengthen the meter needle so that it covers the new scales. A piece of thin stiff wire should be cut to the required length and secured to the needle with a tiny dab of glue. The extension should then be blackened so that it contrasts with the white background.

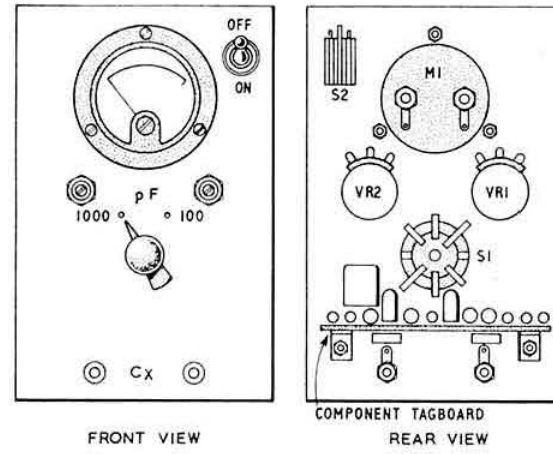


Fig. 3. Suggested layout of components and mounting position of component tagboard.

Calibration and Adjustment

For calibration purposes it is necessary to provide a minimum of seven known accurate values of capacity. Obviously if more capacitors of known value are to hand the more accurate final calibration will be. It is suggested that the following values be used: 10, 20, 50, 100, 200, 500 and 1000 pF.

Other combinations will, of course, suggest themselves to the constructor, but using the values listed the only points which have to be interpolated are 400 pF and 900 pF and 40 pF and 90 pF on the appropriate ranges. If intermediate points are required these can be added by using the smaller values listed in combination with the larger.

Proceed as follows:

(a) Connect a 6 volt battery to the unit, observing correct polarity, switch on and check that the oscillator is functioning by listening on the station receiver (b.f.o. on) at 2 Mc/s.

(b) Set the range selector to 1000 pF and connect the 1000 pF standard across the C_x terminals. Adjust VR1 for full scale deflection. Now continue with the remaining values, and when calibration points for these have been marked, interpolate for 400 pF and 900 pF (red scale).

(c) Set the range selector to 100 pF and connect the 100 pF capacitor across the C_x terminals. Adjust VR2 for full scale deflection. Continue with the remaining values, and when calibration points for these have been marked, interpolate for 40 pF and 90 pF (green scale).

The resultant calibration of the prototype is shown in Fig. 4. On the higher range, values down to 50 pF can be read off, and down to 5 pF on the lower range, with good accuracy.

Applications

The capacitance meter is extremely useful when used:

(a) to determine the values of capacitors which, for various reasons, have no recorded values, or have lost the manufacturers' printed values; or

(b) to pair capacitors for use in crystal filters, as for a capacity centre tap.

It cannot be used to measure the capacitance of electrolytics.

If it is is desired to extend the measurement range so that higher capacitances can be measured, it becomes necessary to change the test oscillator frequency. The simplest solution is to switch crystal frequencies in conjunction with the existing range switch which alters the meter shunts. Thus a 200 kc/s oscillator would provide for a range of 0·001 μF-0·1 μF, and 20 kc/s from 0·1 μF-10 μF, and would permit retention of the simple features of the circuit. However, the scale would be extremely cramped if C2 (Fig. 2) were very much smaller than the capacitor under test.

Alternatively, using the principles of the basic circuit it is quite feasible to start with a 20 kc/s oscillator (or even 50 c/s a.c. mains) frequency, and by inclusion of d.c. amplifiers having the requisite gain and stability, cover whatever range is required.

Measurement of resistance is also possible, and, using two additional meter arcs and the calibration principles described, two ranges of resistance could be added. The circuit could also be adapted for measurement of inductance, although this has not been attempted. Assuming that the primary range of interest to the amateur is 1 μH-100 μH, a test frequency of 2 kc/s would be suitable.

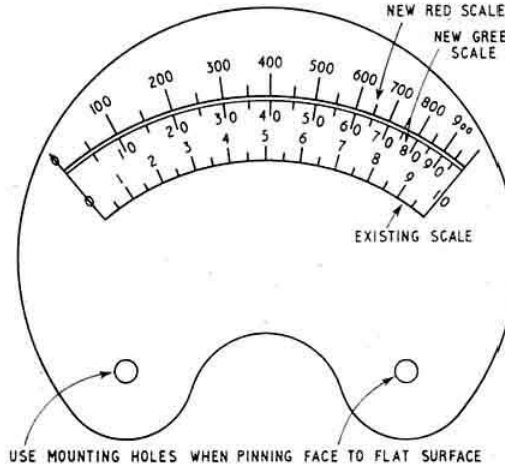


Fig. 4. Additional scales on meter face. The 1000 pF range calibration is in red, and the 100 pF range in green.

Hand Soldering of Printed Circuits

By DENNIS N. LICENCE*

THIS article is aimed at helping the amateur to appreciate the soldering aspects of printed circuits, especially now that home construction kits are including them more than in the past. For the keener type of amateur who prefers to design his own equipment, the problems are not far removed from those encountered by any design engineer in an industrial laboratory.

From the very beginning it is wise to accept, without qualification, that as far as soldering is concerned, cleanliness is of utmost importance. Any attempt to take short cuts in this respect will probably lead to disaster by unnecessary damage to printed circuit panels and components alike, and regarding the latter, this is especially important from the amateur point of view owing to the prominent use of second-hand and surplus equipment.

Whether supplied with a kit, or made up from "Veroboard," or something similar, it is important to ensure that the copper conductors are free from grease or oxide. Generally speaking they would have been either roller tinned with a solder coating or protected with lacquer, in order to retain a high degree of cleanliness. Should this not be the case, either one of several trade liquid de-oxidants should be wiped over the copper, followed by a water wash and drying, or a domestic pummice powder, applied effectively and washed off after use, will bring the copper to a bright finish. Prior to inserting components, all component terminations should be inspected, and any trace of dirt, grease, oxide, etc., removed with a fine abrasive paper, followed by tinning with an approved rosin cored solder. For those with a small solder pot available, a simpler and quicker way to achieve the final tinning required would be to apply any approved liquid rosin flux to the component termination, followed by a quick dip into molten solder, which should preferably be 60/40 tin/lead alloy.

Having achieved complete cleanliness of both laminate and components, consideration should be given as to whether components might be liable to failure during service, thus needing replacement. If such is the case, it would be wise to leave the component termination straight, without any bending, in order to facilitate easy removal, or at least do not bend the component lead more than 30 degrees. Such a technique is now general practice for defence equipment, and is widely taught in Service training schools.

Most radio amateurs have several soldering irons: owing to the risk of damage to components by heat it is naturally wise to be most selective and only use the minimum heat necessary to flow the solder. This is especially true of transistors and the like, although in many instances a heat-shunt can be employed to conduct any excessive heat away from the actual component. A heat-shunt can take the form of a small crocodile clip attached to the component lead on the reverse side of the printed circuit board which is being soldered. The manufactured *X-acto* heat shunt would be even better. Naturally considerable care must be taken not to overheat the actual copper conductor, otherwise blistering will take place, which could lead to failure at a later date. If for any reason a component termination appears difficult to solder, an application of a liquid rosin flux around the area to be soldered will assist the solder to flow properly. Never apply a rosin cored solder to the tip of a soldering iron, and then transfer the iron to the job. By the time the iron is applied to the board, a large percentage of the flux in the solder, if not all, would have carbonised on the iron tip, and the resulting joint would almost certainly be a dry one. It should be remembered at all times that a large mass of solder around a joint does not necessarily make it a better joint than one in which the solder smooths itself out to what is known as a low angled joint, where the solder more or less follows a parallel line to the board.

Where a component termination must be bent flat to the board, bend it in line with the copper conductor and not at angles to it, in order to obtain maximum surface contact between the lead and conductor for the solder to adhere to. After assembly, a light brushing of a clear lacquer, non-tracking varnish or epoxy rosin will preserve the soldered joints and circuit from any subsequent oxidization or attack by salt where a unit might be operated at sea or in coastal districts.

When doing the actual soldering, care should be taken to ensure that the solder does not flow on to an adjacent copper strip, thus bridging two conductors. After soldering, the protruding component leads should be cut off.

One final word in respect of the right solder to use: generally speaking, a 60/40 (tin/lead) will give all that is required for an amateur to achieve good soldering, but choice of gauge is most important. 18 gauge should cater for most needs, although 20 s.w.g. and 22 s.w.g. might be preferred if close mounting of components is required. It should be remembered that the thicker the gauge of the solder, the more heat is required from the soldering iron tip in order to melt the solder before doing anything else. It is correct practice to apply the solder and iron to the job together, thus ensuring just sufficient heat to solder the component and no more.

It is appreciated by the writer that many amateur radio enthusiasts work in the trade. Their training, as far as soldering is concerned, can greatly assist their less fortunate amateur colleagues, some of whom find soldering difficult to say the least. It is hoped that this article has given some guidance as to what to do and what not to do.

* Enthoven Solders Ltd., Upper Ordnance Wharf, Rotherhithe Street, London, S.E.16.

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HIGH STABILITY VARIABLE FREQUENCY OSCILLATORS

Part 2—Assessment of the Vackar Oscillator with Circuits and Values for 1·8-39Mc/s

BY PAUL HARRIS, G3GFN *

HAVING used the Vackar oscillator on a wide range of fundamental frequencies over a number of years, the writer recently undertook quantitative assessment of its performance in order to obtain verification of certain features which had become apparent. Elementary initial tests indicated that a comprehensive study of this oscillator would be well worthwhile, particularly if at the same time optimum values were determined for the amateur frequency allocations and other frequencies used in amateur equipment.

Three oscillators were constructed with basic frequencies of 500 kc/s, 1·25 Mc/s and 5 Mc/s and each in turn tuned to beat with the MSF transmission on 5 Mc/s. After a stabilizing period of one hour, the beat was adjusted to precisely 1 kc/s and displayed on a direct reading frequency meter. The oscillator under test was then switched off for half an hour. Upon switching ON —both h.t. and l.t. at the same instant—the initial stabilizing time to return to the 1 kc/s stated that they were made mechanically very rigid with only first class components. Furthermore, particular attention was paid to the disposition of components and the temperature gradients likely to be encountered by them, especially those directly involved in the frequency determining circuit. Details of this layout are given later.

Reasons for Stability of the Vackar

Why is the Vackar oscillator so stable? Primarily for three reasons:

(a) The valve capacities—as in the Clapp oscillator—are effectively swamped by fixed capacitors forming part of the tuned circuit, but—unlike the Clapp—also with regard to any changes in *interelectrode* capacities. Due to their arrangement, these capacitors remain sizeable even at high frequencies so maintaining the stability factor.

(b) The valve operates virtually in class A so holding

TABLE I.

Frequency of oscillator under test	MSF Frequency	Harmonic of oscillator	Initial stabilizing period	Actual initial frequency shift	Initial shift in fundamental frequency	Initial shift as %	Further drift over 3 hr period	Long term stability as %
500 kc/s	5 Mc/s	X 10	10 secs	250 c/s	25 c/s	0·005%	5 c/s	0·001%
1·25 Mc/s	5 Mc/s	X 4	10 secs	400 c/s	100 c/s	0·008 %	10 c/s	0·0008%
5 Mc/s	5 Mc/s	X 1	15 secs	400 c/s	400 c/s	0·008%	25 c/s	0·0005%

NOTES:— (a) Valve type EF91. (b) All power, h.t. and l.t., applied at same instant. (c) H.t. 105V stabilized by VR 105/30.

beat, initial drift, and long-term stability over a three hour period were noted. The results are shown in Table 1.

This table shows the quite remarkable performance of the oscillators tested in respect of the parameters measured. The figures given are the average of three runs on each oscillator, all of which agreed very closely. From the results obtained, upon which no information was given in the original report, it seems likely the tolerances quoted for (a) voltage variation *v* frequency change (10 per cent variation in h.t. producing a change in frequency of 0·0005 per cent) and (b) frequency change *v* temperature (20°C change in temperature producing a frequency shift of 0·0014 per cent) quoted in Ref. [2] would be easily substantiated.

Precise measurements of the relative levels of low order harmonics of the three test oscillators showed that the second harmonic was 32db down and the third harmonic 45db down on the fundamental.

Concerning the test oscillators themselves, it must be harmonic circulating currents and phasing effects to a minimum.

(c) The cathode of the valve is held at earth potential and is in no way associated with the tuned circuit or feedback path.

In the original review of the Vackar oscillator in the BULLETIN, and as will be seen from Fig. 6 (see Part 1), mention was made of the fact that the circuit required the use of a two gang tuning capacitor, and this may well have hindered its adoption. However, it was indicated that a single tuning capacitor could be employed. (See also Ref. [3.])

Realization of the ultimate stability of which the Vackar circuit is capable will be given when a twin gang tuning capacitor is used, for then the oscillator operates under balanced conditions. Nevertheless, with the exception of oscillators constructed with basic frequencies *higher* than 15 Mc/s, and over the limited deviation required for the amateur bands, a single tuning capacitor has been found entirely satisfactory. The oscillators evaluated in Table 1 employed single tuning capacitors.

With regard to the circuits which are to follow and the

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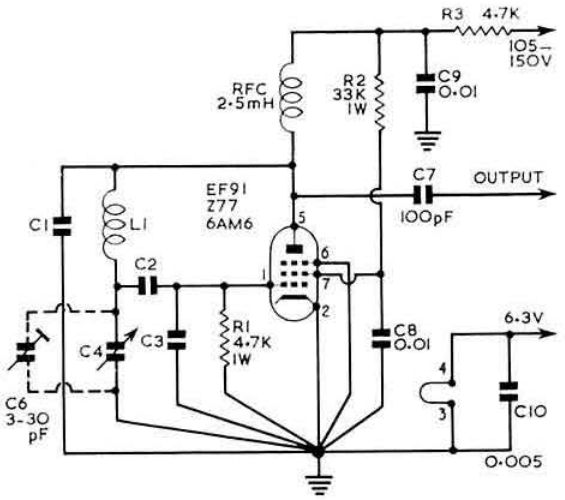


Fig. 7. Vackar oscillator for the frequency range 1·5-15 Mc/s. For the values of C1, C2, C3, C4 and L1 see Tables 2 and 3. Trimmer C6 is optional. C7 is a d.c. blocking capacitor. R3 is mounted outside the v.f.o. box.

values given in their associated tables, it should be stressed that these are those used in practical oscillators constructed to verify calculated parameters, and where corrections were necessary, the corrected value is quoted in the table concerned.

Oscillators for 1·5-15 Mc/s

Where the frequency is below 15 Mc/s, a single pentode type EF91, Z77 or 6AM6 will give excellent results. These types may be replaced by any similar valve with a G_m of the order of 7·5 mA/V. The circuit is shown in Fig. 7 while Table 2 specifies values for fundamental frequencies of 1·8 Mc/s, 3·5 Mc/s, 7 Mc/s, 8 Mc/s, 9 Mc/s, 10 Mc/s, 11 Mc/s and

TABLE 2

For use with circuit of Fig. 7. For amateur bands 1·8-14 Mc/s

RANGE	L_1 S.W.G. Enam:	L_1 Turns close wound	C_1 pF	C_2 pF	C_3 pF	C_4 pF
AMATEUR BANDS						
1·8-2·0 Mc/s	34	70	556	4700	556	15-250
3·5-3·8 Mc/s	28	45	500	2700	300	10-100
7·0-7·1 Mc/s	26	30	200	1800	200	10-25
14·0-14·35 Mc/s	24	15	100	1000	100	10-35
SPECIAL FREQUENCIES						
8 Mc/s	26	25	200	1800	200	*
9 Mc/s	26	20	200	1800	200	*
10 Mc/s	24	25	140	1800	140	*
11 Mc/s	24	20	140	1000	140	*

*All coils wound on $\frac{3}{16}$ in. diameter formers fitted with $\frac{1}{2}$ in. long iron dust cores. Winding sense: from foot of former towards top. *Depending on frequency swing required. See text.*

TABLE 3

For use with circuit of Fig. 7 for general coverage 1·5-15 Mc/s.

RANGE (By adjustment of core)	L_1 S.W.G. Enam:	L_1 Turns close wound	C_1 pF	C_2 pF	C_3 pF	C_4 pF
1·5-2·5 Mc/s	34	70	556	4700	556	*
2·3-3·3 Mc/s	34	45	556	4700	556	*
3·2-4·5 Mc/s	28	45	500	2700	400	*
4·3-6·3 Mc/s	28	35	300	2700	300	*
6·1-8·8 Mc/s	26	30	200	1800	200	*
7·8-11·0 Mc/s	26	20	200	1800	200	*
10·5-15·0 Mc/s	24	20	100	1000	100	*

*Formers as for Table 2. *See text.*

14 Mc/s; those for 8 Mc/s to 11 Mc/s being included for their utility in v.h.f. equipment.

Table 3 details the values of components for use with the circuit of Fig. 7 for any frequency in the range 1·5 Mc/s to 15 Mc/s. The values given are those which will give substantially level output over the frequency bands indicated.

Common Considerations

Notes which apply to all tables are now in order. The values given for amateur and special frequencies are those which produce virtually the same output on each frequency within a similar valve group. That is, the output of an oscillator on, say 7 Mc/s, will be of the same order as that from any other in that group—the 1·8 Mc/s oscillator for example.

It will be noted that only in the case of the amateur bands is a value quoted for a tuning capacitor. For other frequency ranges the value will have to be experimentally determined according to the frequency shift required.

All the coils are iron cored, and with stray capacities of about 10 pF, adjusting the core will bring the oscillator on to

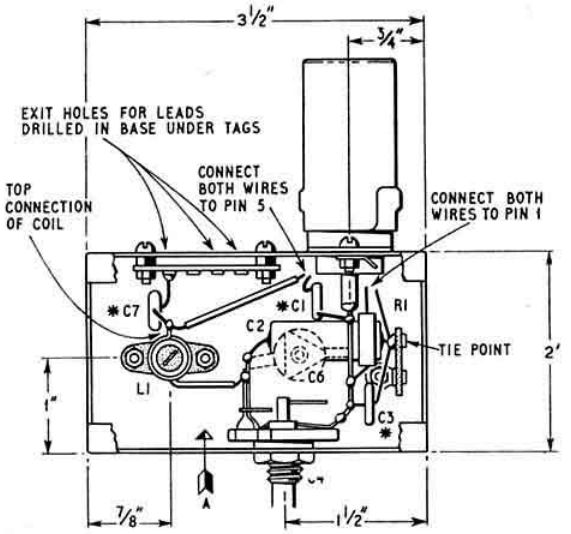


Fig. 8. General component layout of 9 Mc/s, 11 Mc/s and 14 Mc/s oscillators. Main dimensions to be adjusted to allow correct fitting of C4 in 1·8 Mc/s, 3·5 Mc/s and 7 Mc/s oscillators. *vertically mounted.

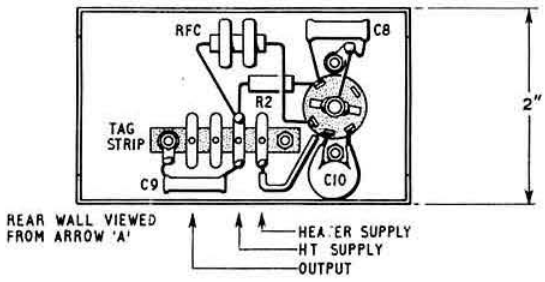


Fig. 9. Rear wall.

the special frequency with the core of the coil concerned set at about mid travel. Adding capacity at C4 will *lower* the frequency by an amount depending on the maximum value of the added capacity. In the case of general coverage coils, the frequency range shown is that over which an oscillator would tune by running the core of the coil from one end of its travel to the other, again assuming circuit stray capacities of the order of 10 pF. For any tuning range the coil is selected which will, by adjustment of its core, tune to the *highest* frequency required. The value of C4 is then determined experimentally to tune the circuit to the *lower* required frequency.

Two types of $\frac{5}{16}$ in. diameter formers are available. One is a straightforward type—see Fig. 8—and the other, usually supplied with a screening can and normally used in the construction of i.f. transformers, has a square base fitted with eyelets for wire termination and is threaded for 6BA fixing bolts—see Fig. 12. Of the two types the latter makes coil construction easier, and it has the added advantage that it is available on the surplus market. The length of former required is 1 in. and any excess can be trimmed down with a fine saw.

It has already been stressed that construction and layout

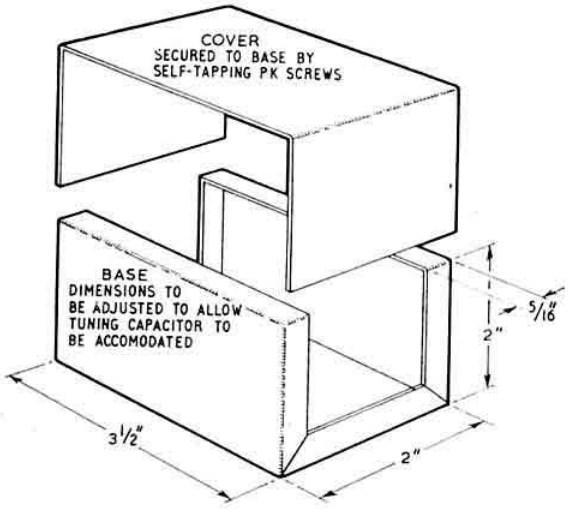


Fig. 10. General construction of oscillator chassis/box assembly. To be secured to the main chassis by PK screws. Clearance hole to be cut in chassis to allow passage of leads from oscillator. Ventilation holes ¼ in. diameter to be drilled in main chassis directly under oscillator valve position. Material: 16 s.w.g. or 18 s.w.g. aluminium.

TABLE 4

For use with circuit of Fig. 11. For amateur bands 14-28 Mc/s

AMATEUR BANDS	L_1 S.W.G. Enam:	L_1 Turns close wound	C_1 pF	C_2 pF	C_3 pF	C_4 pF
14·0-14·35 Mc/s	22	20	100	1000	100	20 + 20
21·0-21·45 Mc/s	20	15	68	1000	68	15 + 15
28·0-29·7 Mc/s	20	10	68	1000	68	20 + 20

Formers, cores and windings as Table 2.

hold almost equal importance with the actual circuit used. For this reason precise layout and construction details are provided for both of the circuits given. While these are not the only arrangements which would prove satisfactory, they are those used in oscillators built to check performance and values. In these layouts, account has been taken of the temperature gradients likely to be encountered by components, especially those associated with the tuned circuit.

Figs. 8 and 9 show the layout of the series of oscillators derived from the circuit of Fig. 7, while Fig. 10 shows the general construction of the chassis/box assembly. This is the form of construction used for the oscillators evaluated in Table 1.

Oscillators for 14-39 Mc/s

Above 15 Mc/s a really effective buffer should always be used after the v.f.o. to ensure adequate isolation and freedom from pulling. A cathode follower offers almost complete isolation but at the cost of a slight reduction in total available voltage. Where the Vackar oscillator circuit is employed this is usually unimportant due to its high output. A useful arrangement utilizes the 6U8/ECF82 in which the pentode functions as the oscillator, and the triode as cathode follower. This particular valve also has the additional advantage that substantially the same layout can be used as for the lower frequency oscillators.

Fig. 11 shows the circuit of a Vackar oscillator, employing a 6U8/ECF82, for the frequencies of 14 Mc/s, 21 Mc/s, and 28-29·7 Mc/s and Table 4 details component values. Table 5 provides details of oscillator constants for any frequency in the range 15 Mc/s to 39 Mc/s. The notes previously given on the selection of a tuning capacitor apply to Table 5. Layout and construction of oscillators in this series is shown in Figs. 12 and 13.

It will be observed that Table 2 and Table 4 both specify values for the 14 Mc/s range using the circuits of Figs. 7 and 11 respectively. The circuit of Fig. 11 has the superior performance due to the isolation given by the cathode follower, and this should be employed where stability

TABLE 5

For use with circuit of Fig. 11

Range (By adjustment of core)	L_1 S.W.G. Enam:	L_1 Turns close wound	C_1 pF	C_2 pF	C_3 pF	C_4 pF
GENERAL COVERAGE						
13·5-19·5 Mc/s	22	15	100	1000	100	*
18·75-25·5 Mc/s	20	15	68	1000	68	*
25·0-33 Mc/s	20	10	68	1000	68	*
30·0-39 Mc/s	20	7	68	1000	68	*

*Formers, cores and windings as Table 2. *See text.*

requirements are critical, such as in s.s.b. applications for example.

Keying the Vackar

As with all variable frequency oscillators, care must be taken if the Vackar is to be keyed directly, especially if keying is associated with the cathode circuit. Above 15 Mc/s cathode keying should not be attempted. This is perhaps the weak point of the Vackar oscillator.

Experiments have indicated that, up to 15 Mc/s, cathode keying is satisfactory *provided* (a) the cathode is held absolutely at earth potential with respect to r.f. by the use of high quality by-pass capacitors connected directly between the cathode pin and the common oscillator earthing point; (b) the heater is bypassed to r.f., and (c) the keying earth return is connected to the oscillator earth point *and not* to some other point on the chassis. This entails the use of a fully insulated jack socket.

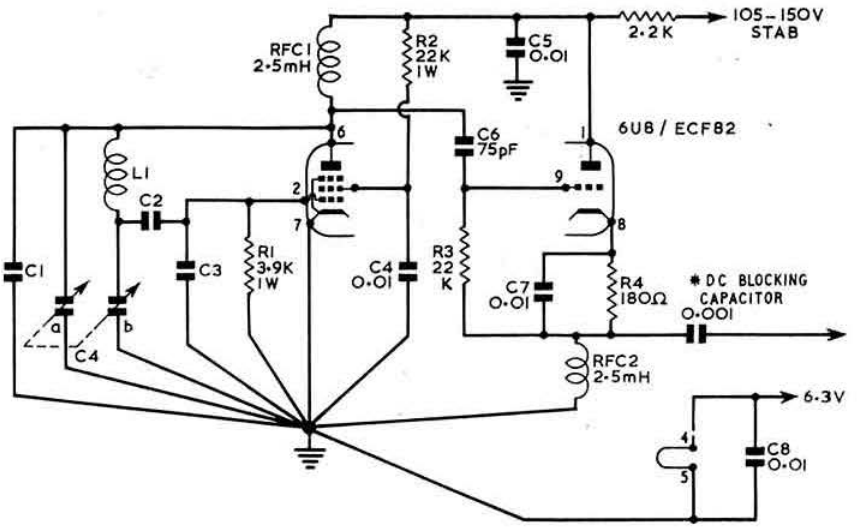


Fig. 11. Vackar oscillator and cathode follower for frequency range 13·5-39 Mc/s. For values of C1, C2, C3, C4 and L1 see Tables 4 and 5.

The foregoing comments apply mainly to c.w. operation where full break-in facilities are required with the ability to listen through under key up conditions without resorting to f.s.k. For standard c.w. operation, keying of either a buffer/doubler or the p.a. is to be preferred. For a.m. and s.s.b. with vox or fast BK, direct keying of the actual h.t. line to the oscillator is entirely satisfactory.

Power Output

When designing transmitters it is always useful to know, at least approximately, the power output to be expected from any master oscillator likely to be employed. There appears to be practically nothing on this point contained in any of the standard reference works, and it seems that one either has to make a calculated guess based on previous experience, or live in hope, neither of which seem to be very scientific in this day and age.

In order to further check the performance of the oscillator designs detailed, and to evaluate power output, a simple two stage driver unit was constructed according to the circuit of Fig. 14. This consists of an EF91/Z77/6AM6 functioning as either a driver or doubler, coupled to a 5763. Table 6 ex-

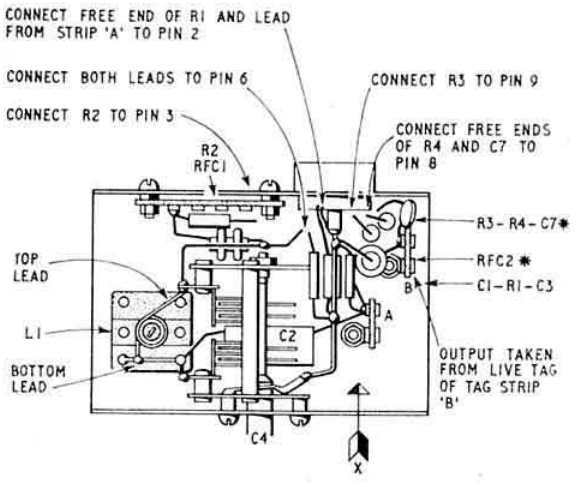


Fig. 12. Component layout of 13·5-39 Mc/s oscillators. *R3, R4 and C7 mounted vertically as is RFC2.

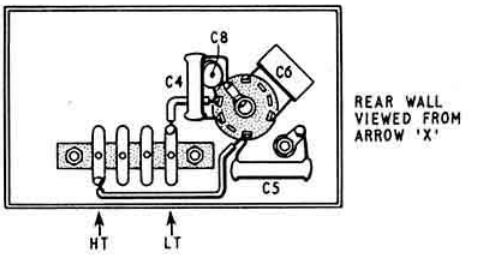


Fig. 13. Rear wall.

presses the results of a series of experiments in which the power output of the oscillator—driver/doubler system is shown as grid current to the 5763 through a 22K ohms grid resistor. To make this as comprehensive as possible, the values of C101 and C102 were determined, which produced the usual values of grid current required. As a matter of interest, the details of L_B and the approximate value of C_B are also included.

As would be expected, the smallest difference between the " net " and " loaded " frequencies of the master oscillator coincided with the lowest value of capacity at position C101 particularly in the circuit of Fig. 7. In the case of Fig. 11, and due to the cathode follower, the value of C101 has but little effect on this variation which was, with this circuit, only of a very minor nature.

In conclusion, it should be stated that it has not been the

purpose of this article to write off the Hartley, Colpitts, Franklin and Clapp oscillators, all of which have their applications. Rather it has been to examine closely the whole question of v.f.o. design, to bring the performance of the Vackar/Tesla to the notice of readers, and through the detailed information provided, encourage others to experiment with, and use this circuit which, under present conditions, has much to offer.

TABLE 6

Expressing available grid drive in relation to frequency, oscillator circuit, driver function and values of C101 and C102 of Fig. 14.

F_{in} (Osc: o/p F)o	F_{out}	C101 pF	C102 pF	Grid Drive mA	Details of L_B and C_B (Strays 15 pF)
Oscillator of Fig. 7 and Table 2.					
1·9	1·9	5	50	3	L_B 90 turns 34 s.w.g. enam: close wound ½ in. dia. C_B 150 pF
1·9	1·9	5	25	2·5	
1·9	1·9	5	10	2	
1·85	3·7	10	100	3	L_B 75 turns 34 s.w.g. enam: close wound ½ in. dia. C_B 70 pF
1·85	3·7	5	25	2·3	
1·85	3·7	5	10	1·9	
3·7	3·7	10	100	4	
3·7	3·7	5	25	3	
3·7	3·7	5	10	2·1	
3·525	7·05	25	200	3	L_B 45 turns 28 s.w.g. enam: close wound ½ in. dia. C_B 30 pF
3·525	7·05	25	50	2	
3·525	7·05	5	50	1·5	
7·05	7·05	10	75	4	
7·05	7·05	5	25	3	
7·05	7·05	5	10	2	
7·1	14·2	50	100	3	L_B 17 turns 22 s.w.g. enam: close wound ½ in. dia. C_B 15 pF
7·1	14·2	25	100	2	
7·1	14·2	10	50	1·5	
14·2	14·2	5	100	3	
14·2	14·2	5	30	2	
14·2	14·2	5	10	1·5	
14·5	29	25	100	2·2	L_B 7 turns 18 s.w.g. enam: close wound ½ in. dia. C_B 15 pF
14·5	29	25	30	1·5	
14·5	29	10	30	1	
Oscillator of Fig. 11 & Table 4.					
14	14	200	62	3	L_B 17 turns 22 s.w.g. enam: close wound ½ in. dia. C_B 15 pF
14	14	100	15	2	
14	14	5	10	1	
21·1	21·1	200	62	2·8	L_B 12 turns 18 s.w.g. enam: close wound ½ in. dia. C_B 20 pF
21·1	21·1	100	15	2	
21·1	21·1	5	10	1	
28	28	200	62	2·9	L_B 7 turns 18 s.w.g. enam: close wound ½ in. dia. C_B 15 pF
28	28	100	15	1·9	
28	28	5	10	1·2	

Oscillator h.t. 105V stab. Driver V_B 250V.

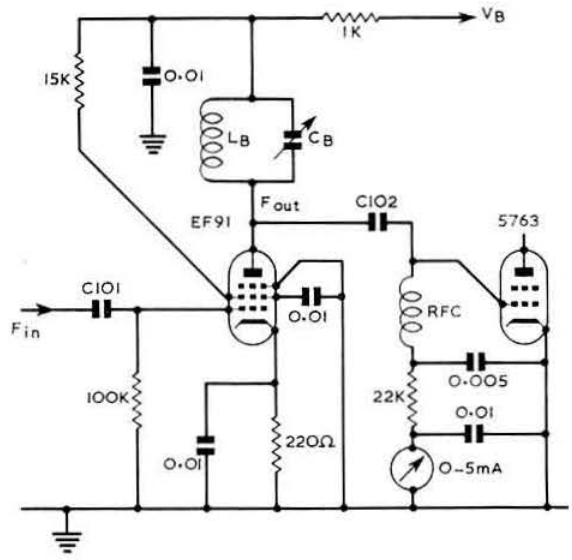


Fig. 14. Basic driver circuit used to determine available power expressed as grid drive.—see Table 6.

Reference

[3] *The Amateur Radio Handbook*, RSGB, page 169.

RTTY Test Transmissions

Regular RTTY test transmissions, organized by the British Amateur Radio Teleprinter Group, are radiated on Sunday mornings at 11.00 GMT on 3·575 Mc/s by G6CW, G2HIO and G8DD, in that order. A frequency of 3·750 Mc/s may also be used in addition to the one stated. The transmissions contain test phrases and lists of RTTY stations active during the preceding week, and are sent at a speed of 50 bauds, followed by a repeat at 45·5 bauds. F.s.k. at 850 c/s is currently used, although 170 c/s shift may be employed in due course.

Please send reports of these tests to the Honorary Secretary of the BARTG, Dr. A. C. Gee, G2UK, East Keal, Romany Road, Oulton Broad, Suffolk, or to the appropriate transmitting stations.

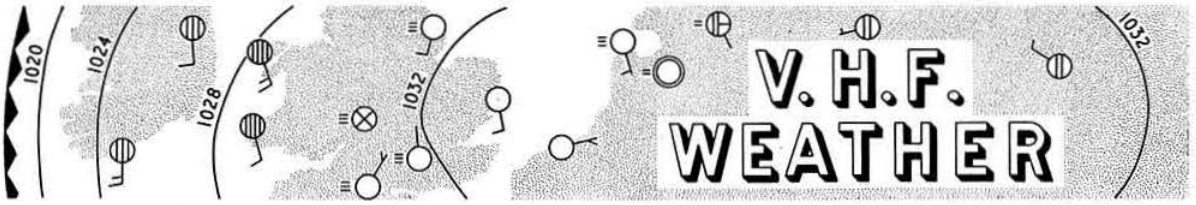
BBC's new Welsh Television and V.H.F. Sound Relay Station in Pembrokeshire

The BBC Haverfordwest Transmitting Station went into service on February 15. Television transmissions are on Channel 4 (vision 61·75 Mc/s, sound 58·25 Mc/s) using horizontal polarization.

The three sound services are transmitted on v.h.f. Band II on the following frequencies:

Welsh Home Service	93·7 Mc/s
Light Programme	89·3 Mc/s
Third Programme/Network Three	91·5 Mc/s

The Haverfordwest station is one of a number of relay stations being built by the BBC to extend and improve its television and v.h.f. sound service coverage.



PART TWO

In which trade secrets are shamelessly disclosed · Three dimensions are harnessed unconventionally · The ins and outs of the ups and downs are recklessly revealed · And a noteworthy occasion is subjected to scrutiny

By R. G. FLAVELL, F.R.Met.S., GM3LTP *

IN Part One of this series [1] the *K* unit of Potential Refractive Index was introduced, and certain claims were made regarding its usefulness in investigating the kind of high-signal conditions which cause unenlightened citizens to telephone the BBC to complain about the quality of the pictures, and keen v.h.f. men to cancel all but the most pressing of engagements.

An anticyclone was examined in some detail, and it was shown that a boundary often formed between warm dry air subsiding from aloft and relatively cool moist air stirred up from the ground. It was also explained that these conditions produced a sharp decrease of radio-refractive index with height and that this was sufficient to cause certain v.h.f. and u.h.f. radio rays, which would normally be lost in space, to be bent towards the ground to arrive many miles beyond their normal range.

The *K*-Profile

As has been described earlier, *K* values may be calculated from observations of pressure, temperature and relative humidity. A graph of *K* values obtained from a radiosonde ascent, plotted against height (or more commonly air-pressure, as this is more readily available) constitutes a *K*-profile.

Details of all the British radiosonde reports are published by the Meteorological Office in their Daily Aerological Record [2]. With the diagram described in Part One and a certain amount of practice an ascent to 500mb can be converted to Potential Refractive Index and plotted on graph paper (constituting a *K*-profile) within five minutes. Although a plot to this pressure level is usually worthwhile during periods of subsidence, all the features likely to affect v.h.f. propagation will appear well before 500mb, and it may be thought an advantage to terminate the work at 700mb (about 10,000 ft) as has been done with the illustrations to this article.

It is a good plan to record all the data directly on the plotting sheet at the appropriate pressure levels, as shown in Fig. 1: 1cm to 10 *K* units and 20mb respectively are very convenient scales to use and *K* may be expected to range between 250 and 340 units over most of the year, occasionally extending a few units beyond either end in the summer, referring of course, to British Isles conditions.

It is hardly necessary to point out that although the published skeleton diagram *can* be used for *K* calculations, it is not sufficiently large, or detailed, for accurate work. The best plan is to transfer the *K* lines to a full-sized tephigram chart, as this will allow values to be read off in comfort to the nearest *K* unit.

The Cross-section

An early authority on propagation, Publius Ovidius Naso (better known under his trade name, Ovid) once wrote,

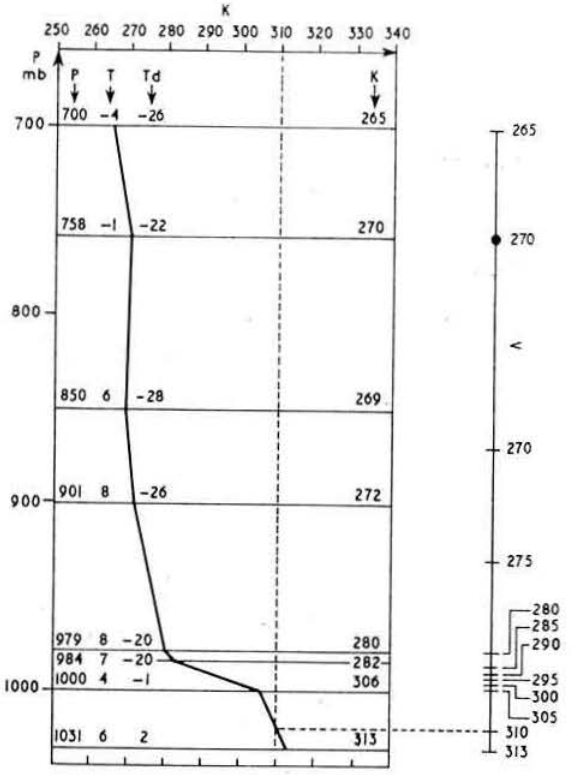


Fig. 1.—K-profile, derived from radiosonde pressure (P), Temperature (T), and Dew Point (Td) data, obtained at Hemsby, Norfolk, at 12.00 GMT on December 3, 1962. The vertical line to which various values have been projected would normally form part of a cross-section or a time-section.

* The Observatory, Lerwick, Shetland.

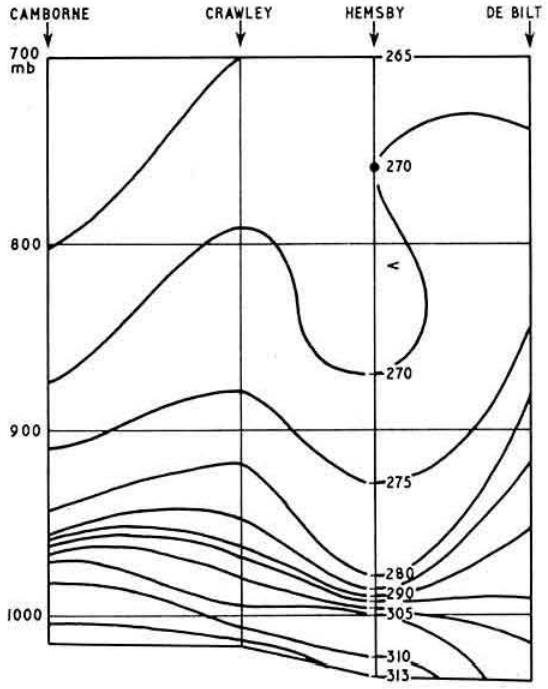


Fig. 2. *K* cross-section through Hemsby, using the levels derived from the *K*-profile of Fig. 1. This was a notable high signal occasion.

" Things which are not of value singly are useful collectively "[3]. Whilst it is hardly fair to regard an isolated *K*-profile as being of no value, it is certainly true to say that its usefulness is enhanced many db when combined with other *K*-profiles in a cross-section.

A cross-section is used to find the vertical distribution of potential refractive index along a given path at a given time.

The way the levels at which certain *K* values occur can be transferred to a vertical line is shown on the side of the *K*-profile diagram, Fig. 1. The line would be one of a series, spaced in proportion to the distance between selected radiosonde stations as nearly as possible along the path of the cross-section. Care is needed to identify on the vertical line turning points where the profile slope changes sign at one of the chosen values, turning points at other intermediate values, and ordinary crossing points, beyond which a rise or fall continues. These all supply useful information which helps to complete the space between stations (Fig. 2).

When the chosen path is too far from a line of radiosonde stations for them to be representative, data must be interpolated by drawing a series of horizontal charts of the *K* distribution over the British Isles at 50mb (or less) intervals, and transferring the distribution along the line of the path on each to the appropriate level of the cross-section. A surprising amount of detail results (see, for example, the comparative *N* and *K* cross-sections in the original official paper, which were drawn on this basis), but the work involved is considerable.

The construction of *K* cross-sections is one of the most rewarding ways of investigating anomalous tropospheric propagation. If very long-range signals have been heard at a time when nothing of interest appeared on the appropriate cross-section, it is fairly safe to presume that sporadic *E*, the aurora, or some orbiting product of the Space Age has been the agent responsible.

The Time-section

Another way of displaying potential refractive index in the vertical is to show how it varies from profile to profile above a given place. The result is a chart very similar in appearance to the cross section, but the horizontal scale is now not distance, but time, and its length is limited only by the interest or patience of the constructor (Fig. 3). The levels at which various *K* values occur on each profile are again transferred to a series of verticals on a separate sheet, in this instance evenly spaced and 2cm apart (a scale of 4cm = 24 hours).

The time-section gives an immediate indication of periods when anomalous v.h.f. and u.h.f. propagation is likely. It reflects the passage of pressure systems on the surface weather chart and, being based on the results of only one radiosonde station, is easy to maintain on a current basis if the necessary meteorological data is available.

3-D with a difference

Since any *K*-profile can form part of both a time-section for a given station and a cross-section through that station for a given time, it is evident that the two forms of presentation must have a lot in common. In fact, a series of cross-sections for a particular period and the individual station time-sections over that same period interlock completely, as is suggested in perspective in Fig. 4.

Although this exercise is one which would be difficult to complete without having to retain the services of a qualified psychiatrist, the idea is an important one as it not only relates the appearance of particular features on both types of diagram but, should difficulties arise, also allows one sort of

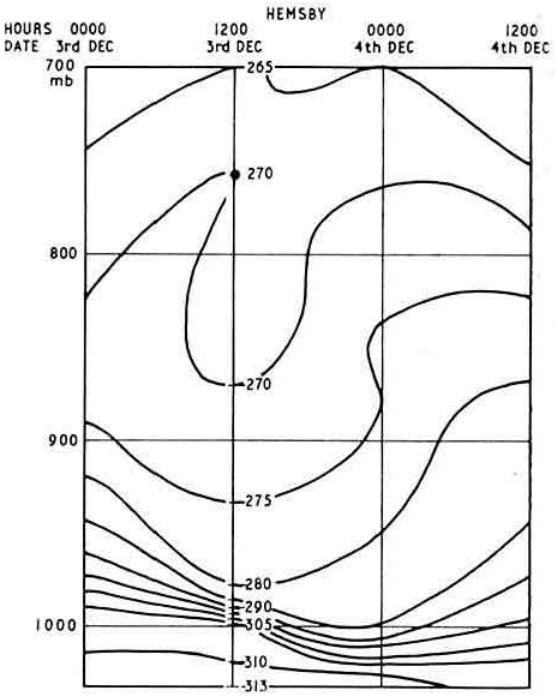


Fig. 3. *K* time-section for Hemsby, in which the profile of Fig. 1 is combined with others showing conditions before and after.

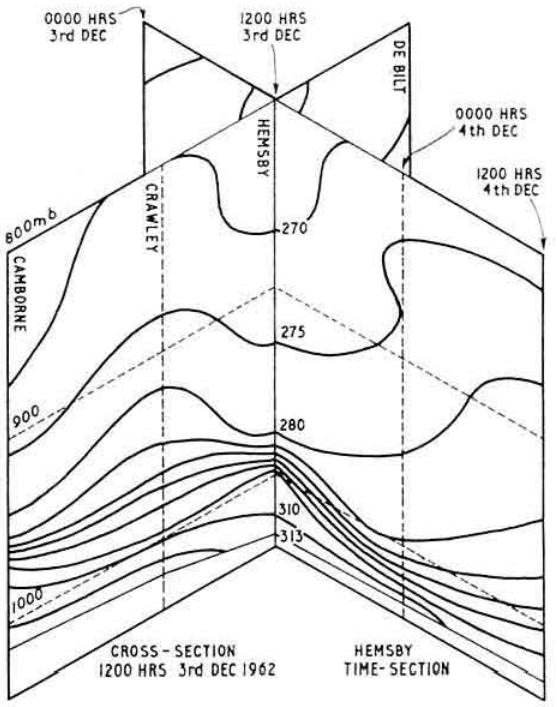


Fig. 4. Showing how the time-sections and cross-sections are related. Other planes containing time-sections for the other stations and cross-sections for the other times may be imagined to interlock in a similar way.

plot to be used as a guide to drawing up the other. It thereby follows that observations made relating to the interpretation of either diagram may be regarded as applying equally well to both.

Air in motion

The most familiar demonstration of air in motion is, of course, provided by the wind. But although a pen recording of the signal strength of a distant v.h.f. station frequently bears a strong resemblance to an anemometer record of wind speed, there is no evidence of a direct connection between them. There is, however, also a less-apparent but very important movement in the vertical, ranging from the gentle downward flow of subsiding air associated with an anticyclone to the fierce up-currents found inside a thundercloud, which have been known to tear the wings off aircraft, and are for this reason rather unpopular with the airline companies.

It was shown in Part One that air descending adiabatically (i.e., without addition or subtraction of heat) retained its *K* value and resulted in low values being brought down towards the ground. The converse applies initially to ascending air, but here the laws of nature demand that temperature falls as pressure decreases, a circumstance put to good use by the manufacturers of compression-type refrigerators. Eventually the temperature drops so far that it reaches the dew-point and condensation occurs, marked by the appearance of cloud. Further ascent causes more water-vapour to condense and this may result in quite large droplets being produced by coalescence, which are then likely to fall out of suspension, a phenomenon known to us in the trade as rain.

Up to the condensation level, the *K* value of a sample of air ascending adiabatically remains constant; beyond that the latent heat released brings about a decrease in potential refractive index with height which, however, only serves to emphasise the appearance of ascending air on the cross-sections and time-sections. It is soon recognised as the trademark of depressions, a consequence of the winds spiralling inwards having to displace air upwards in order to prevent a dreadful pile-up from developing at the centre.

But enough of theory! Let us begin to practice what we preach.

Lows and Highs

As an example let us examine a portion of the Crawley (Sussex) potential refractive index time-section for April, 1962, representative of conditions over Southern England, in conjunction with G2AIW's monthly report [4].

"The 2m band showed signs of lifting out of the winter decline during the Easter holiday period," he wrote. "On Easter Sunday evening signals from the West of England were received in the London area at good strength." This was the 22nd, and there is no mistaking the signs of descending air on the time-section, nor of the boundary which formed around 900mb. An anticyclone was approaching from the Atlantic.

After some signal reports he went on: "During the evening of April 24 signals from continental stations were received in South-East England at quite good strength but subject to QSB." Reports of conditions on the 23rd are conspicuously absent, but an ominous tongue of ascending air will be seen on the diagram, and this has forced the subsidence literally out of the picture. It was caused by the flank of a depression centred over North-East France which quickly moved away past the Low Countries, allowing the anticyclone to return and extend across to the Continent. The double layer apparent on the 24th is very conducive to QSB in the form of deep multi-path fading.

"However on the following evening, April 25, conditions had improved to provide excellent contacts between stations in S.E. England and F, ON, PA, DL, and DJ," G2AIW continued. Notice that there is a single layer again, this time just above 900mb. Amateurs in the Midlands and North shared none of this activity, but their turn was to come on April 26 when a different high pressure centre took over and the main region of subsiding air appeared over the UK. G2AIW went to press that month under the impression that

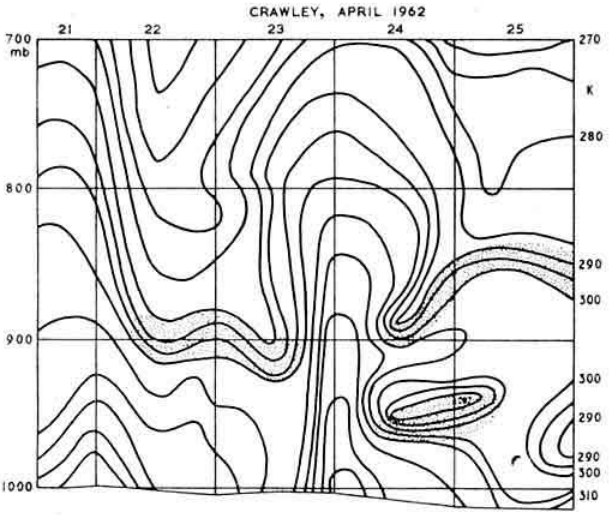


Fig. 5. The *K* time-section for Crawley, Sussex, for the period April 21-25, 1962, analysed in some detail in the text. The layers of steep *K* gradient have been shaded.

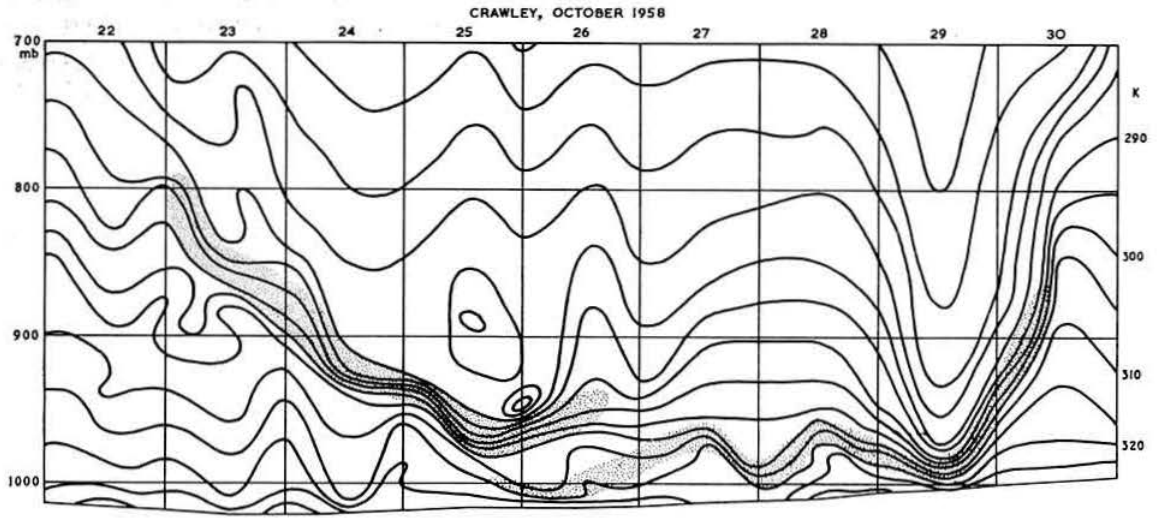


Fig. 6. Crawley *K* time-section for the well-known high-signal period of October 23-30, 1958.

the opening had then finished, but the time-section showed that conditions remained above normal to the end of the month, a fact confirmed by later reports.

Record High during the IGY

Finally, a look at conditions leading to what G2AIW called the "Best Opening Ever" on 2m [5]—the well-remembered anticyclone of October, 1958, which brought GI3GXP into contact with OK1VR/P on Mount Snezka, to establish a 2m record of nearly 1000 miles.

As this occasion occurred during the International Geophysical Year, a wealth of v.h.f. propagation data was available from returns of observers taking part in the RSGB IGY programme, and the writer is pleased to acknowledge the usefulness of this data in confirming some of the techniques which have been described in these articles.

The month had begun badly with signals wallowing in the noise, a succession of depressions and fronts having brought rain and high winds to all parts of the British Isles. Then an anticyclone appeared over Ireland on October 17, 1958, retreated to the south-west where it remained stationary for a few days, and finally moved until it became centred over the British Isles on the 23rd, a day when pressures over Southern England reached a record high level—that at Kew Observatory being the highest recorded in October since records began there in 1869.

Reference to Fig. 6, the time-section for Crawley for the period October 22-30, will readily reveal the onset of the subsiding air as the anticyclone moved in on the 22nd, followed by the formation of a definite boundary on the 23rd.

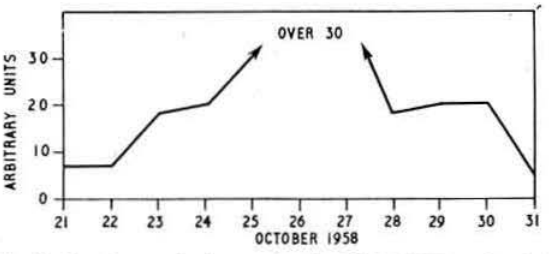


Fig. 7. Signal strength observations by G3GDR (Abbots Langley) of a 74 Mc/s navigational aid transmitter located at Dover, for the period covered by the time-section. O = Receiver noise level, 30 = Receiver saturation.

A typical signal record over the period is shown in Fig. 7, which is based on information supplied by G3GDR (Abbots Langley) as part of the IGY Research Project X. It demonstrates how the received signal strength of a 74 Mc/s navigational aid transmission from Dover increased as the boundary layer formed and intensified, then subsequently declined and returned to normal when the layer dispersed.

On October 24 and 25, 1958, when the time-section shows the layering to be particularly well-pronounced, v.h.f. propagation conditions were extremely good over most of England, parts of Wales, Northern France and Belgium. The anticyclone was by then declining and moving eastwards over the Continent, carrying the sharp subsidence boundary layer with it. By October 27 the good conditions had spread to most of north-west Europe and, among others, brought about the long-range contact with Czechoslovakia mentioned earlier. The 28th was another exciting day when Continentals came in like locals, but the end was by then in sight. During the night which followed, a cold front crept in at the north-west and began its relentless sweep across the country.

On October 29, when the good conditions were beginning to pass beyond our reach, an unexpected bonus appeared, ahead of the cold front which was gradually wiping the slate clean. Another belt of subsiding air, this time travelling ahead of the front (clearly seen on the right of the time-section) produced a good take-off from south-east England into the favourable part of the anticyclone and once again good contacts with the Continent, up as far as Southern Norway, resulted.

But this was to be the final episode. By the 31st the frontal belt of rain had finally cleared the whole of the country and conditions reverted to normal, ending a very interesting period, and one which remains a talking-point wherever v.h.f. men gather, to this day.

What next?

In a survey of this nature it is not possible to do justice to the amount of material which is available for the particular periods discussed. Now that the basic relationship

(Continued on page 167)

A Cascode Pre-amplifier for 14 Mc/s

By J. J. G. CLAYTON*

THE pre-amplifier to be described is used in front of a Marconi RG44 receiver, from which it obtains its power. A three way Yaxley switch is incorporated to make it possible to switch off the heater voltage and h.t. and connect the aerial direct to the receiver when the unit is not in use. The circuit is a series cascode type, described by G3VA,† the advantages of which are stability, a good signal-to-noise ratio, and according to some authorities, greater freedom from cross-modulation than other types.

Two models have been constructed, electrically similar, but different in construction. The first was built on a brass chassis (which meant connections could be soldered directly to the metal) and used Philips trimmers to resonate the two tuned circuits to the required frequency. The second employed an aluminium chassis and was more compact,

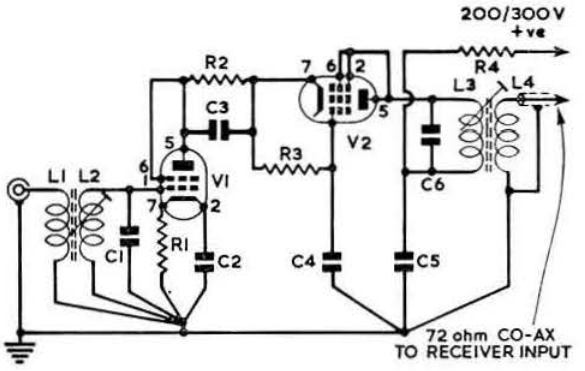


Fig. 1. Circuit diagram of a 14 Mc/s cascode pre-amplifier. C1, 6-30 pF ceramic; C2, 3, 4, 5, 0.01 μF 350 volts wkg. ceramic; L1, 2 turns p.v.c. covered wire at earthy end of L2; L2, 3, 20 turns 26 s.w.g. enamelled, closewound on ⅜ in. Aladdin former with dust-iron core; L4, 7 turns p.v.c. covered wire at earthy end of L3; R1, 51 ohms ½ watt; R2, 150 ohms, ½ watt; R3, 100 K ohms, ½ watt; R4, 4.7 K ohms, 1 watt; V1, 6AK5; V2, 6AU6.

being permeability tuned. In each case, the gain was in the region of 17-20db, which was determined mainly by the valves. The mutual conductance appears to vary considerably from valve to valve and it is therefore worthwhile trying as many as possible.

Circuit

Referring to Fig. 1, the input from the aerial is inductively coupled to the grid of V1, a triode connected 6AK5. There is some voltage gain owing to the step-up turns ratio of L1 to L2. R1, the cathode resistance, is only 47 ohms since the h.t. voltage available for the prototype was only 200 volts. With a higher voltage, the value should be increased to about 100 ohms, but the current may be anything from 2-6 mA without appreciable change in gain.

V1 is directly coupled to V2, a 6AU6 connected as a

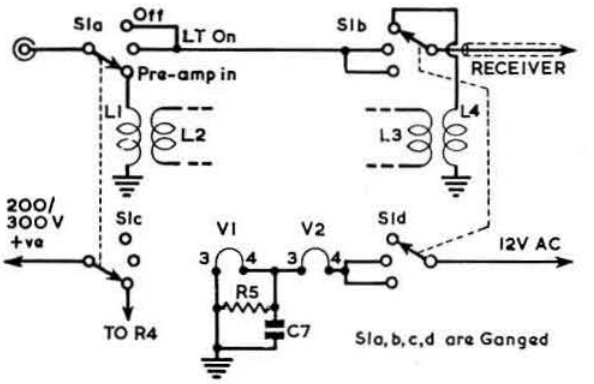


Fig. 2. Switching and heater supply. C7, 0.01 μF ceramic; R5, 47 ohms 1 watt; S1, 3 way, 4 pole rotary switch.

grounded-grid triode. It was found that in this case, the grid connection shown is the best arrangement. A Z77 was tried for V2, and although some 3db gain was realized, it contributed so much noise as to make its use impractical. The anode coil is inductively coupled to the receiver input by L4, the turns ratio being made relatively high to avoid damping L3 excessively by the low impedance of the receiver input.

Fig. 2 shows the switching arrangement, with the switch in the "PRE-AMP IN" position. The heaters are series connected to suit the 12 volt heater supply in the receiver. All the earth connections are returned to a single tag for each stage, to avoid the risk of instability. The leads to the receiver are held by a cable cleat, secured by the bolt holding the Aladdin former for L3 and L4. A fibre collar on the

(Continued on page 167)

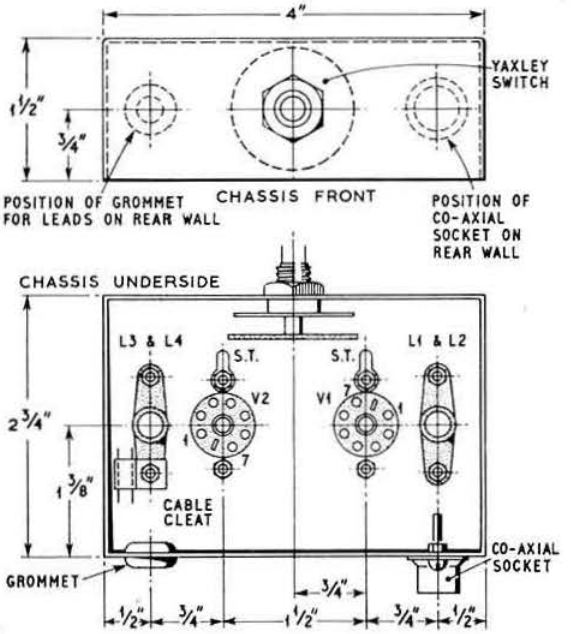


Fig. 3. Suggested layout.

* 110 Upper Moulsham Street, Chelmsford, Essex.

† "Technical Topics," RSGB BULLETIN, September, 1959.

Simple A.M. Monitor Scope

By C. A. HOGG, G3NRZ *

OVER-MODULATION is obviously a condition that is to be guarded against: it is often a cause of TVI, and causes undesirable "splatter" on adjacent frequencies. It is clear, therefore, that an instrument capable of continuously displaying the modulation envelope is highly desirable, and the most suitable device for accomplishing this is an oscilloscope. The one under consideration in this article is very simple, yet does all that is required of it.

Circuit Description

The idea for the circuit (Fig. 1) was an adaptation of one briefly illustrated in the ARRL *Radio Amateur's Handbook*.

The e.h.t. is developed by a conventional half-wave rectifier, although a voltage multiplier might be more suitable, should a high voltage low current transformer prove difficult to acquire. A supply of 1000 volts was found to be adequate for the 3BP1 cathode ray tube, and was also convenient for direct coupling to the conventional bleeder chain.

Asymmetrical deflection is shown in Fig. 1, and has not produced any trapezoidal distortion. Symmetrical deflection could, of course, be used, but as it would involve an additional double triode, or preferably two pentodes, for producing a push-pull output to the *Y* plates, this idea was dismissed. The *X* deflection inputs can be derived from either one of two switched inputs. For a trapezoidal display, the output from the modulation transformer is connected in circuit, while for a wave-envelope pattern, 75 volts r.m.s. from a mains transformer is suitable. The use of a sine-wave *X* scan naturally cramps the display at each end, but this is unimportant for simple monitoring.

The *Y* scan is obtained from the same source in both cases. R.f. from the transmitter tank coil is applied to switched tuned circuits for the various bands. The tuning capacitor can, incidentally, be usefully employed as a gain control. The waveform is then applied to the *Y* plates, after a suitable bias has been impressed on the signal. To avoid direct coupling to the pi-output coil, it was considered easier to form a one turn coil in the aerial lead, and place a three turn link coupling from the monitor near to it.

In view of the possibility of a heater-cathode leak in the

* 20 Sunbury Avenue, Mill Hill, London, N.W.7.

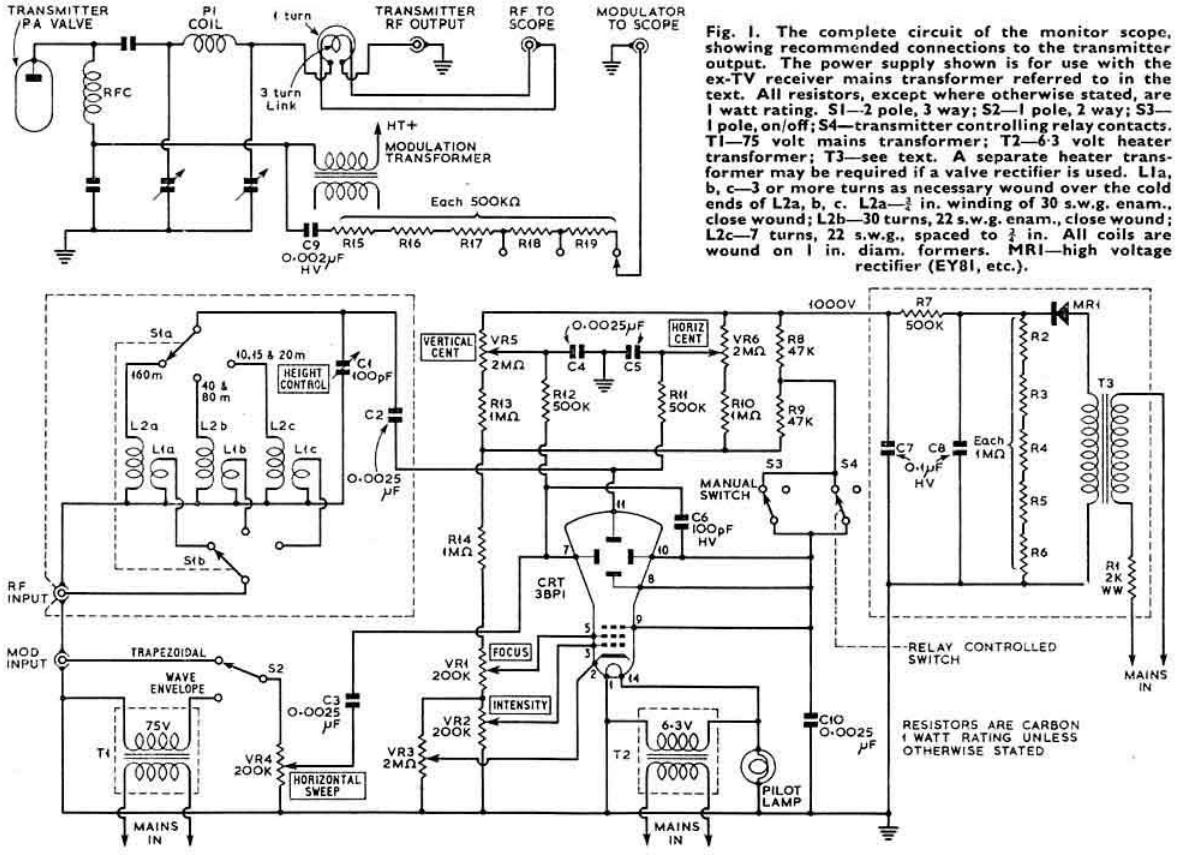


Fig. 1. The complete circuit of the monitor scope, showing recommended connections to the transmitter output. The power supply shown is for use with the ex-TV receiver mains transformer referred to in the text. All resistors, except where otherwise stated, are 1 watt rating. S1—2 pole, 3 way; S2—1 pole, 2 way; S3—1 pole, on/off; S4—transmitter controlling relay contacts. T1—75 volt mains transformer; T2—6·3 volt heater transformer; T3—see text. A separate heater transformer may be required if a valve rectifier is used. L1a, b, c—3 or more turns as necessary wound over the cold ends of L2a, b, c. L2a—¾ in. winding of 30 s.w.g. enam., close wound; L2b—30 turns, 22 s.w.g. enam., close wound; L2c—7 turns, 22 s.w.g., spaced to ¾ in. All coils are wound on 1 in. diam. formers. MR1—high voltage rectifier (EY81, etc.).

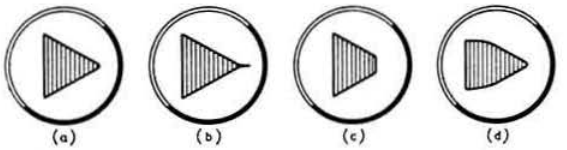


Fig. 2. (a) Correctly operated transmitter, modulated 100 per cent. (b) More than 100 per cent modulation. (c) Less than 100 per cent modulation. (d) Fully modulated signal with insufficient grid drive.

3BP1, a separate heater transformer for the tube was incorporated.

Relay contacts S4 are included in the e.h.t. supply to one deflection plate in each pair, and also to grid 3 of the 3BP1 in order to shift the spot out of the screen area when no signal is being applied to the unit, i.e., when the transmitter is switched off. For setting up the oscillocope, a switch, S3, is paralleled with the relay contacts. The switches were first tried in the e.h.t. transformer primary but it was found that the e.h.t. voltage took too long to build up. In the position shown, however, the pattern appears immediately the transmitter is switched on.

Owing to difficulty first encountered in obtaining a fine trace, VR3 was subsequently fitted to improve the situation. This control should be adjusted in conjunction with the intensity control, VR2.

Construction

The coil unit and height control capacitor were completely shielded to prevent r.f. from affecting the cathode ray tube. As a further precaution the power supply transformers were placed at the rear of the unit, isolated from the tube and its components by a metal shield.

The purchase of suitable high voltage 0·0025μF capacitors proved, at first sight, to be a formidable problem, but as the values were not critical, suitable capacitors of the required 1000 volt rating were assembled by series connecting pairs of 0·005 μF, 500 volt disc ceramics.

E.H.T. Power Supply

The e.h.t. transformer, which gives about 5-6K volts, was salvaged from an old TV receiver, together with the 0·1μF smoothing capacitors C7 and C8. The resistor R1 in the primary circuit reduced the final output to 1000 volts. The e.h.t. rectifier is a K3/100 pencil type. It is quite possible that a number of constructors may have difficulty in locating an appropriate transformer, in which case a standard voltage doubler offers a very satisfactory alternative. A single full-wave 250-0-250 volt mains transformer can be connected to apply 500 volts to a twin-diode doubler.*

Patterns

Trapezoidal patterns showing percentage modulation and grid drive are shown in Fig. 2. In the writer's opinion this is the best and easiest method of checking the output from the transmitter.

S2 is switched to the appropriate position to obtain the wave-envelope pattern. To check modulation percentage with this method, the height of the r.f. pattern should be noted when no modulation is present. When the latter is applied the pattern height should double for 100 per cent modulation. To obtain sufficient modulation input to the scope, the modulator connection can be tapped further up the chain of resistors R15-R19.

The audio output is used only for the trapezoidal pattern.

* *The Oscilloscope at Work* by A. Haas and R. W. Hallows (Iliffe); *Oscilloscope Techniques* by A. Haas (Gernsback).

V.H.F. Weather (Continued from page 164)

between signal conditions and the potential refractive index data has been established, the next step is to analyse in detail specific periods of anomalous propagation using the multiplicity of paths which amateur operating provides, particularly at contest times, when activity is high. A part of the IQSY programme being arranged by RSGB will be an investigation into v.h.f. propagation and it is planned to examine suitable periods using the methods which have been described.

In *V.H.F. Weather*, Part Three, C. E. Newton, G2FKZ, will take up the story. He will continue the survey of material collected during the IGY and present a number of conclusions which have been reached after an extensive analysis of the records.

References

[1] Flavell, R. G. *V.H.F. Weather*, Part 1. RSGB BULLETIN. March, 1963.

[2] Meteorological Office, *Daily Aerological Record*, HMSO.

[3] Ovid. Rem. Amor. 420.

[4] Lambeth, F. G., *Four Metres and Down*, RSGB BULLETIN, May, 1962.

[5] Lambeth, F. G., *Four Metres and Down*, RSGB BULLETIN, November, 1958.

A Cascode Pre-amplifier for 14 Mc/s (Continued from page 165)

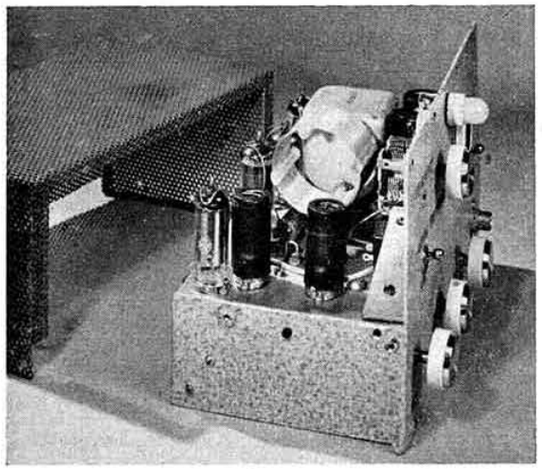
end of this former holds the tags to which are connected the ends of L4 and R4. Holes are drilled through the chassis to permit access to the coil slugs.

A detailed layout is not given, as it is only necessary to avoid undue coupling between input and output, and no components are critical as regards position but a suggested arrangement is shown in Fig. 3. It would be possible to use 0·001 μF capacitors instead of the 0·01 μF components mentioned.

Alignment

Alignment is quite simple, but for best results a signal generator should be used. As the pass-band is several hundred kilocycles wide, it is only necessary to tune the receiver to the middle of the band favoured, and to adjust the slugs L2 and L3 for maximum output from the receiver. If the aerial does not present a resistive impedance to the receiver, the final adjustment of L2 will have to be made with the aerial connected and a signal introduced through stray coupling from the generator into the aerial lead-in, to allow for reactive components reflected into L2.

Measurements of gain were made by setting the generator (a Marconi Instruments type TF390G) to give an output of 1 μV. With the receiver a.v.c. off and the pre-amplifier on, the sensitivity of the receiver was adjusted to give a " fully closed " indication on the tuning indicator. The pre-amplifier was then switched out of circuit, and the output from the generator increased to restore the indication on the receiver. In this unit it was found to be 19·5db. Unfortunately it was not possible to measure the signal-to-noise ratio, but it appears to be improved by the pre-amplifier, owing to the small amount of noise contributed by it.



Three-quarter view of the miniature Top Band transmitter and its perforated zinc cover. The large inductor visible just in front of the modulation transformer is the p.a. coil, L5. Although the original was of American manufacture, a suitable Codar coil should be available.

A Miniature Top Band Transmitter

Designed for Mobile, Portable or Fixed Use

By REX J. TOBY, G2CDN*

WHEN the writer decided to dispose of his all-band A3 mobile equipment in order to change over to s.s.b. /M, the decision was taken to construct a miniature A3 transmitter for Top Band incorporating a number of useful features which will be given special attention in this article. The requirements were the need for s.s.b.-type stability, no drift, wobble or f.m., an input of eight to ten watts, and modulation quality well above average.

The complete circuit is shown in Fig. 1.

Variable Frequency Oscillator

A parallel tuned Colpitts oscillator was chosen, the frequency range being 900 to 1000 kc/s. In view of the superior stability of the inter-electrode capacities of the 6AU6, this valve was chosen for the v.f.o. A standard 150 volt neon acts as a regulator.

Apart from the usual precaution of rigidly fixing all components in this section, there will probably be need for temperature compensation, in the form of a negative temperature coefficient capacitor (C1). By holding a soldering iron or other source of heat close to, but not on the v.f.o. coil and capacitor, the most suitable value of capacitance to eliminate drift can be selected. An Erie 33 pF N750K has been found satisfactory.

Buffer-Doubler and Final Amplifier

This is quite conventional, the 6064 being merely a more rugged version of the 6AM6/EF91. Either of these types, however, can be used with virtually equivalent results.

The netting arrangement has been so devised that when the operator is listening, the v.f.o. can be used as a carrier insertion oscillator, or b.f.o., feeding into the front end of the receiver, for s.s.b. reception (this is sometimes referred to as " front-ending " an s.s.b. transmission). The injection is more than adequate, and the stability of the oscillator makes this easy. When in the *net* position, one can transmit immediately in the event of being in contact with an s.s.b. station.

Screen stabilization for the 5763 p.a. is effected by a low voltage neon, in place of the more usual screen dropping resistor. It may not be common knowledge that much audio power is wasted by the latter arrangement. Any neon that does not drop more than 60 volts on load and can pass 6 mA is suitable. The writer had an STC G551K available, which was found to be ideal.

In order to conserve space, the pi-tank output capacitor is made up by switching six fixed values of capacity calculated to match into a nominal impedance of 50 ohms.

Modulator

It was decided to use a 12AX7 valve in zero bias, driven by a 12AU7 with both sections strapped in parallel in order to accommodate any transformer losses. Approximately seven watts of audio power can be obtained from this arrangement.

Some years ago, John L. Reinartz produced a paper on " Increased Audio without Splatter." It explained that splatter is caused solely by the negative cycle, and that the secondary load always varies under modulation conditions, thus unbalancing a push-pull modulator stage. By loading the whole negative cycle, this state of affairs can be eliminated. A suitably polarized silicon diode with the correct loading resistor enables the operator to reap the full benefit of potent modulation without splatter. Furthermore, no complicated filters are required, because this system has no clipping action, and therefore audio harmonics are not generated by square wave-forms.

Operating Conditions

H.t. rail — 300 volts, 100mA, stiff.
P.a. anode current — 33mA.
L.t. voltage — 12·6v.
Modulator current — 10/40mA.
P.a. grid bias — 45v. negative.

R6 should be adjusted to satisfy the above bias require-

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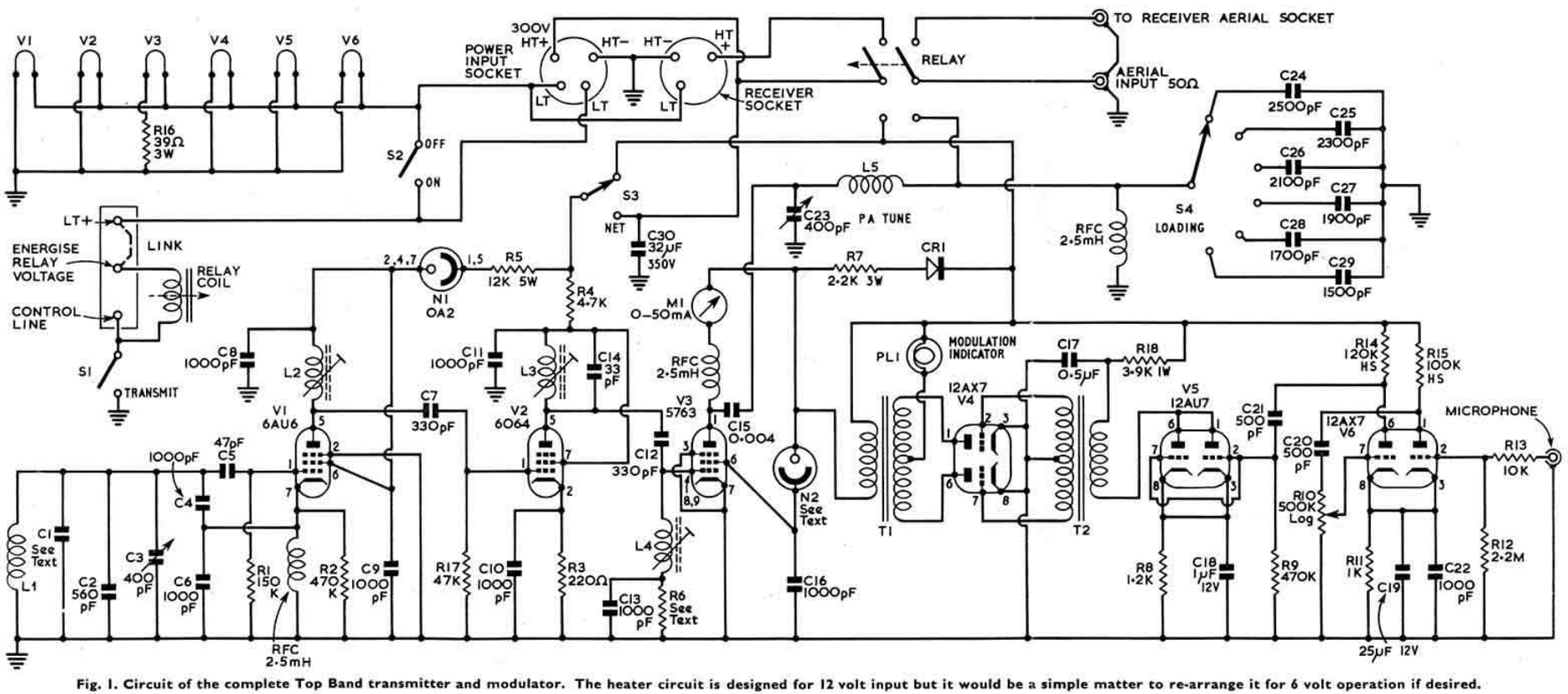

Fig. 1. Circuit of the complete Top Band transmitter and modulator. The heater circuit is designed for 12 volt input but it would be a simple matter to re-arrange it for 6 volt operation if desired.

COMPONENT LIST

C1 see text
C2 560 pF silver mica
C3, 23 approximately 400 pF variable Jackson ganged capacitor)
C4, 6 1000 pF silver mica
C5 47 pF ceramic
C7, 8, 9, 10, 11, 13, 16, 22 1000 pF disc ceramic
C12 330 pF
C14 33 pF silver mica
C15 0·004 µF, 1000 volts wkg.
C17 0·4 µF, 350 volts wkg.
C18 1 µF, 12 volts wkg.
C19 25 µF, 12 volts wkg.
C20, 21 500 pF
C24 2500 pF silver mica
C25 2300 pF silver mica
C26 2100 pF silver mica
C27 1900 pF silver mica
C28 1700 pF silver mica
C29 1500 pF silver mica
C30 32 µF, 350 volts wkg.
CR1 1000 p.i.v., 500 mA
L1, 2, 3, 4 modified slug-tuned medium wave receiver coils*
L5 30µH, 1½ in. diam., air spaced
N1 OA2
N2 see text
R1 150K ohms
R2, 9 470K ohms
R3 220 ohms
R4 4·7K ohms
R5 12K ohms, 5 watts
R6 see text
R7 2·2K ohms, 3 watts
R8 1·2K ohms
R10 500K ohms log. pot.
R11 1K ohms
R12 2·2M ohms
R13 10K ohms
R14 120K ohms, hi-stab.
R15 100K ohms, hi-stab.
R16 39 ohms, 3 watts
R17 3·9K ohms, 1 watt
T1 modulation transformer from SCR522 transmitter
T2 driver transformer from TR1986 modulator chassis
V1 6AU6
V2 6064, EF91 or 6AM6
V3 5763
V4 12AX7
V5 12AU7
V6 12AX7

* *A suitable type is available from Radio Clearance Ltd., 27 Tottenham Court Road, London, W.1.*

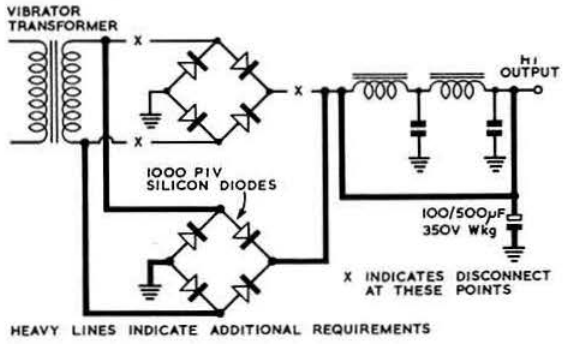

Fig. 2. Modification of the PCR type vibrator power pack.

ments, and the value will be between 10 and 20K ohms, according to the amount of r.f. drive obtained.

The slug-tuned coils should be resonated to the appropriate frequency, either 970 kc/s or 1940 kc/s. They have reasonably broad-band characteristics.

Mobile Power Supply

To realize optimum efficiency in the transmitter, the incorporation of a power supply that does not fluctuate or vary to any extent during modulation peaks is essential. Furthermore, it is necessary to load the final stage to 33mA in order to preserve the input and output impedances.

At the time that the transmitter was assembled, a very cheap PCR vibrator pack was available, and was thus included. Although it was rated at 300 volts at 100mA, the practical maximum load was however, considerably lower under test. Nevertheless, this type can be modified to provide a useful, consistent output, and the procedure for tackling this is outlined as follows.

The four selenium rectifiers should be replaced with 1000 p.i.v. silicon diodes, and a shorting wire connected across the double choke filter as shown in Fig. 2. Finally, a 100 to 500 μF, 350 volts working electrolytic capacitor should be wired across the output terminals.

Conclusion

In the short period during which this transmitter has been used /M, numerous contacts have been made in daylight with stations exceeding the normal ground-wave distances. When the writer was travelling to the Dartmouth Mobile Rally, a contact was made from the Wincanton area to G3PWW in Godstone: a distance of 110 miles with a report of RS58. G5UG of Weston-super-Mare was able to give a report of RS56 to the signals from this transmitter whilst at Basingstoke on the way home.

This small transmitter has lived up to the writer's expectations, and is a very useful, compact little instrument.

Support for the IQSY

DSIR is providing substantial support for the UK contribution to the International Years of the Quiet Sun (IQSY). This is an enterprise in international scientific collaboration aimed at obtaining a better understanding of how the sun's behaviour influences the earth.

Nine universities and colleges are between them receiving £100,000 in the form of thirteen special research grants, and investigations by DSIR's Radio Research Station are being carried out at Halley Bay, Antarctica; Port Stanley, Falkland Islands; Singapore; Lerwick, Scotland; and Slough, Buckinghamshire. The Radio Research Station is also responsible, on receiving notification from the USA, for transmitting to British observatories warnings of special geophysical conditions.

The IQSY (January 1, 1964 to December 31, 1965) coincide with a period of minimum sunspot activity. The scientific programme carried out will complement observations made during the International Geophysical Year (July 1, 1957 to December 31, 1958) when the sun was last in its most active state. The preparation and co-ordination of the UK programme is in the hands of the Royal Society's British National Committee for Co-operation in Geophysics.

The university and college groups being assisted by DSIR are covering all of the IQSY programme subjects except meteorology. These are geomagnetism, aurora, airglow, ionosphere, solar activity, cosmic rays and aeronomy, of which geomagnetism and the ionosphere concern the Radio Research Station. Its ionospheric research includes the reception and analysis of telemetered information from topside sounding satellites, and low and very low frequency radio wave propagation studies.

Enquiries Regarding Bulletin Articles

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

12,000 PLUS IN THE POST

This special 80 page issue of the RSGB BULLETIN celebrates the fact that direct circulation to members has risen to well over 12,000 copies an issue in recent months. Indeed, total circulation is now climbing rapidly towards 13,000.

While no immediate increase in the number of pages in every issue is envisaged, members may help materially to bring the day when the BULLETIN grows even larger by inviting radio friends who are not at present members to join the Society. An application form appeared in the February issue. Alternatively, a QSL card to Headquarters will ensure that a form and complimentary copy of the BULLETIN reaches a potential member without delay.

The increasing circulation of the BULLETIN makes it an even more appealing medium for advertising to the Amateur Radio market both in the United Kingdom and throughout the world. Members can help in this sphere by mentioning the RSGB BULLETIN when writing to advertisers.

The Pre-construction Planning of Amateur Radio Equipment

BY GEORGE W. McDONALD, G2OX *

FOR just over 30 years, the period of time G2OX has been licensed, many bits and pieces of equipment have been built. The construction of equipment has always been of greater interest than operating. In the early days all amateurs were interested in construction work; they had to be, there was no commercially-built gear available. In recent years our ranks have become sharply divided into operators on the one hand and constructors on the other. It is to the latter that this article is aimed, but the former group may also find something to interest them.

The source of material for this article has been drawn from a file labelled " Abandoned Projects." Over the course of years, the data in this file has provided a useful source of information which has enabled bigger and more difficult projects to be tackled successfully. It has been a case of learning from past mistakes. There is no doubt that the greatest number of past failures can be laid against bad planning causing complicated and poor wiring layouts due to ill-considered placing of components on the chassis. The obvious cure for such troubles is to give a project much thought before ever starting to lay out the components on the chassis.

All projects start from an idea. The original idea may be developed from something seen in a magazine article and if the details given by the author are carefully followed the final result will be satisfactory. Few of us can, however, resist the temptation to add a few ideas of our own, and if our ultimate result does not always work as intended, the original designer can hardly be blamed for the shortcomings of our modifications. Let us now consider how to avoid trouble with our designs under an appropriate sub-heading.

Planning the Job

All our ideas, no matter how small, should be entered in a note-book under various headings such as Power Supply, Exciter and I.F. Amplifier, and over quite a short period of time a large set of sketch notes will be gathered. This process could be termed first thoughts. No circuit diagrams are required at this stage, only block diagrams and odd circuits culled from reference to various relevant publications. Under this system one can readily have a drastic change of mind without it requiring any costly alterations. In fact, up to now our planning has cost nothing. There is no point in hurrying over a job, cutting the chassis and lashing up a bit of wiring. This will only lead to making errors which are expensive to correct. Plan for a good-looking layout and a well-finished front panel. Aim high on final finish and make it as near the commercial counterpart as possible.

From all the rough notes full circuit diagrams and panel layouts can be drawn. Use heavy white cartridge paper for this as a considerable amount of rubbing out is likely before the project is finally out of the drawing stage. All voltages and currents can be marked on the circuit and the details of the power supply requirements decided. Component specifications are now dealt with by studying various catalogues which are available from dealers, paying particular attention to the dimensions of the larger components such as transformers, switches, etc. From this data the chassis layout can be drawn, preferably full size in order that one can see clearly that no component on the top of the chassis gets in the way of one underneath, or mounted on the chassis edges.

A point to note when designing equipment is not to make the chassis too small. If any future developments are expected, such as adding another stage or perhaps a modulator, a large enough chassis should be selected when designing to accommodate these expected developments. Afterthoughts which will entail a complete rebuild in about a year's time become expensive in both material and time, so always look ahead a little and make any provision for expected changes on the original drawings.

Two practical points come to mind and need to be dealt with now while the project is still at the drawing stage. The first concerns the design of power supply units. Many amateurs seem to build a power supply with only the bare current supplying capabilities required. This is a mistake. If a 200mA supply is required, get a transformer which will give about 300mA. It costs very little more and is not much bigger physically, and it is sure to be fully loaded at some later date. The other point concerns the cabinet which will ultimately house the finished chassis. Get details of a manufacturer's standard size of cabinet and arrange for the chassis size to suit. This is much easier than to complete the job and then try to fit a cabinet to it. Non-standard cabinet work is costly, nearly twice that of a standard line.

On the point of cost, it is always best to estimate the job on paper and then to adjust the sights to the cash available. It may be decided then to complete the project in stages but as nothing has as yet been committed to expensive metalwork, this decision is simply a matter of re-planning on paper at no expense.

It has now been decided that the layout and the circuit cannot be further improved on paper. The next step is to order the larger components before commencing any chassis cutting. This is advised because if the selected component is not available a larger or smaller substitute may have to be used. While awaiting delivery of all the required components, further minor changes can still be made to the design. Having second thoughts is still not going to cost anything.

Construction

At this stage a set of fairly good drawings has been made as a result of the planning. Chassis boring and fitting the components to the chassis is therefore a simple matter of drilling holes in the right places. The best material for chassis work is 16 s.w.g. half-hard aluminium. The bending tools required to make a chassis in the workshop or shack are seldom available and the writer recommends buying a chassis from one of the advertisers handling such metalwork. Panels over a square foot in area are made from $\frac{3}{16}$ in. aluminium to give the necessary stiffness required. This metal can be easily bored with woodworking bits up to diameters of over 1 in. Do not be tempted to use these bits in an electric drill, if severe tearing of the metal is to be avoided. Use a carpenter's brace slowly with even pressure, and make sure that the hole is backed by a block of hard wood. The electric drill is, of course, quite suitable for holes up to $\frac{3}{8}$ in.

Components which are to be attached to the chassis should be fixed with nuts and bolts. The use of self-tapping screws is not advisable as they are liable to work loose. Self-tapping screws are suitable for fixing where a nut and bolt could not be used. Any screens required can be bent in the workshop but ready-made screens can be bought: they are sold as chassis sides and are obtainable in various widths up to 3 in.

All holes carrying wiring through the chassis should be fitted with rubber grommets. Valve sockets should always be mounted in such a way that no input wiring will have to cross that of the output. Failure to take care on this point is responsible for instability in many cases. Here again, pencil sketches of the valveholder and its associated wiring will prevent this happening.

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The aim of every Amateur Radio constructor should be to produce a piece of apparatus equal in every way to a similar commercially-produced product. This aim is, of course, never realized due to production difficulties in the home workshop and the use of simple tools. An opportunity should never be missed if an exhibition of commercial equipment visits your area to see how the manufacturer finishes his product. Cabinet work may contribute little to the electrical efficiency of a home-made article, but the looks will certainly be improved by using commercially-made cabinets. Large cabinets with front panel measuring 19 in. × 10 in. × 8 in. can be bought for around £4, painted in your choice of colour. Plan, therefore, for a tidy ham shack with well-finished equipment, all of which leads to a pride in the job and ultimately tidy and efficient operation.

Wiring

Wiring up a piece of equipment sounds an easy matter; in fact it is, but certain rules must be followed if the end-product is to be trouble free on test. It is wiring that causes troubles such as hum pick-up and general instability. Hum pick-up in high gain circuits is always a possibility even in expertly wired jobs and the source of the hum is always the mains supply. Heater wiring links all the valves in the circuit and is the main contributor to the hum pick-up. Stray fields from the heater circuit can be very much reduced by the following method. Start wiring at the mains transformer terminals with a length of twisted flex and wire up each valve socket in turn, always keeping the flex in the corners of the chassis.

Metal braided screened connecting wire may be used in a.f. circuits, particularly in the case of high gain speech amplifiers, where hum induced from the heater wiring is likely to be troublesome. The screening should be soldered to an earth point at both ends of the connecting lead. This type of connecting wire is recommended for the heater leads as well as its more common use on grid leads carrying a.f. The use of screened leads for the h.t. circuits is not necessary when working at frequencies below 28 Mc/s and its use may lead to complications if the h.t. voltage is over 700 volts. Screened h.t. leads may prevent r.f. from getting into the power supply and hence into the supply mains but, in the writer's opinion, r.f. can be more easily filtered by fitting capacitors between each incoming mains lead and the earthed chassis.

Screened co-axial cable should only be used to connect an anode to a grid at r.f. if its length is not more than 6 in. If it becomes necessary to connect an anode circuit to the grid of the next valve, working at r.f., a low impedance link winding must be used to keep down circuit losses. Such a low impedance link may be as long as 40 ft. with very little loss involved. Some care must, however, be taken to ensure that no high resistance path exists between the earth connections of the two pieces of equipment so connected. Try earthing the cable screening at one end only when using long leads, earthing at both ends may lead to unexpected circulating currents in the earthed screen. That screened leads can in many circumstances be the cause of instability should not be forgotten.

How the wiring is connected by soldering is of greater importance than it is generally thought to be. All readers are familiar with " dry joints " and the particular joint the writer has in mind is a commonplace feature in all equipment including that made by commercial firms. Dry joints cannot usually be seen and their effects often do not show up until long after the equipment has been in service. The cause of dry joints is using too cool a soldering iron and in these days of miniaturization the small 25 watt iron is the main offender. This small iron is ideal for making connections to small tags on valveholders and delicate parts such as ½-watt resistors and transistors, but for anything larger, particularly soldering tags connected to the chassis, a 75-watt iron fitted with a pencil bit is recommended.

Safety Precautions

No piece of equipment can be called properly designed or engineered if the operator or anyone unskilled who has to handle it is liable to receive a shock in so doing. The chassis should always be connected to the earth pin of the three pin supply socket and care taken that the live and neutral wires are connected to the correct pins on that plug. All exposed terminals and tags on the top of transformers should be carefully covered with a plastic sheet such as ⅛-in. thick Perspex or similar material. The greatest danger of receiving a severe shock is when lifting a chassis which happens to be powered. Keep all high-voltage points well clear of the chassis edges so that the fingers will not accidentally contact the live h.t.

For complete safety, always SWITCH OFF before handling a chassis, but as mishandling is likely to happen in the best regulated workshops, it is wisest to design in such a way that accidental contact risks are as far as possible eliminated. All designs should have a low-voltage pilot light included, and it should be fitted in such a position that it can be seen easily when working on the chassis.

This article has been devoted entirely to the design aspects of our hobby and most of the points have appeared in print before. The writer makes no apology for repeating them because newcomers are always joining the ranks of radio amateurs and they are always on the lookout for information on how to do a job. The correct approach to the design of your own equipment can be summed up in four words: " Think first, design later."

Some Notes on Portable Operation

(Continued from page 149)

on some occasions it is very difficult to achieve contacts with other G stations owing to the closed shop principle which some of them seem to use on 3·5 Mc/s.

FUTURE PLANS

S.s.b. equipment and operation have not been mentioned: the writer has had considerable experience with this equipment at the home station but has not had the time to build a portable s.s.b. generator and modify the existing portable equipment.

The s.s.b. generator at the home station is transistorized and operates from 12 volts. Its size, including the driver stage, is only 5¼ × 14 × 2 in., and it could well be used for portable operation. S.s.b. is now so popular that the number of s.s.b. stations probably outnumber those using ordinary a.m. on 14 Mc/s. Furthermore the p.e.p. output against battery consumption favours the use of s.s.b.

The rapidly increasing number of miniature components will assist in making portable equipment of the future very much smaller, as will the use of printed circuits or micro-module techniques.

Some saving in space can be made by adopting transceiver techniques, but unfortunately this makes the equipment less flexible in operation. In the present congested bands it is often desirable to transmit on one frequency and listen on another.

The future aerial for the high frequencies could be a two or three element beam with folding or collapsible mast and elements. On removal from the container the system would be immediately available for use. A fortune awaits the inventor of a pocket size efficient high gain aerial.

The power source is the biggest problem in weight and maintenance. Perhaps solar batteries will be available to the amateur of the future.

DXPEDITION CAMEROONS

By R. S. BRIGGS, 5N2RSB/TJ8

A DX'pedition! At last I have finally made it! But what chaos it turned out to be.

After months of writing letters to most of the better known makers of amateur equipment, asking for the loan of a sideband rig and getting little or no reply from them, I eventually received a letter from Hallicrafters, in the person of Bud Drobish, offering to loan me for a period of six months an SR-150 and SX-117, complete with all accessories. What a wonderful combination these make! Having only just picked up the bug for s.s.b., I shall be lost when the time comes to return the equipment.

Due to several minor reasons (one of which was the visit of 5N2BRG on his way to New Zealand), I left Kaduna on Friday afternoon December 6, 1963. The route taken was Kaduna, Makurdi, Gboko and Susu, the last named being on the border of the Cameroons. Most roads here are laterite, and this one proved to be very tiresome and sandy. Makurdi was in sight when the Land Rover stalled and refused to start. It had developed carburettor trouble, and after a quick look, I decided the job was too big for me or my Nigerian driver. Since the light was failing, we unloaded our camp beds and spent the night by the side of the road.

The following morning my driver hitched a lift into Makurdi, and returned with a mechanic, who duly got cracking. I contacted WA2SFP on 15 sometime during the day and told him, rather rashly, that I expected to be in location at Susu at approximately 23.59 GMT. The repair to the vehicle took seven hours, and after all the bits had been miraculously replaced from whence they came, we left Makurdi at 16.00 on Saturday December 7. One puncture and 200 miles later we crossed the border, and camped about 5 miles from the village of Susu. Time 03.30 Sunday morning! This was no time to be setting up the station, so we got what little sleep we could.

Portable Hallicrafters SR-150!

The operating tent at 5N2RSB/TJ8

At 08.00 on the Sunday, the Land Rover was unloaded, the tent erected, the two masts of the dipole hauled up, the generator run out 100 yards and placed in a small pit to deaden the noise, everything was plugged in and 5N2RSB/TJ8 was on the air by 09.45! One stay of the mast of the dipole was insulated both at the top and bottom and this was my 7 Mc/s end-fed aerial. At 10.00 local time, the first contact from the Cameroons was made with 5N2FEL, who surprisingly gave me a RS58 report. This QSO was followed by 5N2DFT, who took a little time to adjust his BC221 in order to resolve my s.s.b. on his receiver! I then switched to 14 Mc/s, and this is an extract from the earlier portion of the log:—

09.30 GMT	..	..	..	called CQ with no reply
09.45 GMT	..	..	..	called CQ with no reply
09.49 GMT	..	..	..	SV1AE 55 both ways
11.10 GMT	..	..	..	called CQ with no reply
11.17 GMT	..	..	..	called CQ with no reply
11.20 GMT	..	..	..	DL5CF 58 and 56

Total QSO's amounted to the large figure of 131 in 30 countries. So much for my grandiose thoughts! I fully expected to be worked to the limit, but found plenty of time to have a rag-chew with several stations.

The busiest time was between 15.30 and 18.50 GMT. During this time the G's and DL's were outstanding. In particular, G4CP, G5HZ, G3PCG, DL7BA, DJ0GS had very good signals. First W/K QSO was with WA2SFP, who called in on c.w. with a 599 signal. Needless to say, Jim was my first W/K sideband contact!

The SR-150 was performing as expected, and although I was reported as very weak, I was also given 5 and 9 reports frequently. The location, although a bit overgrown, was good. A clear spot out here is essential, not only by Amateur Radio standards, but to keep all the bugs and insects at bay! Here my driver did sterling work with his " langa-langa " (a machete), and had a spot cleared in quick time.

Several stations called in on c.w., and I tried my best to give them a report, but as I was going to operate on c.w. anyway, I concentrated on the sidebanders. Funnily enough, when I did go on c.w. I amassed the grand sum of five QSOs

in 30 minutes! This was getting me nowhere, so I reverted to s.s.b.

From 20.00 the South Americans really kept me busy. How many hams do they have in Caracas? Heading the large signals from this area were YV's 5BNW, ANF, BIB, OA4CV and two very nice XYL's in PY2CE and HC2JT!

As I had to get back to Kaduna by Monday morning, I closed the station at 23.00 local time. The total of W/K QSOs amounted to 10, and although I operated on the low end of 20, and said I was listening on the high end, there were no takers. I then went up to the high end and gave several calls, but still no results. It appears I shall have to take a linear with me the next time!

Several people were surprised to hear me on from TJ8. The trip was reported in the usual magazines, the *DX News Sheet*, and verbally by myself to all and sundry. All QSLs will be answered but if a direct reply is required, please include IRCs, otherwise QSL will be sent via the RSGB. I return to the UK this month, and all cards will be held for me till I return, so please be patient.

The USS "Independence", Floating QTH of W4KNF/MM

by Norman A. S. Fitch, G3FPK/3A2BT *

JOE STEELE, G3KZI/3A2CT, and the writer spent the Christmas vacation with their families in Monte-Carlo. The weather was so warm and sunny that we spent very little time operating, however. Instead, we visited our friends in and around the principality. In a QSO with W4KNF/MM prior to our departure, we arranged to meet the operators on the *Independence*, which was due to be anchored off Cannes on the Cote d'Azur during the Christmas period.

The *USS Independence* is the second largest aircraft carrier afloat with a 70,000 ton displacement. It carries approximately one hundred aircraft of several types, some being capable of speeds of about 2000 m.p.h. It has an angled flight deck, and four steam catapults which toss the aircraft off the deck at 140 m.p.h., both of these being British inventions, incidentally. The carrier is 1100 feet long, with the deck some 90 ft. above the sea, and the height from keel to top of mast being equivalent to a 25 storey building. To allow readers to gain an idea of how impressive the ship is, it contains four lifts each of 36 tons capacity. A small fleet of liberty boats and motor cars is also carried. The power plant generates 200,000 h.p. and drives four, five-bladed, 20 ft. diameter propellers, and the two anchors weigh thirty tons apiece. The complement of over 4000 men are served 10,000 meals a day, and have 2300 telephones at their disposal in the 1501 compartments.

* 79 Murchison Road, London, E.10.

Joe Steele, G3KZI/3A2CT, second from left, with US and Monegasque amateurs at W4KNF/MM on Christmas Day 1963. *(Official US Navy Photo)*

That odd one compartment is the radio shack, which uses the call of Red, W4KNF. The other operators are Bud, WA4GXO; Bob, W9HJP; Mac, K8YEG; and Doc, K4IFK who will have left the ship before this appears. The equipment at present in use is a Johnson Invader 2000 transmitter, a Hammarlund HQ180 general coverage receiver with a stand-by Hammarlund HX-500 transmitter. The extremely potent signal put out by W4KNF/MM is radiated from a 35 ft. whip aerial fed from a Johnson Matchbox. When aircraft are landing, the whip is cranked over to a horizontal position.

One of the main functions of W4KNF/MM is the phone patching of messages from the crew members to their families in the USA. Whilst many British operators object strongly to this practice being used in the amateur bands, it is undoubtedly a great morale-booster, especially at Christmas time when it enables the crew to speak directly to the folks back home. When we were on board on Christmas Day, many sailors were lined up outside the shack waiting to get messages to their families.

In addition to G3KZI and the writer, other amateurs on the ship on Christmas Day included F2AX, F3EG, F3NT, F8SC, F8VD, F8ZF, G3HPH (now 3A2CP), 3A2BF and 3A2BY, Jean and Yvette Jaquenoud who are past visitors to the Luncheon Club, and W6NRT currently signing 3A2CV. Two days later, G3KZI, G3FPK and W6NRT again visited the ship with a few other French amateurs and were entertained to lunch after being taken on a comprehensive tour of the ship. The operators of W4KNF are anxious to get some RSGB awards, and always appreciate calls from UK amateurs when not working phone patch traffic.

We were also invited on to the Submarine *Piper* which was anchored in Monaco harbour, and there we met Ed, WA1ANO/MM, who obtained special permission to operate as WA1ANO/3A2. On one visit, we had the pleasure of taking the Commandant of Prince Rainier's yacht, Captain Yves Caruso, to see over the *Piper*. The Prince's radio operator, George Lukomski, is very interested in amateur radio and there may well be some /MM operation from the yacht one day.

Due to our short stay, the superb weather and numerous social engagements, we had few QSOs although we took a Collins 75S-3, 32S-1 and a Courier Communications CTR-1 Transceiver. We should like to record our appreciation of the exceptional hospitality extended to us by our Monegasque and American friends.

THE MONTH ON THE AIR

A CHRONICLE OF EVENTS ON THE HF AMATEUR BANDS

BY R. F. STEVENS, G2BVN*

DESPITE the approach of the trough of the current sunspot cycle there is a considerable amount of DX activity on the h.f. bands, and it is believed that on many occasions there are open paths on 21 and 28 Mc/s which are not evident owing to the lack of activity on these bands. The activities of W4BPD and other DXpeditions have provided a continual source of interest on 3·5, 7 and 14 Mc/s, whilst Top Band has produced DX contacts not previously thought to be possible, and a separate section appears this month devoted to happenings on this band. Stew Perry, W1BB, must be given the major share of the credit due for the organization and liason work that has been put in to produce the results now being experienced, together with a small credit for favourable propagation conditions!

Faced with the prospect of an international frequency allocation conference during the next five years, it is of major importance that full use should be made of all amateur bands and operators are urged to use the 28 Mc/s band, both for local ground wave QSOs when DX is not available, and also to participate in the section of the IQSY programme being undertaken by the Society. The amateur movement cannot rest on its laurels, and continuing and useful work must be undertaken on which the case for the retention of the bands can be based.

News from Overseas

VS1LU mentions that the new prefix for the Singapore area of West Malaysia will be **9M1**, but that, at the time of writing, no starting date had been fixed. VS1 calls are now up to VS1MF with an all time high level of activity. Concentrating on 7 Mc/s, VS1LU has worked 63 countries on the band but generally finds DX hard to raise. Frequently European stations are heard calling CQ DX, but many times go back to a station on their own doorstep. W6VSS, with a full sized beam for 7 Mc/s, is a consistent signal and is audible when there is little else to be heard on the band. The list of stations worked on the band is doubly interesting in that it provides evidence that there are a large number of DX stations active on 7 Mc/s, and these include 9N1MM, JT1CA, MP4QBF, ZS3E, VS4IH and HS1SD, in addition to the less exotic countries. On the controversial subject of home-built and commercial equipment VS1LU makes the comment that he would rather work a good operator with commercial gear than a poor operator who might be a home-brew genius! And that comment is fair enough.

5N2JKO reports further Nigerian converts to the s.s.b. mode with **5N2's CKH, EBL** and **RJO** now suppressing their carriers. In spite of the increased interest in A3J, only two 5N2 Awards for all two way s.s.b. QSO's have been issued, ZB1A and PZ1AX being the recipients. 5N2JKO mentions that **5N2RSB** was awarded the B.E.M. in the New Year Honours List and we hasten to add our congratulations. 5N2RSB will be UK bound on March 15 having completed trips to TJ8 and TY2, which were somewhat frustrating owing to poor conditions. After having raised the hopes of Nigerian licence holders by mentioning a fee of £3 in the new licence, the Posts and Telegraphs thereupon sent out licence renewals at £5 per annum! 5N2JKO will be arriving in the UK on March 22 for a well earned leave and will be active on Top Band, 80 and 40 metres as **G3JKO.** He has no plans for /M operation but will be touring in the UK and hopes to meet a number of British amateurs on his travels. Thank you, Mike, for your support of *MOTA* and have a good leave.

VK9LA, formerly active from Cocos Is., is now resident in Perth, W. Australia, and will be on the air with a VK6 call. There is unlikely to be any further Cocos Is. activity for some time. Anybody lacking a VK9LA QSL may try again through the VK6 Bureau. (VK4SS).

The first **South African SSB Convention** will take place at the hotel QTH of ZS6IP on May 23, 1964. The organizers will appreciate letters, cards and cables from other sideband ers and organizations throughout the world and these will be displayed in the meeting hall.

ZK1AR is now operating on a.m. and c.w. on at least two days a week and also during contests. He has a new QSL manager in **K4SHB,** replacing former manager K4LRA, who will, however, forward all incoming mail connected with ZK1AR. (LIDXA)

The **9L1 QSL Bureau** is under the care of **9L1NH,** N. Henwood, The Technical Institute, Congo Cross, Freetown, Sierra Leone.

VU2GG will be active on 3·5 Mc/s on Thursdays and Saturdays around 19.00 and between 05.00 and 07.00 on Sundays. He will transmit between 3895 kc/s and 3900 kc/s listening for replies between 3500 and 3520 kc/s. (G3IFB).

The **K6MLS Trophies** for the first operators to work 300 countries on two way s.s.b. have been claimed. The Gold Trophy goes to Humberto, the Silver Trophy to Robby, **5Z4ERR** and the Bronze Trophy to Al, **W8PQQ.** 5Z4ERR was presented with his trophy at a recent dinner of the Radio Society of East Africa. (K2MGE).

Owing to poor propagation conditions the logs from **VP8GQ** have not been taken over the air, and there is considerable delay with transmission by post. Operators

Gus Browning, W4BPD, and his wife will be visiting London during the latter half of 1964, and he has accepted an invitation to give a talk, illustrated with films, on his dxpedition travels. It is envisaged that the talk will be preceded by a buffet tea, and that a small dinner party, with W4BPD as guest of honour, will take place later in the evening. Further information will be given as soon as a probable date can be arranged.

* Please send all items to RSGB Headquarters to arrive not later than **March 6** for the **April** issue and **April 10** for the **May** issue.

awaiting a QSL are asked not to send duplicate cards or letters to G3PAG. All outstanding cards will be dealt with as soon as the logs can be obtained.

DXpeditions

Due to bad weather the trip by **VQ9HB** was postponed but operation from **Chagos** should be imminent by the time that this is being read. The call-signs to be used are: VQ8BFC-Chagos; VQ8BFR-Rodriguez; VQ8BFB-St. Brandon or VQ8BFA-Agalega. It is anticipated that the operation from the first stop at Chagos will last about ten days. QSLs for this operation to G8KS, with s.a.s.e./IRC please.

G5GH will be operating as **GM5GH/A** during the period March 26 to April 5. This activity will be of interest to prefix chasers and CHC members, and G5GH will be pleased to receive any requests for schedules.

5N2RSB/TY2 was not lucky with conditions during his weekend trip to Dahomey, but was putting a good signal into the UK between 10.00 and 17.00. Many operators have been delighted by the extremely swift QSL returns for the /TJ8 trip. 5N2RSB will be returning to the UK on March 15, and after that date QSLs may go via the RSGB QSL Bureau.

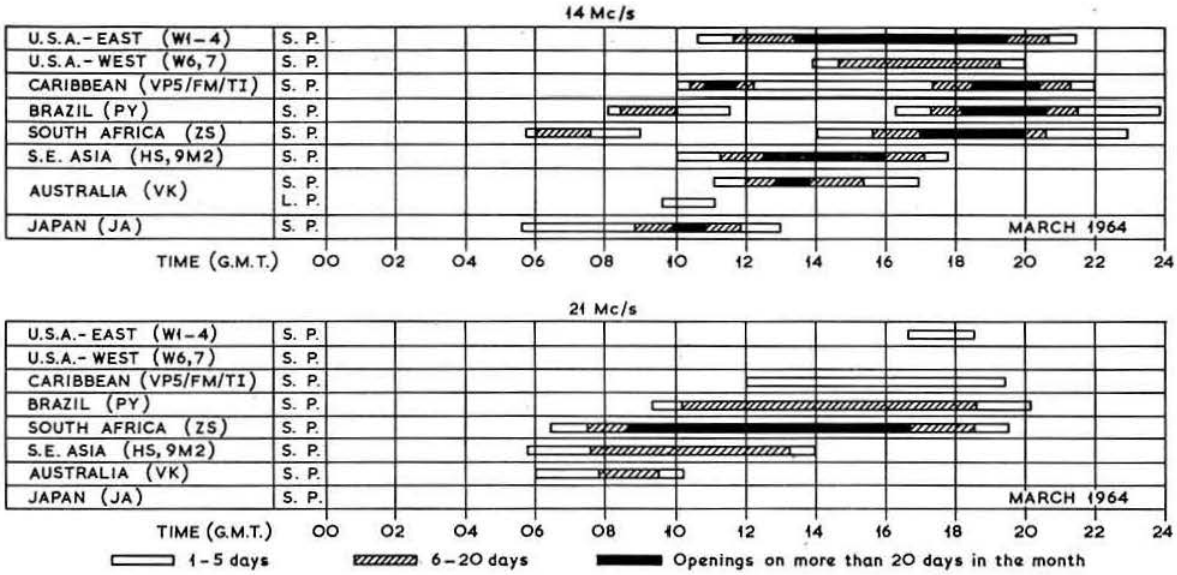
Beginning April 15 for 14 days **VK2AGH** will be active from **Lord Howe Island** on both c.w. and s.s.b. on 3·5, 7 and 14 Mc/s. S.s.b. frequencies will be 14,120, 14,300, 7095 and 3695 Kc/s. Calls should be made up or down 5 kc/s from the transmitting frequency and QSLs go to VK2AGH.

Given favourable weather conditions **VP8HF** will pick up sideband gear from Montevideo before proceeding on his **S. Sandwich** trip which is scheduled to commence around March 6. Operation will be mainly on 14 Mc/s with some time on 7 Mc/s in addition. Bearing in mind the experience of VP8GQ when on S. Georgia it may well be that the latter band will offer the best path to the UK around 01.00.

G3NQF, G3RPB and G3RFS will all be operating from **Sark** in the Channel Is. during the period March 27 to April 6, the call-signs being **GC3NQF** etc. Operation will be on 3·5, 7 and 14 Mc/s with a special effort for Top Band. The QTH will be 350 ft. above sea level and 200 yards from the shore.

HB9KC will visit the rare Swiss canton of **Valais** during the **Helvetia 22 Contest** during the weekend April 18-19.

PROPAGATION PREDICTIONS



At the time of the equinoxes which occur in March and September, and during which night and day are of equal duration, the M.U.F.'s are distributed symmetrically about the Equator. For this reason the propagation conditions are almost similar in the Northern and Southern Hemispheres. Conditions for contacts with the Southern Hemisphere (South Africa, South America and Australia) will generally show an improvement over the winter months. Sunspot activity is so low at the present time that the 28 Mc/s band will be of little value for working DX, although contacts with South Africa will be possible between 09.00 and 16.00, and with South America between 14.00 and 16.00, on exceptional days. After the beginning of May the 28 Mc/s band will produce more frequent contacts over distances between 450 and 1100 miles by sporadic-E reflection. Poor conditions will prevail on 21 Mc/s, and contacts with the East Coast of North America will only be possible during the late afternoon and on days with higher than average F2 M.U.F.'s Prospects for the coming second half of the ARRL DX Contest will therefore be poor, and only the path to Africa will open with any regularity. On days of strong geomagnetic disturbances contacts on 21 and 28 Mc/s will be possible in Europe by auroral reflection.

The 14 Mc/s band will show an improvement over previous months and with the longer days the band will remain open during the evening hours, giving the average person greater opportunities to effect DX QSOs. It should be possible to work all continents with certainty on 14 Mc/s, but contacts over the long paths will now be infrequent. During days with higher than average F2 M.U.F.'s there will be opportunities for contacts between 16.30 and 18.30 with Hawaii, and between 08.30 and 12.00, and 15.30 and 18.30, with Alaska. The 7 Mc/s band will give opportunities for DX working when the greater part of the transmission path lies in darkness, and conditions for working South America, Australia and South Africa will show a seasonal improvement. The Eastern Coast of North America should be heard after 21.00, QRM permitting. In comparison with the winter months conditions on 3·5 Mc/s will be less favourable as the atmospheric noise level increases slowly during the month, which increase will be maintained with the approach of summer.

The provisional sunspot number for January, 1964, was 14·6, only marginally greater than the figure for December 1963. The period of greatest activity lay between the 13th and 17th of January, and the predicted figures for May, June and July are 16, 15 and 14 respectively. At the present rate of decline it seems unlikely that the trough of the present sunspot cycle will be reached before the beginning of 1965.

The station will work from the Jungfrau-Joch at an altitude of 11,700 ft and all contacts will be confirmed with a special and attractive QSL card. The period of the H22 Contest is the ideal time for activity by those operators searching for contacts towards the attractive H22 Award. QSLs should be sent to HB9KC, Werner Bopp, Alpenstrasse 80, Gumligen, BE, Switzerland.

It is reported that W6FAY (KP6AZ) will operate from **Navassa Is.** during the entire month of March.

G2HFD will be making his usual summer DXpedition with a trip to the **Isle of Man** during the period August 8 to 30. Howard reports that the first count of QSOs made by ZS6BBB during his recent DXpedition was: **ZS8,** 750 QSOs with 60 countries; **ZS9,** 925 QSOs with 64 countries.

FB8WW has been active from Crozet Is., usually around 14,040 kc/s, although 21,040 kc/s transmissions have also been reported. Operating periods have been spasmodic and the tonal quality of the signals has been poor.

The s.s.b. station offered by WA2WUV and the Long Island DX Association to the RAFARS has reached the UK and will be taken by G3HCL during March to the first place of operation in 9M2. It is hoped that there will be operation from VS4 and VS5, with in addition visits to some of the rare island groups lying in the Indian Ocean.

The DXpedition calendar now reads:

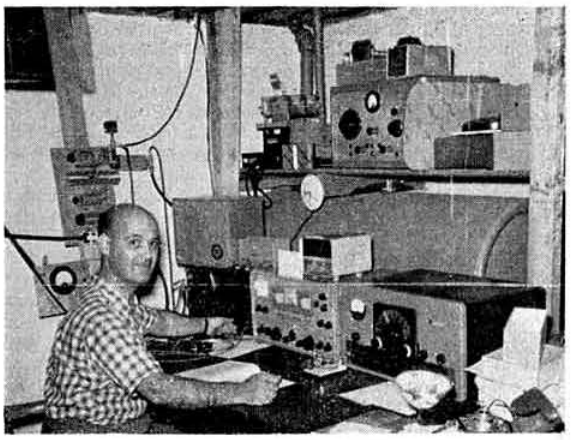
March 1. **XW8AH** by W4BPD.
March **JY4X** by HZ3TA.
March 6 **VP8HF** on S. Sandwich.
March 10 **VQ8BFC** (Chagos) by VQ9HB.
March **Navassa Is.** by W6FAY.
Late March **9M2** by G3HCL.

Top Band Activities

The Trans-Atlantic Tests and the *CQ* 160m Contest have provoked a considerable amount of interest in this band and the level of results is reaching an all time high. It seems probable that this is a combination of good operating and equipment and favourable conditions. Certainly a good QTH, radiowise, is a useful start for Top Band work and **G3IGW** selected Lochnaw Castle, nr. Stranrear, Wigtownshire, as the site of their operations over the *CQ* Contest period. The three aerials were about 60 ft. high and in the clear and consisted of a dipole NW/SE, a 414 ft. end-fed E/W, and a 300 ft. end fed running N/S. In all 38 trans-Atlantic QSOs were made and these consisted of eight W1, nine W2, four W3, two W4, two W5, four W8, one W9, six VE and two VO. The total of QSOs was 269, including 41 with OK. HK4EB and VP7NS were heard but no other non-European stations were worked. G3IGW and G3JML operating as GM3IGW/A are claiming a contest score of 41,905 points.

6YACZ reports hearing European signals earlier than last year and beginning at 04.30 GMT. G3GRL is the outstanding signal being audible for four hours during the *CQ* Contest, closely followed by DL1FF. Stations worked by 6YACZ recently include: CO7HQ, KZ5FC, HK4EB, HK7ZT, VP7NS, HR3HH, G3GRL, VE2 and 3, and all W districts except 6. UK stations heard but not worked include G3PU, G3OLI and GI6TK. The quietest spots on the band are given as 1805 to 1820 kc/s and 1990 to 2000 kc/s. **6YACZ** and **6YAXG** will both be active during weekends for the next two months, the former being crystal controlled on 1809 kc/s and using an aerial 300 ft. long and 120 ft. high. Obviously the new aerial at W1BB/1 does not favour Jamaica as the signal is about two S points down on last year.

Excellent Top Band logs have been received from **BRS19107,** John Hall, and **BRS20317,** Bill Wilkinson, and these appear in *Around the Bands*. BRS19107 comments that the K5 and VE4 were the first heard from these districts the latter being a very good signal at 07.28 on 1999 kc/s. W6VSS was heard at 07.08 and HR3HH was calling CQ G but was not heard to make any contacts. From the other side of the Atlantic W1WY, Contest Editor of *CQ*, found conditions good and worked the following UK stations on January 12: G3PQA (04.45), G3RBP (05.01), G5ZT (05.25), G3PU (06.20), and GW3FSP (23.20). W1WY was pleased to work G3PU directly after dusk (New York time) reporting his signals as a consistent RST569 for over an hour. Also worked was HR3HH on 1827 kc/s at 05.57.



Well-known Top Band exponent, VE2ATU.
(Photo via W1BB)

The latest issue of the **160 Meter DX Bulletin** from **W1BB** highlights eventful happenings on the band, of which probably the most interesting to UK readers was the first QSO on 1·8 Mc/s between England and Singapore on January 26 when G3GRL and VS1LP QSOd at 23.52 on 1805 kc/s. What is believed to be the first Top Band QSO between Europe and California was recorded when G3PU worked W6ML, the former also contacting K5HRR and W0GDH. W1BB/1 is at present keeping schedules with VS1LP and is hoping for another " first," in so far as the East Coast is concerned. The DXpedition to the Aaland Is., operating under the call OH2YV/0 made 200 QSOs on Top Band, and the transmitter and aerial are being left for the future use of OH0NI. OH2YV mentions that the OH0 area is very subject to heavy QRN.

Rounding off with comments from the African continent **5N2JKO** reports the band as being disappointing with almost a total absence of north-south propagation. Stations heard included GI6TK, G6VX, G3GRL, DL1FF and W1BB/1 and the greatest signal strength was S4 with the general level much lower. The best times were around 22.00 and 05.00 but at those hours the Europeans were giving fantastic signal reports to the North American stations and 5N2JKO could not make himself heard.

Contests

The results of the **USSR CW DX Contest** show five entries from England, those concerned being: G3EYN (1900 pts); G3NSY (1152); G3RIB (885); G2GM (870) and G3HAL (220). The USSR Contest in 1964 will take place between 21.00 May 9 to 21.00 May 10, and logs should be sent to Box 88, Moscow, postmarked not later than June 1, 1964. Study of the rules received from the Radio Sports Federation reveal no major change from previous years.

Participants in the **WAE DX Contest 1963** were: G2DC (55,554 pts.); G3EYN (23,820); G2AJB (4171); G3MWZ (746) and G3OLU (624).

The **Swiss H22 Contest** will take place from 15.00 April 18 to 17.00 April 19 on all bands from 1·8 to 28 Mc/s. Each Swiss contact counts for three points and the multiplier is

the sum of Swiss Cantons worked on each band, a possible multiplier of 22 per band. Logs must be sent within 30 days after the contest to HB9ZY, Traffic Manager, USKA, Meggen-LU Switzerland. This contest is an opportunity to make the contacts necessary to qualify for the H22 Award.

The **International SP DX Contest** will take place between 15.00 April 11 and 22.00 April 12, 1964, on all bands between 3·5 and 28 Mc/s. The multiplier in this contest is the number of Polish call areas worked on each of the five bands, i.e. a total possible multiplier of 45. Separate log sheets for each band are required and should be sent to reach the organizers not later May 31, 1964. The address for logs is: PZK, PO Box 320, Warzawa 1, Poland.

On the fifth anniversary of the **WOSA Award** the members of Antwerp-OSA will be taking part in a weekend contest during March 7 and 8. The participating stations will be recognised by their /OSA suffix. European stations need five QSOs to qualify for the WOSA Award.

The **Certificate Hunters' Club** annual **QSO Party** will take place between 23.00 May 29 and 06.00 June 1, 1964. Members of CHC and the Flying Hams Club will participate and will be looking for contacts with other CHC and FHC members and also with non-members (designated Hunt The Hunters, abbreviated to HTHers). The scoring system is that contacts CHC to CHC count one point; CHC to HTHer two points; any YL QSO is one additional point. For HTHers each QSO with a CHC member is three points, except YL CHC member which is five points. Contact with a FHC member counts one additional point to all. The multiplier is determined by the number of different continents, countries, VE/VO provinces and US states worked. The total score is arrived at by multiplying the points total by the multiplier total. Logs should be sent to K6BX, Box 385, Bonita, California, bearing a postmark within 30 days of the QSO Party.

To coincide with the CHC/FHC/HTH event, the **International SSB'ers** are holding their 1964 QSO Party which will run during the same period, but participation will be limited to two-way s.s.b. contacts only.

Awards

The **Royal Naval Amateur Radio Society** has instituted a new certificate called the **Mercury Award,** which may be claimed for contacts with RNARS members as follows:

Class 1 (UK stations) 20 points required.
Class 2 (European stations) 10 points required,
Class 3 (DX stations) 5 points required.

Points are awarded as follows: QSOs with member stations count one point: QSOs with HQ stations G3BZU/GB3RN count two points. Stations may be contacted on more than one band to score extra points. Only contacts after October 1, 1960, are valid. Claims from UK stations must be accompanied by QSLs, but overseas operators may submit a GCR list, and these should be sent to G3HZL, 153 Worple Road, Isleworth, Middlesex, together with a remittance for 1/6d. or six IRC.

The **Worked Upsala Radio Klubb Award,** with photos of worked members, is offered to every operator who collects three labels from different members. To claim the award the labels should be sent (or a GCR list) with ten IRC to Awards Manager, Upsala Radio Klubb, P.O. Box 12006, Upsala, Sweden. Only contacts after January 1, 1962, count, but there are no band or mode restrictions.

The **Radio Sports Federation** have notified the Society's Honorary Certificates Manager that the following charges for certificates will apply forthwith:

R-150-S, W-100-U and R-100-O, 14 IRC each.
R-15-R, R-10-R, R-6-K and Cosmos, 10 IRC each.

Around the Bands*

Excellent conditions on **1·8 Mc/s** during the past month have produced a lot of DX stations which enabled one regular listener to obtain four new countries. Contests helped to generate the activity and a record number of new stations have been heard for the first time from across the Atlantic. **A2340** (Plymouth) logged HK4EB on 1801 kc/s at 02.30 for a good start to the CQ test on January 25. Other notable stations heard were 9A1VU (22.00), OH2YV/0 (23.00), CO2CY (06.30), VP7NS (04.35), ZB1BX (05.00). Americans abounded during the dark hours from W1, 2, 3, 4, 8 and 0. The Europeans were also much in evidence including over forty OKs. GM, GW and GI stations were at good strength and GC3PAI/A was active from Sark. **BRS20317** (Bromley) confirms conditions and found the USA appearing by 22.15 GMT. During the CQ Contest, monitoring from 01.00-08.30 and 04.00-08.30 was very rewarding with 76 trans-Atlantic stations logged over the two days, 25 of which had not been heard on Top Band before. Three of these were three new countries, with a K5 in Texas for the first K5 ever heard on the band. Loggings included HK4EB (02.10/30), VP7NS (04.37), 6YACZ (05.40), 6YAXG (07.53), VE4RO causing much excitement and peaking S5 at 07.30, K5HRR (06.25), W6VSS (07.08) and W0AIH (07.10). **BRS19107** (Beckenham) found most of the above stations and adds many from VE1, VE2 and VE3.

G5ZT (Plymouth) found the CQ Contest very productive and worked 12 countries: G : GW : GM : DL : HB : PA : W : VE : OK : GC : VO and EI. Amongst the trans-Atlantic contacts were: VE1ZZ (02.55), W2EQS (04.31), W1FZ (04.41), VE3KE (04.48), W3MFW (04.50), W1WY (04.59), W2GGL (05.45), W4BVU (06.15), VO1BD (03.24), W8HAW (06.14), VE3BWY (06.59), whilst February 2 brought further N. American contacts including VE2UQ (05.30), W8HRV (05.52), W9PNE (06.24) and W2EQS (07.13). 6YACZ was heard at 06.14 but unfortunately no QSO resulted.

Conditions on **3·8 Mc/s** s.s.b. were good and world-wide contacts are reported by many correspondents. An interesting commentary from **5N2JKO** (Zaria, Nigeria) gives the picture from the other end for a change. Normally he is on 3·790 to 3·799 Mc/s from 20.00 on Wednesdays and Saturdays and after 21.00 on some other evenings. Conditions

* Compiled by J. G. Cottrell, G3PSY

QTH Corner

AP2AD	A. O. Ebrahim, Box 65, Lahore, W. Pakistan.
DL2AH	J. T. Worrall, 204 Sig. Sqdn. (Gds Bde Group), BFPO 44.
ET3GC	A.P.O. 843, New York, NY, USA.
FB8WW	via 5R8BC, V. Defaysse, PO Box 587, Tananarive, Malagasy Republic.
KV4DE	via K4SWN (correction)
LU2XL/9K3	via W5DOZ
SV0WF	via W2CPJ
VP2KJ	via W4SSU, E. C. George, 2278, Borge Rd., SW, Atlanta, Georgia, USA.
VP8HW	Box 48, Port Stanley, Falkland Is.
VQ1IZ	via K6PUC (home call).
VQ8BFC	via G8KS.
VS1MA	F/Sgt. J. Woods, Command Electronics, RAF, Changi, Singapore 17, Malaysia.
YS1MM	via W2CTN.
ZB2AH	via G3NPZ (home call).
ZK1AR	via K4SHB.
ZS2QK	Box 253, King William Town, Rep. of S. Africa.
ZD6PBD	Box 57, Limbe, Nyasaland.
9K2AN	Nasir Hussain Khan, PO Box 736, Kuwait, Arabia.
9L1TL	Tom Lloyd, Fourah Bay College, Freetown, Sierra Leone.
9L1 QSL Bureau	N. Henwood, 9L1NH, The Technical Institute, Congo Cross, Freetown.
9X5MH	via DL1ZK, Postfach 344, 5 Koln, W. Germany.

* * *

RSGB QSL Bureau: G2MI, Bromley, Kent.

are fair then, but not outstanding, and the QRM is something of a problem. However, in the mornings, from 05.30 GMT, the band is in excellent shape, and signals from Europe and the USA are up to S9 until about 06.15. 5N2JKO has been modifying his pre-going-to-work habits so that he can get on every morning from 05.40 to 05.55 GMT, and usually has three or four European QSO's. Not many G's up at that hour of course! He says there is not much point in giving a list of stations worked, since they are mostly the regulars, but he has had a few new countries for 80 metres this month like YV, OY, OH0 and 4U1ITU. Of the G's, G3DO deserves mention for handling the pile-ups that develop when he is on in the evenings. **A2498** (Evesham) has recently started serious listening on 80 metres and found EA9AZ (07.35), HZ1AT (21.30), KP4AWH (22.15), OX3JV (22.50), PZ1AX (22.10), TI2HP (07.30), W7PBS/VO2 (22.50), YV5AMP (08.35), ZL2AA (07.55), 7X2VZ (22.25), 9Q5AB (22.20). **D. M. Hayes, A3053,** using a new Heathkit RA1 receiver heard 4X4DK on regularly after 22.00, XE1IL and XE2OM (08.00), FG7XT (23.00), KZ5FC (07.00), PJ2AA (23.00) and ZL1AIX (06.30). DL7BA has been heard working into CE3 at 05.00. **BRS25901** (Worcester) reports good signals from K7EUA (08.35), HC8FNN (08.20), amongst others. **BRS20317** (Bromley) encountered a vast improvement to c.w. signals from the USA from 22.15 onwards. Signals up to S7 and continuing, particularly from Canada, up to 09.00 GMT. Signals from other areas included VP8GQ in the Falkland Islands (00.38), YA5A (00.50—c.w. and s.s.b.) and 9G1EI (00.47). VK5ZP at 19.15 on c.w. near the band edge gave Bill his second c.w. VK. Around 01.00 GMT, HK4DP, HV1CN, KV4CI and PY1BTX ranging S4 to 8 have often been received whilst LU1ACF, ZS1A and 9Q5AB are about between 04.30 to 05.00 GMT—weak but possible.

More and more stations seem to be acquiring verticals and are pulling in the DX on **7 Mc/s.** There is plenty to be found although not, perhaps, so much as in previous years. **G3PVS** (Woking) has found good signal strengths from many DX stations including VS1LU (17.58), VK5NO (18.20), MP4QBF (18.02), TF5TP (15.58), YA5A (11.30), VP2AV (11.30), SM5BKK/9Q5 (18.28) and HB9YG/4W1 (18.45). **G3POI** (Dulwich) has done well by finding AP5GB (00.07), KC4USK (00.16), MP4BEE (23.50), YA5A (00.19), VP7BG (23.54), HI8NPI (02.43), 6W8DD (20.32) and 9Q5AB (22.45). **G3AAE** (Loughton) also using a vertical made contact with VK0VK (20.30), UA1KAE/1 (20.20), 9A1VU (16.15), 4U1ITU (21.00), VU2PF (20.10), OD5LX (22.45), 6W8AC (19.20), ZD3A (20.00), ZS6FN (19.40) and EL2AD (20.30). **5N2JKO** in Zaria says whilst not often on the band he does hunt around 7025 at 18.30 to 19.30 on some evenings when Europeans are strong and workable.

BRS20317 (Bromley) reports his highlights for the month as TF5TP (15.00), AP5GB in East Pakistan (17.15) and strength 6, Japan not so good this year and only JA6YG (14.05) heard. From Oceania DU6TY (14.10), DU7SV (14.40), VK2NS (15.00), VK2QL (18.00) and ZL3KN (08.45) regularly. Many of the usual African DX stations were heard during the month whilst from the Americans the best signals came between 20.00-00.00. W6's were about and in particular VE8OR (15.30) and VP7NS (00.30) were recorded. The South produced VP8HJ from the Falkland Islands at 02.00, HK3VV (13.15), KZ5FC (22.10) and VP6LJ at 00.15. BRS20317 observes that next month should be better since BERU and ARRL contests ought to generate more activity.

A2340 (Plymouth) has submitted a very comprehensive list of stations heard on **14 Mc/s.** From Africa 5Z4IV (19.00), FB8XX (19.00), 6O6BW (21.00), 7X2NJ (21.07). Asia provided strong signals from MB4BEE after dark, RST 589 from AP5GB (00.00) and EP2SX (22.11). XZ2ZZ was heard in QSO with JA1PI for about 15 minutes at 19.15. A good selection of stations from the Western Hemisphere were recorded, notable amongst them being VP8GQ, although not so strong from S. Orkneys, KC4USK at 56/79 after 22.30 every night and VK5NO working Europeans at 22.00 GMT. As the days begin to lengthen so the close-down on 14 Mc/s gets later. Currently the band is staying open up to 19.00/20.00 GMT and conditions to South Africa and South America have been particularly good during the evenings. Other areas, however are well represented. **G3AAE** (Loughton) exchanged c.w. with VP8GQ (19.30), VP8HW (19.40), XE4SE (18.50), 7G1IX (17.00), 5T5AD (16.30), VK9DR (12.20), 3W8AD (15.10), VQ9HB (15.30), VQ8BT (15.30), VS4IH (16.00), FB8WW (15.45), 6O6BW (18.00), 9X5MH (14.40) and W4KKA/VS9 (14.50). **G3PSY** (Thorpe Bay) also on c.w. contacted ZS2GD, 5N2RSB/TY2, (18.52), OA4PF (19.47), HK3HY (20.10), CP5EZ (20.30) and heard many other countries from the same areas. **GM3ITN** (Clydebank) reports that the long path DX is still holding up well to VK and ZL with signals from VK4YP and VK2EO being most consistent. Japanese stations have also been workable and contacts were also made with HL9KA, KG6AOX and KR6JZ all between 08.00 and 10.00. **G8JM** (London) has been active on s.s.b. and worked KR6CF (09.35), 9K2AN (08.50), EP2AU (15.20), ZS8Z (16.03), ZE1AC (16.10), ZS1XR (16.45), ZP5DD (09.58), ZD6PBD (16.05), OH2AH/0 (09.45), VP9FJ (17.05), ZB2AH (10.20), 5T5AD, 5T5YL (10.45), YS1MM (13.28). **G3POI** (Dulwich) reports ZD3A (19.41), W4KKA/VK9 on Cocos (15.08), 5T5AD, (11.26), VU2FB (14.50) and FS7RT (16.10) all on c.w. **A2340** reports hearing the US Coastguard Ice Breaker *East Wind* in position 64°S 64°W operating KC4USE/MM. **A2498** (Evesham) says January was one of his best ever months for finding s.s.b. DX. An impressive list includes AP5GB (10.25), HS1S (13.10), KG6SA (09.10), LA9MI/P on Jan Mayen (13.05), 5N2RSB/TJ8, TU2AU (15.50), VP2's and VP3's, ZS6BBB/ZS9 (16.30), ZS7R (17.45), 9K2AN (13.20) and to top the lot WA1ANO/MM on the US Submarine *Piper* whilst submerged off the Spanish Coast at 19.35 GMT. In Nigeria, **5N2JKO,** reports the European path opening from 06.30 to 10.00 when the skip shortens and African signals become dominant. The path opens again around 17.00 and may remain as late as 22.00 GMT. He has not heard from the Pacific for some time but Oceanic openings appear from 13.00 to 17.00 whilst JA's are regular at 07.30. Good s.s.b. contacts have been made including FG7XR (20.20), FR7ZD (14.00), HB9AET/HZ (14.30), KC6BK (07.30), KR6, KX6, various Russian republics 4S7WA (14.00) and many others. Confirmation of many stations heard in the UK has been provided by A3699, A3233, BRS25901 and other correspondents who are thanked for their reports.

G2BJY (Walsall) used 100 watts and a dipole to contact AP5HQ (12.08), EA6AM (11.20), F9UC/FC (11.35), MP4TAS (12.15), OH2OH/0 (12.14), W7ITN (17.20), W7UZE (16.10), UH8, UM8, UF6, UL7 and many North American stations including K0BLT who is said to be the only station in Boyd County, and sought after by those chasing the USA-CA.

On **21 Mc/s** lack of activity is the chief shortcoming. **G3PVS** (Woking) reports that ZE1AS has been worked at 14.30 GMT and is looking for UK QSOs every Wednesday at this time. On s.s.b. **A2498** (Evesham) heard CR7CR (15.00), KP4BLC and CF (14.30), KZ5LW (15.50), 5N2JKO (13.20), ZS1TZ (15.25), ZS6AOW, BCT, VX (15.30) whilst a.m. yielded CR6JL (15.25), CR6GO (11.20), TT8AM and AN (11.00). VP6AQ (13.10), VS9AE (10.45), ZE7JR (09.45), 5N2CKH (11.25), 9G1DM (14.45) amongst others. **5N2JKO** (Zaria) says that even the BBC has been struggling to make itself heard on 21·47 Mc/s, so finds it not surprising that few Europeans have been worked recently. Occasional openings to the USA occur around 15.00 to 16.00, otherwise African and Southern European stations are mainly heard. 5X5IH and 5X5JK were worked recently and 5N2JKO has

now worked all seven licensed amateurs in Uganda as well two who were not!

No reports for **28 Mc/s** except from **5N2JKO** who says CT1 and CR6 have a path open between them regularly.

DX Briefs

ZL4LY has been reported as active from **Campbell Is.** on 14 Mc/s c.w.

The VP3RW at present heard on 14 Mc/s is a pirate, and and VP3YG adds that the former holder of this call, which has not been legally used since 1961, is now GW3ENZ.

CE9AT on S. Sandwich Is. has not been heard on 14 Mc/s c.w. but his operating hours are usually such that there appears to be little chance of this station being heard in the UK.

CR4AD is sporadically active during the early afternoons on crystal frequencies of 14,105, 14,121 and 14,127 kc/s using s.s.b.

Contrary to information appearing elsewhere G2BVN is *not* the QSL manager for **VP3YG,** and does not appreciate the many QSLs now being received for Des, who has been in Europe for the last two months.

ZD6PBD (Limbe) is now using a Viceroy and KW500 and hopes to be able to put up a beam in the near future. QSLs may go the Hammerlund DXpedition address, but direct applications to Box 57, Limbe, will be answered.

After a brief spell of operation in North Yemen **HB9AET** is now back in Switzerland and was worked by **5N2JKO** as HB9AET/HZ.

JT1CA reports the following stations now active in Mongolia: JT1KAA, JT1KAG, JT2KAA, JT4KAA, JT1AD, JT1AE and JT1AG, all of whom operate c.w. only.

* * *

The co-operation of correspondents is much appreciated and acknowledgment is made to the West Gulf DX Club *Bulletin* (W5IJG), the LIDXA *Bulletin* (W2MES), *DX'press* (PA0FX), and the *DX'er* (WA6TGY). Please send all items to RSGB Headquarters to arrive not later than **March 6** for the **April** issue and **April 10** for the **May** issue.

Measured Frequencies of Two Metre Stations

By D. V. NEWPORT, G3CHW*

DUE to the congested state of the low frequency portion of the 2m band, it became desirable that western area stations should know their frequencies as accurately as possible in order to avoid guard and beacon frequencies and interference with each other. This all goes to prove that there is activity in the South West despite the protestations of others.

While the frequency measuring equipment was set up, it was no problem to check other stations as they were heard, and it became apparent from subsequent QSO's that knowledge of the measured frequencies would be of general use, especially perhaps as an aid to calibration and selection of a crystal to avoid potent local signals. The list is by no means complete, but things being what they are, those entered can be regarded as pretty active stations.

Stations as far north as possible were measured in order to provide some sort of national coverage, but it is regretted that no GM or GI stations are recorded. The only occasion on which they broke through was during the October, 1963 aurora and the writer was far too busy trying to work them, completely without success it may be added.

The measuring equipment used was a Marconi Instruments Counter/Frequency Meter Type TF1417 with a Counter Range Extension Unit Type TF1434/2 for frequencies up to 220 Mc/s. The frequency meter is completely transistorized with digital in-line readout, and has a stability of 2 parts in 10^{-7}. In general, measurements were made to the nearest 100 c/s.

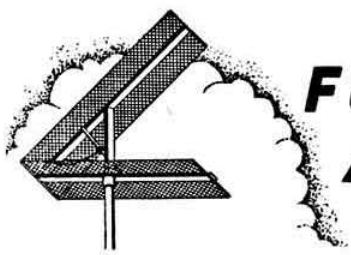
A word of caution is necessary in so far as some stations are known to be v.f.o. controlled and that in any event, few are stable to 100 c/s. Some stations are remarkably good and others were noted to have a change of several kilocycles, Presumably, as in the writer's case, it depends on how long the transmitter has been on. Nevertheless, if the frequencies are taken to the nearest kilocycle, a useful exercise will have been made.

As a cross check, attempts were made to measure the Wrotham beacon, GB3VHF, but at the time the station could not be heard in Bristol. However, by setting up the receiver and waiting, a few pings were ultimately resolved and so far as could be made out it was about 400 c/s high and therefore in line with the BBC measurements.

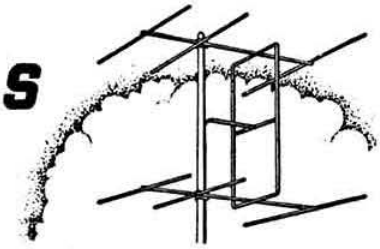
Acknowledgments are made to the writer's employers, Marconi Instruments Ltd., for permission to publish this article.

* 38 Huckford Road, Winterbourne, Bristol.

Call-sign	Measured frequency (kc/s)	Date
GB3CTC	144,105	Various
G2DQ	144,697·85	9.10.63
G2MQ	144,771·5	16.9.63
G2BHN	144,224·8	7.10.63
G2CRG	145,628·0	19.9.63
G2CZM	145,136·8	11.10.63
G2HIF	144,091·14	16.9.63
G3BA	145,114·9	19.9.63
G3HQ	144,469·73	16.9.63
G3YH	144,097·7	16.9.63
G3AQX	145,827·5	10.10.63
G3BLP	144,969·3	9.10.63
G3CHW	144,352·5	
G3DFL	145,479·1	10.10.63
G3DKF	145,219·0	20.9.63
G3EDD	145,140·69	16.9.63
G3EGK	144,387	10.10.63
G3EHY	145,017·2	20.9.63
G3EKP	145,756	10.10.63
G3FAN	144,667·9	10.10.63
G3FIH	144,039	29.9.63
G3FNM	145,342·2	10.10.63
G3GYQ	144,167·1	9.10.63
G3HKA	144,075·95	17.9.63
G3IFV	144,397·77	16.9.63
G3IRS	144,069·56	17.9.63
G3JXK/A	144,923·7	7.10.63
G3JXN	144,917·6	17.9.63
G3KHA	144,624·12	17.9.63
G3KUJ	144,287·6	20.9.63
G3KXA/P	144,590·5	29.9.63
G3LTF	144,962	9.10.63
G3LYD/M	144,488·97	16.9.63
G3MCG/M	144,688	16.9.63
G3MRA	144,386·9	19.9.63
G3MTG	144,039·67	16.9.63
G3NEO	145,678·6	9.10.63
G3NIL	144,261·7	10.10.63
G3NIL	144,357	10.10.63
G3NNG	144,093·77	16.9.63
G3OCB/P	144,020·2	17.9.63
G3OJY	144,126·5	17.9.63
G3OUK	144,427·23	29.9.63
G3OVQ	145,195·7	20.9.63
G3OYF	144,477·68	16.9.63
G3PBV	144,744·8	20.9.63
G3PGS	145,738	10.10.63
G3PHZ	145,216·6	16.9.63
G3PTM	145,272	10.10.63
G3RMB	145,178·53	16.9.63
G3RND	145,784·5	9.10.63
G3SNM	145,793·3	10.10.63
G4DC	145,056·6	22.9.63
G4GA	144,756·8	9.10.63
G5DF	144,137·3	20.9.63
G5DS	144,544	22.9.63
G5DW	144,169·08	7.10.63
G5IG	145,760·9	11.10.63
G5TZ	144,205·5	19.9.63
G6GN	144,326·6	16.9.63
G6OX	144,746·3	Un-recorded
G8VJ	145,145·7	7.10.63
GC2FZC	144,245·5	11.10.63
GC3OBM	144,223·3	11.10.63
GW2HIN	144,398·7	16.9.63
GW2HIN/P	144,450·37	16.9.63
GW3ATM	144,246·8	9.10.63
GW3LJP	144,134	29.9.63
GW3MFY	144,361·15	16.9.63
GW3PDI	144,435·5	19.9.63
GW5BI	144,412·4	9.10.63
GW8NP	144,305·5	20.9.63
GW8SU	144,279·25	9.10.63
GW8UH	144,391	17.9.63
F3XY	144,728	19.9.63
F8MX/A	144,157	19.9.63



FOUR METRES AND DOWN



By F. G. LAMBETH, G2AIW *

TO many v.h.f. operators the annual " 144 Mc/s C.W." is the most interesting of all contests. Past experience has amply demonstrated that even when " conditions are rock bottom " (as the terminology has it), and rain and high winds outside presage little hope of DX, the DX in fact is there. Weak and watery c.w. signals rise sufficiently above the noise level to produce a goodly crop of points for participants and demonstrate once again that 2m is more continuously open than many operators who never touch the key may imagine.

During the January 26 event the best path, as observed in the Home Counties at any rate, seemed to be running east-west. Many southern operators had no difficulty in raising West Country stations when the latter were beaming north.

The widespread use of QML, QHM and other indications of tuning direction helped enormously in the timing of calls put out in response.

But it also encouraged certain operators to slip in that out-of-zone crystal in order to make sure of being heard first by a choice piece of rare-county DX.

If everybody did this the Band Plan would degenerate into anarchy, observes one Hertfordshire operator, who adds trenchantly:

" We should remember that contests are *le sport*, and it doesn't *really* matter who wins so long as everyone obeys both the letter and the spirit of the contest. And we are required by the contest declaration we sign to adhere to ' the spirit ' of the event. Poachers don't, in my view. To their boasts of rare catches made on Two, the conscientious operator will feel inclined to reply: ' Yes, but you got them by purposely taking an unfair advantage. If you played fair you'd be a lot lower in the lists! ' For cheating cannot go undetected."

The following are some claimed scores in the 144 Mc/s C.W. Contest, 1964. They are not official results, and are subject to checking.

Low Power Section

G3NNG	1585	G3CHW	1300
G3ICO/P	1455	G8KL	1270
G3KEU/A	1450	GM6XW/P	820

High Power Section

GW5BI	1865	GW3MFY	1570
G3LTF	1630	G5DF	1525
G6GN	1580	GC2FZC	635

Two Metre News and Views

G3BJD (Seascale, Cumb.) found January a good month. A minor opening on the 16th indicated by Channel 9 interference, produced G3LBA (Surrey) and G3MTG (Somerset). GC2FZC was also heard at 559, G6NB 58, G5TZ 56 and G2JF 56. The afternoon of January 18 gave an excellent opening with intense TV interference. The beacon was S8, the strongest yet heard. Many stations in the south were worked and among those heard was F8VN, 579, who was called frantically but with no result. The 144 Mc/s C.W. Contest on the 26th enjoyed a high level of activity and began with fair conditions which gradually deteriorated. G3BJD's best QSO was with GM6XW/P (Stirling) to the north, and G5MA, G3GWL, G3NNG and G6NB to the south.

G2JF (Wye, Ashford, Kent) reports that extended tropo propagation in excess of 400 miles was possible during January, on the 3rd and 4th and 18th to 22nd of the month inclusive. The longest path contacts were with SM stations quoting a QRA location with an HR prefix, which puts them on the eastern side of Sweden. Normal tropo propagation which is generally about 200 miles from G2JF's well sited and equipped station, has been well maintained during the whole of the month, with the possible exception of the odd day. In retrospect, January was an excellent month, producing 181 continental contacts and 169 UK contacts.

G3SML (Earl Shilton, Leics.) started on 2m at the beginning of December, and has been very pleased with the results achieved so far with simple equipment. Nine counties have been worked so far on an SCR522 running at 22 watts with an aerial (4-element Yagi) at 16 ft. (a 7-element aerial is now under construction). The receiver is a home built superhet with a crystal controlled second oscillator and a much modified RF27 unit.

G3CCA (Oadby) loaned the first of his parametric amplifier prototypes to G3CKQ (Braunstone, Leicester), who is in a very poor location and had never heard the Cornish beacon. He was then able to receive the beacon, at S3/4, but at a time when everyone was complaining of bad conditions. This test certainly proved that parametric amplifiers are very useful in all locations. G3CCA has recently worked G3XC and G2BHW (both in Cornwall), and it is interesting to note that G2BHW was only using about 10 watts and could not be heard on the Nuvistor converter. Changing over to the parametric brought him in at S6/7 peaking S9. Apart from these, weekly skeds with G3RND (Pontefract) and G3AZT (Abingdon) are going well. F3XY and F2VB have also been worked.

G3CCA reports a very special QSO on February 7 when he worked G3AZT (Abingdon) at 68 miles. G3AZT was transmitting c.w. from a transistor transmitter, power 40 mW, and was received on the parametric converter at 5-4/5-9.

G3EMU (Canterbury) reports that his two skeds with Amsterdam are still kept, but they have not been wholely successful lately. They have perhaps two solid QSOs each week, and sometimes S8 when least expected! With reference to DARC awards, G3EMU thinks that DJ/DLs will have to improve on their QSL average to make claims possible, if his experience is anything to go by!

G5ZT (Plymouth) worked HB9LN (59-58) on January 26 at 14.06 GMT. Apart from this, the locals, Cornish stations, Gloucester, Wales and Dorset are sometimes worked, but otherwise all is quiet.

A3603 informs us that G3MTI is again active on 2m.

* 21 Bridge Way, Whitton, Twickenham, Middlesex. Please send all reports for the April issue to arrive by March 6, and for the May issue by April 10.

V.H.F. QSY

Members who wish to acquire or dispose of crystals in connection with the British Isles Two Metre Band Plan are invited to send details to " V.H.F. QSY," RSGB BULLETIN.

Crystals Required
by D. Markland, G2BNZ, 29 Rumworth Street, Bolton, Lancs. 10X type at or near 8092 kc/s.

Crystals Offered
By D. Markland, G2BNZ, as above. Brookes 10X type at 8012 kc/s.

G5MA (Gt. Bookham) had some useful contacts during January, including DL6EH (c.w.) HB9LN (second QSO on phone), GI5AJ (c.w.), GM3FYB (c.w.), G3RHE (Cumberland, phone), G3BJD (Cumberland), (c.w.), G2FO (Co. Durham, c.w.), G3JYP (Westmorland, c.w.), and GW2HIY (Anglesey, c.w.). This is a very good mixed bag in a relatively dead period.

G3OCB (Stithians, Truro) found January rather better than expected, in fact much better than last year for local activity, with G3XC, G3OCB and G2BHW on during most evenings at 21.00 GMT. G3NVJ, G3IGV, G5ZT and G3KHU join in occasionally. Others heard from time to time were G3EKM, G2DOT and G3IEA. Tropo propagation has been better, and G6GN is often a very good signal. Others heard or worked include G3ICO, G3OBD, G3BA and G5TZ. During the opening some of the locals worked quite a few Gs and GWs, including G3CCA, which produced much discussion on parametric amplifiers. Operation was possible for only a short period during the January C.W. Contest, and only a few weak signals were heard. The band did not appear to be in very good shape, and it was therefore surprising to hear G5ZT working HB9LN. The HB was only S4/5 on peaks, but S8/9 with G5ZT. A weak French station was also heard, but nothing more.

G2BJY (Walsall) found conditions poor up to early February, although there was a fairly good G opening around January 21. The usual Lancashire and Yorkshire regulars were S9, and G3OHT (nr. Hull) and G3AZU (Bradford) were worked. Similar conditions prevailed to the south and south east, and G4IB (Tunbridge Wells) was worked for the first time. G3AHB (Slough) was also worked. During the contest, conditions were fair. Signals from a radius of 150 miles were above average, most stations being S7/9+, but although there was much activity, nothing outstanding was heard or worked. Many stations were heard and worked from over 100 miles during four hours of operation, the best DX being GW5BI (Cardiff), G3IOO/P (Dorset), G3GVM/A (Worthing), G3EIX (Danbury) and G2AIX (Tadley, Hants.). The Bristol area was well represented, but nothing was heard further south, or, for that matter, further north than Yorks./Lancs.

G3MTG (Bridgwater) now has a 6-over-6 aerial at 30 ft., and worked G3BJD (Seascale) on January 16, and EI2A on the 24th. January 18 was celebrated with two consecutive QSOs with PA0FB, the first lasting 45 minutes. No signals were otherwise audible except for GB3VHF (S9+). PA0FB returned to say that he could hear no other signals and another QSO ensued for 20 minutes. The only time G3MTG heard BBC u.h.f. TV was through PA0FB! However, 42 different stations were worked during January.

BOOK THE DATE—

TENTH INTERNATIONAL V.H.F./U.H.F. CONVENTION

Saturday, May 16, 1964

Kingsley Hotel, London

After having been QRT since 1950, **G3AHB** (Slough) returned to the band last April with a 6-over-6 at 45 ft., 40 watts input to an 829B, and a 6CW4 converter with a measured noise factor of 3·1db. During January, stations worked rose from 170 to 250, including HB, DJ, and the counties of Denbighshire, Cheshire and Anglesey. In spite of a poor and noisy QTH, 32 counties and seven countries have been worked. G3XC's efforts in beaming east resulted in a fine QSO in January. G3AHB says that he believes in short QSOs, and that many QSOs are lost through " rag chewing," which prevents others from working the DX.

The first note for a long time from the far north comes from GM3ENJ (Dunfermline), who says that just before Christmas, GM3FYB travelled north up the Aberdeen coast, while GM3IQL and GM3ENJ went south down the Berwick coast. Four stops were made, and 2m contacts were achieved between the two stations at distances of up to 125 miles. This may not seem much, but it was very good fun, especially when GMFYB reported being stuck in a field just south of Montrose!

GM3IQL/ENJ had a Withers transmitter and Twomobile receiver, whilst GM3FYB had a home-built transmitter with a transistorized modulator, and a Twomobile receiver was used.

GM3ENJ is now active on c.w., and RTTY on all bands and c.w. on 2m.

G3WW (March), who used to be very active on v.h.f., has raised a point about the " Four Metres and Down " awards. He queries the date limitation imposed on applications for the certificates, and thinks that many people (including himself) may be precluded from claiming, as most or all of their QSOs may have been made prior to the commencing date. This point was put to the Chairman of the V.H.F. Committee who commented that, when considering the introduction of these awards, the Committee was of the opinion that all intending claimants should start off "on the same foot " to give the then newcomers to the band an equal incentive. The certificates are also intended to encourage band activity, and by having a qualifying date could reactivate the interest of some of the stations (like G3WW) who used to be so well known on v.h.f. in earlier years. Incidentally, G3WW is using a 5m QSL with FA8 in a claim for ARRL phone DXCC!

G3NPF (Rochford, Essex) now has two new aerials, a 4-over-4 for 2m at 22 ft. and an 8-over-8 for 70 cm at 30 ft. The QTH is also new, 4 miles north of the previous one. The transmitter is the same 150 watt model using a pair of 4X150As modulated by a pair of TZ40s. The receiver is also as before.

Four Metres

G3FDW (Seascale) is now using single sideband, but unfortunately nobody appears to be able to resolve it apart from G3PLX.

G3RPE (Hemel Hempstead) has been doing rather well from a poor QTH which is almost entirely shielded by hills to the north. Fifty-three stations in 14 counties have been worked during the past 12 months, with all but one on phone. The best DX has been G3EHY (Banwell), and G2AIH when working /A at Swansea. The present equipment is: transmitter: EF80—5763—5763—829B at 50 watts; modulation: EF86—12AU7—2 × 807 in class AB1; receiver: G3IIR/G3FZL converter (October, 1962 BULLETIN). This performed very well in the London area, but suffered badly from second channel TVI when /A in South Wales. The aerial is a 4-element Yagi of G5FK design, at 30 ft. As a newcomer to transmitting, G3RPE found starting on 4m an advantage over 160m. Because of the absence of QRM and QRN, operating proved to be much simpler and the comfortable phone range much greater at about 50 miles. The limited periods of activity assure a welcome for new stations. An

SCOTTISH V.H.F. CONVENTION
The Mill Hotel, Rutherglen, Glasgow
SATURDAY, APRIL 18, 1964

The programme will include lectures during the afternoon and a dinner in the evening.

The Council of RSGB will be represented by the Society's V.H.F. Manager, R. C. Hills, G3HRH. Further information may be obtained from W. B. Miller, GM3PMB, 14 Clamps Wood, East Kilbride, Glasgow.

Organized by West of Scotland V.H.F. Group

G3EMU (Canterbury) now has a QQV03/20 on 433·5 Mc/s, and hopes to be on the band a little more this year.

G5ZT (Plymouth) is currently working **G2DOT** and G3KHU on this band.

In the early hours of October 21, 1963, OK1EZH/P made contact with HB9RG on the 70cm band (from *Amaterske Radio*, December, 1963).

Amateur Television

G5FS/T (Bristol Technical College) has received reports of good pictures from G3RUJ, GW3ATM and G3OYM/T. A peak power of 60 watts at peak white to a QQV06/40A feeds a 16-element rotary aerial array. It is hoped to include particulars and circuit of a 430 Mc/s converter for feeding a TV receiver (developed at Bristol Technical College) in *Four Metres and Down* next month.

Twenty-three Centimetres

G3NBQ (Coventry) reports on extensive tests and constructional work which is taking place with the collaboration of G3KEF and G3RYB/T. More work has been done on the QQV04/16 tripler, but it seems that they have so far been pushing both the valve and their luck a little far, for the apparatus will not function above 1000 Mc/s. Work on a 2C39A tripler is also proceeding. On February 2, a trip to Meriden Hill, six miles north-west of Coventry, gave some interesting results.

The idea was to receive and possibly work G2CIW, G3KPT and G3KFD and to find out how good the site was; G2CIW was worked on 2m and a switch made to 23cm where he was S9+ on phone. G3KPT was then worked S7 on phone, but G3KFD was not heard. The QSOs were crossband, as the portable transmitter did not function. The results, however, were very pleasing, as the 8-over-8 was only 12 ft. off the ground. More tests will take place later using 70cm as a link and G3NBQ's 4 ft. dish as the aerial, which will give 3-4 " S " points over the 8-over-8. Future expeditions to Northants are also envisaged. G3KPT and G2CIW made contact on 23cm for the first time without pre-arrangement. G3KPT has to beam at a shale heap in order to give G2CIW the optimum signal, which means that his aerial is end-on!

G2CIW heard G3FP five times and worked him twice in the January period; G2CIW has now improved his 2C39 tripler. Instead of 2 watts output he now obtains 10 watts (measured with a professional instrument), which makes him 589 on c.w. and 57 on phone with G3NBQ, a considerable and very useful improvement. G3RYB/T is now constructing a 23cm converter and a 2C39A tripler.

Coventry Night on the Air is now on Thursdays at 1900 hours as well as Wednesdays.

GM5VG (Glasgow) and **GM3FYB** (Dunfermline), both of whom are active on 1296 Mc/s, hope to make two-way contact shortly.

Overseas News

We have been asked to say that the SRKB V.H.F. Contest of 1964, organized by the Students' Radio Clubs of Belgrade, will take place on April 4 to 5, 1964. The contest will be on 2m and 70cm.

We have just received the results of the 1963 SRKB-UKT (V.H.F.) Contest, which was won by OK1KKL with 14,688 points. YU1EXY/P was second with 10,464 points. There do not appear to have been any British entrants, although entries were sent from as far away as Sweden.

* * *

Many readers have recently written expressing thanks for, or appreciation of, this column, and the writer wishes to acknowledge these kind thoughts, which are very encouraging.

RSGB QSL Bureau Sub-Managers

The following is a list of the RSGB QSL Bureau Sub-Managers showing the call-sign groups for which they are responsible:

G2:	S. Marsh, G2CZU, 10 Vernham Grove, Odd Down, Bath, Somerset.
G3, 4 and 5 two-letter calls & GC	E. G. Allen, G3DRN, 65A Melbury Gardens, London, S.W.20.
G6 and G8:	A. J. Mathews, G6QM, 62 Ashlands Road, Hesters Way Estate, Cheltenham.
G3AAA-BZZ;	C. C. Olley, G3AIZ, 157 Wanstead Park Road, Ilford, Essex.
G3CAA-DZZ:	C. A. Bradbury, B.R.S. 1066, 13 Salisbury Avenue, Cheltenham.
G3EAA-HZZ:	W. J. Green, G3FBA, 790 Rochester Way, Sidcup, Kent.
G3IAA-KZZ, B.R.S. and A numbers:	T. D. J. Miles, G3NXR, 7 Hampden Road, Wantage, Berks.
G3LAA-MZZ:	C. Harrington, B.R.S. 2292, 91 Brabazon Road, Hounslow, Middlesex.
G3NAA-NZZ:	C. R. Emary, G5GH, 133 Fairlands Road, Thornton Heath, Surrey.
G3OAA-PZZ:	J. H. Brazzill, G3WP, 43 Forest Drive, Chelmsford, Essex.
G3RAA-RZZ:	K. Walden, G3OLN, 250 Gloucester Road, Cheltenham, Gloucestershire.
G3SAA-SZZ	E. G. Allen, G3DRN, 65A Melbury Gardens, London, S.W.20.
GD:	T. R. Moore, GD3ENK, " Glyn Moar," St. John's, Isle of Man.
GI:	R. R. Parsons, GI3HXV, 45 Erinvale Avenue, Finaghy, Belfast.
GM:	D. Macadie, GM6MD, 154 Kingsacre Road, Glasgow, S.4.
GW:	J. L. Reid, GW3ANU, 28 Waterston Road, Gabalfa, Cardiff.
DL2:	4027469 C/T Griffiths, DL2OX, 212 Hohenzollern Str., Munchen Gladbach, Germany.

Cards must be sent to G2MI but envelopes may be sent to the appropriate Sub-Manager or to G2MI. Printed and gummed labels are obtainable from G2MI by sending an s.a.e.

The address of the QSL Bureau Manager (Mr. A. O. Milne, G2MI) is 29 Kechill Gardens, Bromley, Kent.

Society News

Committees of the Council 1964

The following members have been appointed to serve on the committees of the Council for 1964.

Contests. *Council Members:* J. C. Foster (G2JF), J. C. Graham (G3TR). *Non-Council Members:* M. D. Bass (G3OJE), R. S. Biggs (G2FLG), D. A. Findlay (G3BZG), R. L. Glaisher (G6LX), M. Harrington (BRS20249), W. H. Matthews (G2CD), H. W. Rees (G3HWR), M. C. W. Sandford (G3PIT), D. W. Wyatt (G3PNW), Mrs S. Wyatt (G3PNX), R. A. Wybrow (G3JVJ).

Education. *Council Members:* L. E. Newnham (G6NZ), G. M. C. Stone (G3FZL), J. W. Swinnerton (G2YS). *Non-Council Members:* D. J. Bradford (G3LCK), K. L. Smith (G3JIX), P. W. Winsford (G4DC), D. W. Wooderson (G3HKX).

Exhibition. *Council Members:* J. C. Graham (G3TR), L. E. Newnham (G6NZ), E. W. Yeomanson (G3IIR). *Non-Council Members:* A. J. Gibbs (G3PHG), G. W. Norris (G3ICI), F. F. Ruth (G2BRH), P. A. Thorogood (G4KD), R. G. B. Vaughan (G3FRV), C. Waterman (G3NKX), A. J. Worrall (G3IWA).

Finance and Staff. *Council Members:* N. Caws (G3BVG), J. C. Graham (G3TR), E. G. Ingram (GM6IZ), L. E. Newnham (G6NZ), G. M. C. Stone (G3FZL), E. W. Yeomanson (G3IIR).

GPO Liaison. *Council Members:* L. E. Newnham (G6NZ), R. F. Stevens (G2BVN), J. W. Swinnerton (G2YS), R. L. Varney (G5RV), E. W. Yeomanson (G3IIR).

Headquarters *ad hoc* Building. *Council Members:* N. Caws (G3BVG), E. G. Ingram (GM6IZ), R. F. Stevens (G2BVN).

Membership and Representation. *Council Members:* H. A. Bartlett (G5QA), J. C. Graham (G3TR), R. H. James (GW3BFH), F. K. Parker (G3FUR), A. D. Patterson (GI3KYP).

Mobile. *Council Member:* F. K. Parker (G3FUR). *Non-Council Members:* G. C. Clark (G3NJL), C. Fenton (G3ABB), M. A. C. McBrayne (G3KGU), N. O. Miller (G3MVV), P. W. Winsford (G4DC).

RAEN. *Council Members:* L. E. Newnham (G6NZ), E. W. Yeomanson (G3IIR). *Non-Council Members:* G. A. Allcock (G3ION), E. R. L. Bassett (BRS 16075), R. Ferguson (G4VF), Dr A. C. Gee (G2UK), J. D. Kingston (G3VK), E. A. Matthews (G3FZW).

Scientific Studies. *Council Members:* R. F. Stevens (G2BVN), G. M. C. Stone (G3FZL). *Non-Council Members:* W. H. Allen (G2UJ), R. G. Flavell (GM3LTP), H. L. Gibson (BRS 1224), C. E. Newton (G2FKZ), Dr W. E. D. Parker (G6BY), D. G. Thorpe (G3OBT).

Technical. *Council Member:* R. F. Stevens (G2BVN). *Non-Council Members:* W. H. Allen (G2UJ), D. N. Corfield (G5CD), G. C. Fox (G3AEX), G. R. Jessop (G6JP), J. W. Mathews (G6LL).

TVI/BCI. *Council Members:* L. E. Newnham (G6NZ), J. W. Swinnerton (G2YS), F. K. Parker (G3FUR), R. L. Varney (G5RV), E. W. Yeomanson (G3IIR).

V.H.F. *Council Members:* N. Caws (G3BVG), R. C. Hills (G3HRH), G. M. C. Stone (G3FZL). *Non-Council Members:* W. H. Allen (G2UJ), P. Balestrini (G3BPT), D. N. Biltcliffe (G6NB), F. E. A. Green (G3GMY), F. A. Griffiths (G3MED/T), J. H. Hum (G5UM), A. L. Mynett (G3HBW).

The President is an ex-officio member of all Committees.

Headquarters Fund—List No. 23

The following is the 23rd list of those who have contributed to the Headquarters Fund:
H. G. Price (B.R.S.23444), H. F. Nell (G2ABB), E. Somerville (B.R.S.25693), N. C. Haigh (G3NUC), B. Speakman (B.R.S.23256), H. E. Bull (G3ABM), A. G. Mabbutt (G3ILL), G. V. Haylock (G2DHV), R. Heath (G3OAN), W. H. Brownson (G3NYI), J. B. Foster (G3IIT), J. H. Young (G3RWY), J. Barton (A.2737), E. H. Trowell (G2HKU), E. Rayner (G6IO), S. J. Stansfield (WA8GDR), Stockport Radio Society, T. Edgar (G3BZZ), N. C. Hews, Cpl D. F. Higgins (DL2DP/6O2AB), K. R. Davis (G3GPL), J. O. Dykes (B.R.S.2036), E. Early, (F8ZF), J. R. Gazeley (B.R.S. 20533), P. J. McGoldrick (A.2379), L. Boor (B.R.S.22653), N. P. Sjostedt (F.R.S.345), A. R. Wakeman (B.R.S.25492), R. W. Peters (G3JXV), P. J. Atkins (G3RJU).
Total amount contributed to February 4, 1964: £1905 17s. 7d.

RSGB Tape Library

A recorded talk by John Clarricoats, O.B.E., G6CL, entitled *My Golden Jubilee Year*, is now available in the library to RSGB Groups and Affiliated Societies. In this talk, Mr. Clarricoats turns the pages of his diary and recounts events from 1912 to 1963 both in his own life and in the history of the RSGB.

The tape is recorded at 3¾ i.p.s. on a 5 in. spool, and runs for 75 minutes. Applications to borrow this and other tapes in the library should be addressed to the Honorary Curator, N. C. Ta'Bois, G3HWG, 81 Snakes Lane, Woodford Green, Essex.

Another Pirate Fined

On January 27, 1964, at Hatfield Magistrates' Court, Peter Coot of 23 Briars Lane, Hatfield, Herts., pleaded guilty to a charge of using wireless telegraphy apparatus without the necessary licence. He was found guilty, fined £5, and ordered to pay £4 4s. costs and to forfeit his equipment to the Postmaster General.

DARC Third International Meeting at Lake Constance

This meeting is being held on the weekend of June 27/28 at Constance, on Lake Constance, and members of the RSGB will be most welcome.

As in previous years, those interested in obtaining a temporary German licence may do so on production of their own national licence.

Further information may be obtained from Otto Blankenhorn, DJ1TC, Sophienstr. 178, 75 Karlsruhe/Baden, West Germany.

Resignation of Miss Gadsden

Miss A. M. Gadsden resigned from the Headquarters Staff on December 31, 1963, after more than 34 years' service to the Society.

It is believed that many members would like to contribute towards a presentation to her. This is of course over and above arrangements made by the Council in connection with Miss Gadsden's pension.

Members who wish to contribute are asked to send donations to the President, Mr. G. M. C. Stone, G3FZL, who has agreed to act as treasurer for this presentation, at 10 Liphook Crescent, Forest Hill, London, S.E.23. Cheques should be made payable to G. M. C. Stone, No. 2 A/c.

LONDON LECTURE MEETINGS

Friday, March 13, 1964
"RADIO ASTRONOMY"
By Frank Hyde, F.R.S.A., F.R.A.S.

Friday, May 1, 1964
"AERIALS"
By H. V. Sims (Head of Engineering Maintenance Section, BBC)

at the

Institution of Electrical Engineers
Savoy Place, Victoria Embankment, London, W.C.2.

Buffet tea 6 p.m. **Lecture 6.30 p.m.**

Headquarters Office Hours

Members may like to know that the business hours at Headquarters are from 9.30 a.m. to 5 p.m. Mondays to Fridays, including the lunch period. Headquarters is not open on Saturdays.

Claims for RSGB Certificates

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

Mobile Rally at Texas Instruments Ltd.

Apropos the note in *Mobile Column* in the February issue of the BULLETIN, advance notification of the names of those who wish to join the conducted tour of the Texas Instruments Ltd. plant on April 5, 1964, is no longer required.

Visit from VE3BWY

On May 6, 7 and 8, H. A. M. Whyte, VE3BWY (ex-G6WY) together with his wife, will be in London on a working holiday. As he wishes to meet some of his old friends, a luncheon is to be organized, and this will be held at the Kingsley Hotel on Friday, May 8, at 12.15 p.m. Those who wish to attend are invited to write to G. A. Leicester, G3IKC, 153 Park Road, Chiswick, London, W.4.

Essex Amateur Radio Weekend

A weekend course on Amateur Radio is being held under the auspices of the Essex Education Committee on April 3-5 1964. The cost will be £1. An application form to attend the course may be obtained from the Warden, M. F. Collings, B.Sc., Clarence House Residential Youth Centre, Thaxted, Dunmow, Essex.

Proposed Essex Summer School in Electronics

Members who are teachers in Essex or connected with the Education Service are invited to contact Mr. D. Bond, BRS21555, 14 Brook Road, Gidea Park, Romford, who has been asked by the Association for Science Education to explore the possibilities of organizing an Essex Summer School in Electronics on similar lines to those run by the Kent Education Committee.

Mr. Bond will be pleased to receive comments on the feasibility of such an enterprise and on the type of course which should be run.

Amateur Licences

On January 31, 1964, 10,470 Amateur (Sound) licences and 146 Amateur (Television) licences were in force. In addition, 1,462 mobile licences were current.

Silent Keys

We record with sorrow the passing of the following amateurs:

Harold Clamp, G2CRL, of Derby.

Tom Geeson, G2ML, of Broken Cross, Macclesfield.

George Golding, G6GG, of Rochford, Essex.

A. M. "Tiny" Houghton, VS6AM, of Hongkong.

J. H. Senior, B.R.S. 24615, of Watford, Herts.

Peter Wendels, G3JNL, of Newark.

C. R. Wiggett, B.R.S. 18905, of Hucknall, Nottingham.

Obituary

MAJOR G. McLEAN WILFORD, VP6WD, EX-G2WD

With sorrow we record the death, at the age of 73 years in Barbados, on January 8, 1964, of Major G. McLean Wilford, A.M.I.E.E., VP6WD. Although well known to post-war DX workers under his VP6 call Major Wilford was perhaps even better known as G2WD and for the many technical contributions he made to Society publications prior to the war. Possessed of a fertile brain and an ability to construct with meticulous care he produced a range of excellent transmitter designs many of which were later embodied in the Transmitter chapter of the First and Second Editions of the *Amateur Radio Handbook*. He was the recipient of various trophies awarded to him in recognition of his valuable technical contributions to Society publications.

Major Wilford served with distinction in the Royal Engineers during the first World War and between wars was a Chartered Electrical Engineer with the Central Electricity Board. He was attached to the Military Mission in Washington during the second World War. Major Wilford was the son of Sir Thomas McLean Wilford K.C.M.G., who was for some years High Commissioner for New Zealand and one time leader of the opposition in the New Zealand Parliament.

Last September Major and Mrs. Wilford were the guests of the London Members' Luncheon Club when the Chairman of the Club (Mr John Clarricoats, G6CL) reminded those present of the great debt the Society owed to Major Wilford for his pre-war contributions to RSGB publications.

Major Wilford was a past president of a Rotary Club in New Zealand.

Major Wilford was buried with full military honours on January 9, 1964.

Deepest sympathies are extended to his widow, Peggy, who will always be remembered by her many friends in England and Barbados for the care and attention she bestowed on her husband after his last serious illness. J. C.

DUNDALK CONVENTION

Ballymascanlan Hotel, Dundalk

SATURDAY, APRIL 18, 1964

The programme will commence at 2 p.m. and will include a talk on "Transmitting Aerials" by H. V. Sims, (Head of Engineering Maintenance Section, BBC) and a number of lecturettes on topics of interest. A separate ladies' programme is being arranged.

The Convention Dinner will be at 7.30 p.m. Tickets, price 30/- each, and further information may be obtained from A. F. McNamara, EI8A, 11 Shanowen Drive, Whitehall, Dublin, 9, or from S. H. H. Foster, GI3GAL, 31 Belmont Park, Belfast.

Organised by Belfast RSGB Group in conjunction with the Irish Radio Transmitters' Society.

Duke of Edinburgh to open Electrical Engineers Exhibition

The 1964 Electrical Engineers Exhibition at Earls Court, London, S.W.5, will be opened on March 18 by H.R.H. The Prince Philip, Duke of Edinburgh.

RSGB members may obtain tickets for the Exhibition, which will be open from March 18-25, by sending a stamped addressed envelope with their request to Phil Thorogood, Electrical Engineers (A.S.E.E.) Exhibition Ltd., 6 Museum House, 25 Museum Street, London, W.C.1.

Radio Amateur Old Timers' Association

The Association, which has a membership of 150, was founded at a dinner of radio amateur old timers held in London on October 10, 1958. Full membership is restricted to those who have held a radiating licence, issued by the United Kingdom Postmaster General, for a period of not less than 25 years, including the war years. Honorary membership is conferred on old timers who have rendered outstanding service to Amateur Radio over a period of very many years.

The Association was founded to keep alive the pioneer spirit of Amateur Radio through the medium of annual reunions.

A life membership subscription of one guinea is payable at the time of application. Revenue from life membership subscriptions is used to cover administrative expenses, including the provision of a distinctive badge.

At the inaugural reunion in 1958 it was agreed to open a Benevolent Fund for the purpose of providing assistance to Old Timers who are ill or in financial difficulty.

The next reunion will be held on Friday, May 8, 1964, at The Horse Shoe Hotel, Tottenham Court Road, London, W.C.2. Applications for membership of RAOTA should be addressed to the Founder-Secretary, Mr. John Clarricoats O.B.E., G6CL, 16 Ashridge Gardens, Palmers Green, London, N.13.

LONDON U.H.F. GROUP

will meet at the

Bull and Mouth Tavern

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

at 7.30 p.m. on Thursday, March 5, and April 2, 1964

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

Current Comment

(Continued from page 139)

damages against the supplier. Indeed, if he acts quickly enough, he may be able to reject the article altogether. A case that actually occurred will perhaps put the point more clearly. A man who wished to buy a car approached a firm of car dealers and told them that he wished to buy a car "Suitable for touring purposes." They recommended a Bugatti and so he bought one. The car in fact was quite unsuitable for touring purposes. The purchaser repudiated the contract and the court held that he was entitled to have his money back.

Further, where goods are bought by description from a dealer in such goods and the goods are not of "merchantable quality" then, unless he had a chance to examine the goods and should have noticed their defects, the buyer is again protected by the Sale of Goods Act and can claim damages against the seller.

In one case a man went into a public house, asked for some beer and the publican sold him some. The beer contained arsenic and the purchaser came to harm. He recovered damages for the goods were bought by description (beer) from a dealer in such goods, they were not of merchantable quality, and, although the buyer had a chance to examine them, it could not be said that he should have noticed the defect in them before the damage was done.

The Act also gives protection where goods are ordered by description or after examination of a sample: the goods subsequently supplied must correspond with the description, or the sample, as the case may be.

These provisions can be of great value to a buyer. Unfortunately, because the parties to a bargain can settle the terms of it as between each other, it follows that they can, if they are so minded, agree that the Sale of Goods Act shall not apply to their transaction. It is in the seller's interest to exclude that Act and in the buyer's to retain it. Unfortunately the seller usually wins. If taxed with the matter the seller can tell the buyer to accept the terms offered or go elsewhere but more usually the buyer finds, too late, that he has lost the benefit of the Act without being aware that it has gone. Most of us are familiar with the glossy warranty, or guarantee, given with certain types of goods. It is not without value to the buyer, but what he often fails to notice is that small print further down the page in some such words as: "all conditions and warranties express or implied, statutory or otherwise are hereby excluded." It was this type of "warranty" that prompted the caustic remark of the Official Referee.

To these considerations must be added the fact that Litigation is expensive and may well prove to be a lengthy and frustrating business. It should certainly not be entered into lightly, and it is hoped that the foregoing may have clarified to some extent the positions of the two parties to a contract of sale of goods. As far as the buyer is concerned the situation might well be summed up as follows:

Do not expect a "bargain" to perform as well as a more realistically priced article.

Make sure of your rights as purchaser before trying to obtain satisfaction from an unco-operative supplier, and remember especially the old legal maxim *caveat emptor*—let the buyer beware. W.H.A.

Receipts

Receipts for subscriptions paid by cheque, bankers' order or postal order are not now issued unless specially requested.

Society Affairs

A digest of the business discussed at the December, 1963, meeting of the Council

The December meeting of the Council was held on December 19, 1963, and was attended by Messrs. N. Caws (President), H. A. Bartlett, L. N. Goldsbrough, J. C. Graham, R. C. Hills, E. G. Ingram, J. Douglas Kay, A. O. Milne, L. E. Newnham, F. K. Parker, A. D. Patterson, R. F. Stevens, G. M. C. Stone, J. W. Swinnerton, E. W. Yeomanson (Members of the Council), John Clarricoats (General Secretary), John A. Rouse (Editor) and A. J. Reynolds (Secretary-Accountant).

Membership

The Council approved 113 applications for membership (94 Corporate and 19 Associate). In addition, seven applications for transfer from Associate to Corporate grade were approved. The subscriptions of two members were waived on the grounds that they suffer from blindness.

The Council granted affiliation to the Ariel Radio Group (Westerglen), Northern Polytechnic Amateur Radio Club, Peterborough and District Amateur Radio Society, Stroud Radio Club, and Worcester and District Amateur Radio Club.

Supplementary Report of the Council

A Supplementary Report on the affairs of the Society was approved for submission to members at the Annual General Meeting on December 20, 1963. (The Report was published in the February issue of the BULLETIN.—EDITOR)

Terms of Reference and Standing Orders for Committees

A quotation for the printing in booklet form of the terms of reference and standing orders for Committees was accepted.

Regional Representatives' Conference

The Council studied the report on the Conference prepared by the General Secretary and agreed to refer to the appropriate Committees a number of matters which required further consideration.

Resignation of Miss A. M. Gadsden

The General Secretary reported that Miss Gadsden had given notice on December 8, 1963, to resign from the Society's staff on December 31, 1963. The Council accepted this with regret.

Classified Advertisements

The Council gave consideration to a suggestion that the rates charged for classified advertisements should be increased but agreed to make no such change at the present time.

Radio Amateurs' Examination

It was agreed to seek guidance from the Institute on the procedure to be adopted by the Society in filling two vacancies on the City and Guild of London Institute's Advisory and Moderating Committees for the Radio Amateurs' Examination.

Rare Drug Messages

Mr. Caws and Mr. Patterson reported on matters relating to a rare drugs message. (The procedure to be followed by UK amateurs who are asked to accept requests for rare drugs was outlined on page 44 of the January issue of the RSGB BULLETIN.)

RSGB Intruder Watch

A vote of thanks to Major Dennis Haylock, G3ADZ, for his services to the Society as Honorary Organiser of the RSGB Intruder Watch was carried.

It was agreed to appoint Mr. R. H. Carr, G8IJ, to succeed Major Haylock.

Awards and Certificates

Mr. Stevens submitted the report of an ad hoc Committee set up to consider matters relating to the awards and certificates issued by the Society. It was agreed to act on the report as soon as arrangements can be made to produce the new certificates.

Bulletin Deliveries

The Council considered a complaint from a member regarding late delivery of the BULLETIN and instructed the Editor to discuss the matter with the Society's printers.

Retirement of Mr. Clarricoats

Mr. Caws reminded members of the Council that the meeting would be the last meeting of Council Mr. Clarricoats would attend as General Secretary.

Resolved to record the thanks of the Council to Mr. John Clarricoats, O.B.E., G6CL, for his services to the Society since he became Secretary in January, 1930.

Reports of Committees

The RAEN Committee met on November 16, 1963, to consider the award of the Raynet Trophy (it was presented to Norfolk RAEN Group) and to discuss a new draft of procedure for use by members. The Committee also considered a number of routine matters and anticipated expenditure during 1964.

At its meeting on November 25, 1963, the Finance and Staff Committee gave consideration to the production of Headquarters notepaper and memo forms, the provision of postal racks, advertising of the *Amateur Radio Handbook* in *Practical Wireless*, a proposed History of the Society and a number of staff matters.

The Contests Committee met on November 28, 1963, and dealt with correspondence, the checking of entries in V.H.F. National Field Day, the Second Top Band Contest 1963, and arrangements for scrutinising the 7 Mc/s and 21/28 Mc/s Contests. A report on the Second 420 Mc/s Contest was approved for publication. The Committee gave careful consideration to the position of stations in Monmouthshire and recommended to the Council that for contest purposes they should be regarded as being in the country whose prefix they employ.

* * *

Members of the staff left the meeting at 9.45 p.m. and the Council then went into private session.

* * *

The Council was in session from 6 p.m. to 11 p.m.

GB2RS SCHEDULE

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

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

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

RSGB 7 Mc/s DX Contest 1963

The second 7 Mc/s DX Contest took place during the week-ends of October 19-20 for the phone section, and November 2-3 for the c.w. section.

Both sections received far more support than during the previous event, and there were some excellent listener logs submitted for the receiving section.

Of 151 entrants for the c.w. section, the winner is again P. J. Broom, G5DQ, with 2486 points from 276 contacts: a very similar result to that of 1962 when he had 2535 points from 273 contacts. In second place is S. A. Tremaine, G8PB, who has 2092 points, which is an improvement on his 1962 score when he was 21st in the table.

In the phone section, Alec Gilding, G3KSH, is again the winner with 590 points, a result that is only very slightly below his 1962 total of 610 points. In second place is Roger Smethers, G3NLY, who did not enter in 1962. The number of phone logs is just twice the quantity received in 1962.

The leading overseas entrant is DJ2IB with 1193 points, which puts him in the 18th position in the c.w. table. DJ2IB also submitted a log for the phone section, in which he is placed 13th with 195 points.

As mentioned in the report of the previous contest, there is no award for the leading overseas station, but PA0LV, who tied for first place in the c.w. section in 1962, was then the leading overseas station in the phone section, and retains that position for the 1963 contest.

Comments from Participants

The change in the rules which restricted the scoring to a period of 24 hours met with considerable criticism. A number of stations had claimed scores for the whole period of 48 hours, and it was necessary to rescore these logs. G2DC, who is in third place for the c.w. section and is a veteran of DX operating, comments on the 24 hour rule, and feels that

C.W. SECTION

Position	Call-sign	Points
1	G5DQ§	2486
2	G8PB§	2092
3	G2DC	1980
4	G3HQT	1910
5	GW3CW§	1810
6	G2QT	1755
7	GW3JI	1690
8	G3KSH	1655
9	G3FM	1635
10	G3EYN	1630
11	G3POI	1610
12	G3VW	1598
13	G3OLN	1585
14	G3JVJ	1560
15	G3DYY/A	1430
16	G3PFB	1365
17	G8AB	1220
18	DJ2IB§	1193
19	G3OHP	1180
20	G3JKY	1095
21	G3LZQ	1085
	OK3KGJ§	1085
23	GW3BQY	1070
24	G3APN	1040
25	DJ1QP	1033
26	G3OHN	1020
27	G3IGU	1005
28	G2BLA	995
29	SP6FZ§	990
30	PA0VB§	985
*	G3LHZ	980
31	DL3MO	975
32	DJ2SR	955
	ON5AZ§	955
	PA0LV	955
	SM6DED§	955
	ZB1BX§	955
37	UA6MK§	945
38	YU1AG§	935
39	G2TH	905
40	OZ7G§	895
41	F2PO§	890
	G3FTQ	890
*	UB5KED	875
43	I1KE§	870
44	F2NZ	865
45	G3NQW	855
46	G3BSR	825
*	HA5KBP	825
47	W2JAE§	820
†	G3RCE	820
*	UA1KAG	805
48	ON4XG	795
	5B4TC§	795
50	G6TC	785
51	UA3NP§	783
52	G3OYU	775
*	HA1KSA	775
53	OK1AEV	770
54	IT1AGA	760
55	OK2QX	755
56	SP2LV	755
57	G3SEP	750
58	DL1WJ	740
59	LA2Q§	725
	OZ4H	725
61	PA0VO	710
62	F8TM	695
	SM3TW	695
64	PA0FLX	690
	UA4AZ§	690
*	UC2KSA	680
66	G8DI	678
67	GI3OLZ§	675
68	5B4TZ	670
69	LA6U	660
	YO4CT§	660
71	DM3JBM	655
72	DJ1UE	650
73	G3PWU	630
74	DJ1VI	615
	SM5BDY	615
76	SM6BDS	610
77	G8KU	605
	SL6BH	605
*	HA5KFZ	605
79	DL9WW	603
80	DJ7LQ	600
81	SM5BGK	593
82	G2FYT	590
	UT5FG§	590
84	DJ2YE	585
	SP1AAY	585
86	YU1SF	575
87	DJ8SG	565
88	UP2QQ§	550
*	YU1BCD	550
89	OK1AMS	545
90	LA1H	535
91	W8JIN§	530
*	YU1ABH	530
92	SM5CUS	515
	UB5MZ§	515
*	LZ1KSA	515
94	OK1OO	510
	ON4CE	510
96	4X4DH§	500
97	PA0PDG	495
	UC2AR§	495
99	SP8MJ	490
100	G3OLU	486
101	G2AJB	485
	OK2BCO	485
*	YO8KGA	485
103	UA3RO	478
*	UA3KYI	475
104	OK1AAZ	460
	UP2AW	460
106	I1BFE	455
	UD6DU§	455
108	OH5UQ§	450
	SP2AOB	450
*	UQ2KAE	449
110	YU1NGO	445
111	CN8FN§	440
	DJ5QK	440
	SM5CZK	440
	SP2RS	440
115	GM3NYY§	433
116	DJ6WD	430
	OH2FS	430
118	HA1SD§	425
	HA8UD§	425
120	G3CWL	410
121	SP9AGS	395
	TF3AB§	395
123	DJ8GE	385
124	UW3QP§	380
125	W1BPW§	340
126	SM6CMR	330
127	EA2CR§	325
	UB5FG	325
129	PJ2AE§	320
130	HB9DX§	310
	SM5CMG	310
	4X4DI	310
133	OZ2NU	305
*	UA3KYA	295
134	ZD7BW§	285
135	K4VWH§	265
136	I1CKN	255
	SP4NL	255
	UW3BX	255
139	YO3JW	250
140	SM7DQK	230
141	VK3XB§	225
142	VS9AAE§	220
143	G8CO	200
	PA0NW	200
145	UA9WS§	190
146	G2KW	175
147	PY2SO§	165
148	VK5KO§	125
149	OZ4DX	120
150	VS1LU§	110
151	OK3CDF	55

TELEPHONY SECTION

1	G3KSH§	590
2	G3NLY§	520
3	PA0LV§	410
4	DL5SE§	400
5	ON4PG§	375
*	SM4ATA§	370
6	G3MTB	340
7	UB5FG§	325
8	MP4BBW§	285
9	G3MQD	280
10	SL6BH	270
11	G3PWU	215
	GW3OCD§	215
13	DJ2IB	195
14	OH0NI§	190
15	VS1LP§	170
16	G3JVJ	125
	SP9AHA§	125
18	CT1LN§	120
	ZB1BX§	120
20	UA6MK§	115
21	LA6U	70
22	F2AO§	55

* Multiple Operator. † Incomplete Log. § Certificate Winners.

it will spoil the contest. He also makes some very good points concerning the scoring system which will certainly be considered before the next rules are published. G3OCN joins G2DC in his dislike of the 24 hour rule, and believes that a certain amount of luck can significantly affect the results. G3DYY commented that ZLs were heard, and thinks that conditions were worse than in 1962, though only marginally so. He did, however, manage to work KL7PI, and felt that this made it worth the effort. G3PFB brings to light another point against the 24 hour rule. He comments that many stations had given up long before the end of the contest, and consequently the latecomers found very little to work. G8AB says, " On Sunday, even the commercials were barely with us, so poor were the conditions, but the operating was friendly, and the standard high." To G3LZQ, the band did not sound like 40m, as there were so many good signals and good operators! G3OYU would apparently prefer an arrangement where the contest is divided into six periods of four hours, so that each would be less of a test of endurance and more of a test of operating skill. G2FVT considered the operating to be generally good, but DX conditions poor.

I1KE enjoyed the contest, despite stormy weather with lightning, and strong QRM. VK5KO commented on the difficulty of working G stations through European QRM, but felt that he had his reward when he worked G3KSH, G3VW and G3NFV in quick succession. VS9AAE joins VK5KO in his remarks on the difficulty of working into G. VS1LU, who works exclusively on 7 Mc/s feels that propagation to Europe during the contest week-end was the worst that he has ever known!

In the phone section there were few comments, although G3KSH makes a plea for more phone activity—particularly s.s.b., for he heard (but could not work through the QRM) VK2, VS1, MP4, VS9, 4W1, VQ4 and 5N2. VS1LP holds the same views, for in a five hour period, he could only make three s.s.b. contest contacts.

The contest seems to have been enjoyed by all who took part, despite the conditions, and logs submitted were of a very high standard. The only difficulty appears to have been with the 24 hour rule, as has been mentioned.

Check logs from F8NS, G3PIT, OH2BS, OH5VD, PA0UC, SM5ARC, SM5DKH, SM6ARH and SM7CXH are gratefully acknowledged.

C.W. RECEIVING SECTION

Position	Identification	Points
1	BRS24775	1715
2	BRS6604	1490
3	BRS21008	1270
4	A2122	1110
5	BRS18461	1050
6	BRS22844	775
7	BRS21624	435
8	ONL383 (Jean-Jacques Yerganian)	295
9	BERS195 (Eric Trebilcock)	225
10	WIA-L6021 (Peter W. Drew)	60

PHONE RECEIVING SECTION

1	A1798	655
2	A3606	485
3	HE9RAP/FRS319 (G. de Cramayel)	470
4	A3331	445
5	A2111	440
6	GEC Apprentice Association ARC	415
7	BRS21624	375
8	A3713	360
9	BRS22844	340
10	DEA6767-R 01 (F. W. Kradepohl)	325
11	A2966	285
12	SM4-3245	165
13	A3699	155
14	NL455 (Fred Weidema)	145

Listeners' Section

The leading station in the c.w. section was Eric Howell, BRS24775, of North Shields, and he must be congratulated on a very fine log, and a most interesting and useful commentary on conditions. In second place is E. H. Sherlock, BRS6604, of Tynemouth, who also submitted an excellent log.

In the phone section the leading entrant is Peter Baxter, A1798, of Winchester, and in second place is R. J. Storey, A3606, of Caversham.

The standard of listener logs was very high, and all the comments have proved most helpful.

Grafton G2AAN Top Band Contest

Grafton Radio Society will be running their annual Top Band Contest for the G2AAN Cup on Saturdays, March 14 (c.w.) and March 21 ('phone), both days from 22.30 until 01.00 the following day. As ususal there will be an Open Section for any UK station. Each contact must consist of RST or RS exchanges plus serial number starting anywhere between 001 and 100. One point per contact will be scored, the final score being the sum of the c.w. and 'phone sections. Certificates will be awarded to those placed first and second, with further certificates to the individual winners of the c.w. and 'phone sections. Logs should be sent to G2CJN, 145 Uxendon Hill, Wembly Park, Middx., to arrive not later than March 31, and should be accompanied by the usual declaration.

CONTESTS DIARY

*March 7-8	- 144 Mc/s Open and Listeners' V.H.F. Contests (see pages 115 and 116, February, 1964.)
March 14-15	- First 1·8 Mc/s Contest (see page 50, January, 1964.)
March 14-15	- ARRL DX Contest (Phone) (see page 49, January, 1964.)
March 28-29	- ARRL DX Contest (C.w.) (see page 49, January, 1964.)
April 5	- Low Power Contest, (see page 190)
April 11-12	- CQ WW DX SSB Contest.
April 11-12	- International SP DX Contest.
April 12	- D/F Qualifying Event (Rugby). (see page 190)
April 18-19	- Helvetia 22 Contest.
April 19	- D/F Qualifying Event.
April 25-26	- PACC (C.w. and 'phone).
April 26	- D/F Qualifying Event (Newbury or Oxford).
*May 2-3	— First 144 Mc/s Portable Contest.
May 9-10	— USSR DX Contest (C.w.).
May 9-10	— OZ CCA (C.w.).
May 10	— D/F Qualifying Event (Manchester).
May 16-17	— OZ CCA (Phone).
May 30-31	— CHC/HTH Party.
*May 30-31	— First 420 Mc/s Contest.
June 6-7	— National Field Day.
June 14	— D/F Qualifying Event (High Wycombe).
June 20-21	— 70 Mc/s Contest.
June 28	— D/F Qualifying Event (Derby).
June 27-28	— RSGB 1250 Mc/s Tests.
*July 4-5	— Second 144 Mc/s Portable Contest.
July 12	— D/F Qualifying Event.
July 19	— D/F Qualifying Event (Wirral).
July 26	— D/F Qualifying Event.
*September 5-6	— V.H.F. National Field Day.
September 13	— D/F National Final.
September 20	— Low Power Field Day.
October 3-4	— RAEN Rally.
October 17-18	— Second 420 Mc/s Contest.
October 31-November 1	— RSGB 7 Mc/s DX Contest (Phone).
November 21-22	— RSGB 7 Mc/s Contest DX (C.W.).
November 28-29	— Second 1·8 Mc/s Contest.
December 5-6	— RSGB 21/28 Mc/s Telephony/Receiving Contests.

* *To coincide with Region 1 IARU Contests.*

CONTEST NEWS

RESULTS — REPORTS — RULES

Low Power Contest 1964

The rules for the Low Power Contest to be held on April 5 are given below. It should be noted that the event is for one day only. The bonus for transistorised transmitters has been deleted as it would appear that it no longer serves a useful purpose.

1. **When:** 08.00 GMT to 20.00 GMT on April 5, 1964.
2. **Eligible Entrants:** All fully paid-up members of the RSGB resident in Europe.
3. The General Rules relating to RSGB Contests, as published in the January, 1964 issue of the RSGB BULLETIN, will apply except as superseded by the rules of this Contest.
4. **Contacts:** Must be made on c.w. (A1) only between 3500 and 3600 kc/s.
5. **Scoring:** Points will be scored on the following basis:

Watts input to p.a. stage	Up to 0·5	To 1	To 2	To 3	To 4	To 5
Points per contact	20	10	5	3	2	1

A bonus of 20 points may be claimed for the first contact with each different county code area listed on page 52 of the January, 1964 issue of the RSGB BULLETIN.

6. **Contest Exchanges:** RST reports followed by the contact number, starting at 001, and the county code letters, e.g. 559061SX or Sussex.
7. **Logs:** (a) Must be tabulated in columns headed (in this order) " Date/Time(GMT)," " Call-sign of station contacted," " My report on his signals and serial number sent," " His report on my signals and serial number received," " His County," " My input power," " Points claimed."
(b) The cover sheet must be made out in accordance with RSGB Contests Rule 5, and the declaration signed.
(c) Entries must be postmarked not later than Monday, April 20, 1964.
8. **Awards:** At the discretion of the Council, the 1930 Committee Cup will be awarded to the winner, and certificates of merit to the runner-up and to the non-transmitting member submitting the best check log in the opinion of the Contests Committee.

D/F Qualifying Events

Details of the Rugby Qualifying Event are as follows:

Sunday, April 12, 1964
Organizer: E. E. Meachen, Wyngarth, Meriton Road, Lutterworth, Rugby, Warks.
Frequency and call-signs to be announced at the start.
Map: Ordnance Survey, New Popular Edition, Sheet 132.
Assembly Point: Cathiron, approximately 2 miles northwest of Rugby (NGR 472782).
Assembly Time: 13.00.
Entries and Tea: Intending competitors should notify the Organizer as soon as possible stating the number of people in each party who will require tea.

First 144 Mc/s Portable Contest 1964

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

1. **When:** 10.00 GMT to 19.00 GMT, on Sunday, May 3, 1964.
2. The General Rules relating to RSGB Contests, as published in the January, 1964 issue of the RSGB Bulletin, will apply except as superseded by the rules of this Contest.
3. **Eligible Entrants:** All fully paid-up members of the RSGB resident in Europe. Multi-operator entries will be accepted provided only one call-sign is used.
4. **Power Supplies:** Power for any part of the station shall not be derived from supply mains, and the input must not exceed 25 watts in any stage in the transmitter.
5. **Contacts:** May be made on either A1, A3, A3a or F3, in the 144-146 Mc/s band.
6. **Scoring:** Points will be scored on a basis of one point per mile for contacts with fixed stations and two points per mile for contacts with other portables or mobiles.
7. **Contest Exchanges:** RST or RS reports followed by the contact number and location (e.g. RST559001, 5NE Luton). This location must be identifiable on the 10 mile to the inch Ordnance Survey Map. Five figure QRA locator details may be exchanged with continental stations. It is the responsibility of the receiving operator to obtain the information he requires to calculate distances correctly.
8. **Logs:** (a) Must be tabulated in columns headed (in this order) " Date/Time (GMT)," " Call-sign of station contacted," " My report on his signal and serial number sent," " His report on my signal and serial number received," " Location of station contacted as received," " Distance in miles," " Points claimed."
(b) The cover sheet must be made out in accordance with RSGB Contests Rule 5 and the declaration signed. Multi-operator entries must be marked on the cover sheet. The QTH as sent and National Grid Reference (full six figure grid reference) must be recorded on the cover sheet for entries from G, GD, GM and GW. In all other cases, entrants must show latitude and longitude.
(c) Entries must be postmarked not later than **Tuesday, May 19, 1964.**
9. **Awards:** At the discretion of the Council, a **miniature cup** will be awarded to the winner and **certificates of merit** to the runner-up and to the non-transmitting member submitting the best check log in the opinion of the Contests Committee.

Second 1·8 Mc/s Contest 1963

The Second 1·8 Mc/s Contest, held on November 9-10, 1963, brought forth a further increase in the number of entries compared with the corresponding event of 1962. This increase is welcomed by the Contests Committee, and in view of the small number of entrants passing remarks on the scoring system it can be assumed that the majority are now satisfied.

After an absence from Top Band contests for a considerable number of years, D. E. Davies, GW3FSP, earns a praiseworthy first place with 736 points. Fifteen points behind in second place is H. J. M. Box, G6BQ, and D. G. Alexander, G3KLH, takes third position with a total of 707 points.

Conditions seemed to vary considerably from very noisy to excellent, with DX from Europe being stronger than Great Britain on occasions. DX also included 7X2BM worked by G3GRL who shares fourth place with G3JEQ.

Although it is not intended to carry out an aerial survey on this competition, the Committee feel that mention should be made of G3DCZ. The aerial employed by him was a balloon-borne 200 ft. vertical. Weather conditions were fine until 0600 when wind and rain necessitated lowering the balloon for safety, and so G3DCZ then had to be content with a more orthodox quarter-wave horizontal aerial.

Committee's Comments

While most entrants complied with the General Rules of RSGB Contests regarding entries (rule 5), it must be pointed out that a few people still persist in using both sides of the paper for their logs. This can be confusing, as also can be the practice of close-typed or hand-written logs, being upwards of 50-60 contacts on side of paper. One log was particularly eye-straining. Standard log sheets can be easily obtained from Headquarters.

Competitors' Comments

" Contest was excellent and I can say that it was one of the most enjoyable Top Band contests in which I have participated "—G3ILO. " Conditions very good indeed, never heard so many stations on the band even during a contest "—G3KAY. " Conditions peculiar, Europeans stronger than G's "—G3KLH. " Could submit four pages of

facts and figures to justify the present scoring system but such things can be made to prove anything these days as long as you only give the ones that support your own particular circumstances "—GW3FSP. "This should have been the winning log. It *would* have been under any reasonable rules

Second 1·8 Mc/s Contest 1963

Posn.	Call-sign	County	Contacts 3 pts	Contacts 5 pts	Points
1	GW3FSP	GN	9	143	736
2	G6BQ	KT	51	114	721
3	G3KLH	OX	20	131	707
4	G3GRL	NM	22	123	681
	G3JEQ	SY	67	96	681
6	G3BMY	SE	9	129	672
7	GM3NYY	AY	3	131	664
8	GW3JI	CV	5	128	655
9	G3FM	SY	58	91	629
*	G3RSR	WR	19	105	582
10	G3OSW	ND	5	109	560
11	GI3GAL	DW	0	112	558
12	G3NHE	YS	26	95	553
13	G3RRU	MX	49	81	552
14	GM3FXM	FE	4	98	501
15	G3JFY	ST	13	92	499
16	G3HBR/A	BS	33	79	494
17	G3OYU	KT	37	76	490
18	G3KBC	CE	5	95	487
	G3RJH	MX	41	73	487
20	G3PHO	YS	23	83	484
21	G3DCZ	SY	67	55	476
	G3ILO	GR	17	85	476
23	G3JSK	SD	7	87	455
24	G3LAS/A	LD	48	62	454
25	G3PVK	SY	55	56	445
26	G3PEO	GR	16	77	432
27	G3NGZ	GR	12	79	430
28	G3KAX/A	SY	43	58	419
29	G3LHJ	DN	6	77	403
30	G3PHG	SX	30	61	395
31	G3IGW	YS	18	65	379
32	G3PIA	BE	25	61	378
33	G3ORA	ST	9	70	373
34	G3RKJ	LD	49	44	367
35	G3AHB	BS	37	51	366
†	G3PYI	GR	21	60	362
36	G3RSD	LN	17	62	361
37	G3JKY	KT	41	47	358
38	G2BLA	HF	14	63	357
39	G3RSF	EX	27	53	346
40	G3KZZ/A	DH	10	63	345
41	G3NQT	EX	24	54	341
42	G3KPU	NM	10	62	340
	G3LZQ	BE	35	47	340
44	GM2HCZ/A	DF	1	67	338
45	G3OZM	NM	10	61	335
46	G3BZG	HF	13	57	324
47	G3FTQ	SY	54	31	317
48	G3OVL	SY	48	32	304
‡	G2BTO	LE	10	55	304
49	G3GFG	HE	16	50	298
50	G3PJB	LD	38	34	284
51	G2XP	SY	49	27	282
52	G3SED	HE	20	44	280
53	G3KOR	LE	6	51	273
54	G3AKY	YS	14	45	266
55	G3GNS	ST	6	49	260
56	G3BFP	SY	38	28	254
57	G3OHX	ND	2	48	246
58	G3EUE	SY	35	28	245
	G3RYJ	YS	9	44	245
60	G3DDM	HE	17	38	241
61	GW3ROG	MH	3	47	240
62	GM3KMR	MN	3	45	234
63	G3FHN	KT	17	36	231
64	G3LPT	SF	1	45	227
65	G3EMO	LE	6	41	220
66	G3SFR	HE	18	32	214
67	G3OJI	LN	10	36	210
68	G3MCX	SY	36	19	203
§	G2QT	KT	7	33	186
69	G3MWZ	LN	9	31	181
†	G2VV	MX	32	14	166
70	G3RWL	LD	23	15	144
71	G8BN	BS	12	17	121
72	G2ABK	LN	5	18	105
73	G6OO	LN	6	14	88

* Multi-operator.
† Late entry.
‡ No record of serial numbers sent.
§ No power indicated.

The Committee *ought* to be thoroughly ashamed of themselves—I hope they are!"—G6BQ. "Contest should be two evenings as this long session very tiring "—G3GNS. "This 3 and 5 points system is obviously not a complete leveller but I think it is the best we have had yet "—GM2HCZ/A. "No complaints to make and having got used to the new scoring system—rather like it "—G3NHE. "Would suggest that bonus points are awarded for the first contact with each county only "—G3KOR. "Rule regarding sending "R" upon receipt of all information still seems poor. Several people ignore this and QSY or call CQ "—G3PHG.

The Contests Committee wish to thank the following for their check logs:—G2IM, G3CIO, G3GGS, G3KAY, G3LLM, G4VF, GW6GW, DL9KRA, HA9-007, OK1AEV, OK1AFC, OK1ZL, OK3EE, PA0PN.

70 Mc/s C.W. Contest, December, 1963

A good clean contest with good operating, even if the conditions were not of the best.

The leading logs lost no points for report and serial number errors, which fact confirms the quality of the operating. However, points have been lost by some contestants because they have recorded where they know stations to be, rather than "as transmitted" by the station. The rule

Position	Call-sign	Points	NGR
*1	G3PIA/P	3290	SU416838
*2	G3OXD/A	3037	SO968887
3	G8PD/A	2837	SU6382
4	G3MYI	2438	
5	G3KEU/P	1551	
6	G3BJD/P	1496	
7	G3OJE/A	952	TQ322573
8	G3PHG	933	TQ2736
9	G3SRC/A	912	
10	G3JKY	751	
11	G3PJK	725	SD884052
12	G3JEQ	718	
13	G3ORE	714	TQ331561
14	G2AXI	704	
15	G3FD	668	57/2796
16	G3OKJ	653	51/133916
17	G3GOX	646	
18	G3PLX	637	SJ393933
19	G3OHH	601	SJ917801
20	G3HWR	488	TQ255862
21	G2BJY	238	
22	G3YH	222	31/577706
23	G3ICO	173	31/555178
24	G3PDT	170	

* Certificate winners.

covering this point ensures that stations unknown to each other are on the same footing as those known to each other, furthermore, it is the only aid given over the air for distance calculation. The last sentence of Rule 6 puts the onus squarely on the recipient.

The big black patches of London, Birmingham, Manchester etc., do not show the subdivision of those cities, therefore it is necessary to give QTH indications from somewhere outside. G3HWR's case is typical, i.e., 10 miles south of Potters Bar. Please note that Woodcote is on the Ordnance Map.

Many omitted to give the NGR; these we require for checking, and the following is an example.

The DX for this contest is 214 miles between G3BJD/P and G8PDA/. If G3BJD/P had given his NGR, we could have calculated to see if his 220 miles claimed, or 213 miles by G8PD/A was correct, as it is, we have settled for 214 being the measured distance between the high ground north of Mellow and Woodcote.

The Committee have considerable paper work as it is and

(Continued on page 201)

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.

Some Comments on the New Front Cover

Congratulations on the improved design of the BULLETIN cover . . . *M. Gibbs, G3FGQ*

I really must write and congratulate you on the " new look " . . . The new cover is one of the most striking I have seen for a long time . . . *B. A. Wilbraham, G2ATU, ex-5N2ATU*

May I congratulate the designer of the front cover of the January BULLETIN? A contemporary mind has obviously been at work . . . *W. M. Lee, GW3MFY*

. . . congratulations on the new cover for the BULLETIN . . . *Arthur C. Gee, G2UK*

. . . it certainly has a striking contemporary character and personally I think it ranks with the finest designs of magazine covers in this country . . . *Stanley K. Lewer, G6LJ*

Two Metre Band Plan

DEAR SIR,—I wish to voice my support for Mr. Roberts' suggestion (January issue) that a small segment of the 2m band should be set aside for c.w. only. Referring to the last sentence of his letter, I think it is *very likely* that some surprising DX would be worked. Tuning, say, 100 kc/s after a c.w. CQ has obvious advantages, as those who tune slowly with the b.f.o. on will realize.

Yours faithfully,
W. M. LEE, GW3MFY

Bridgend, Glam.

V.H.F. F.M.

DEAR SIR,—I was disturbed to see in Mr. Gurney's letter in the January BULLETIN the suggestion that we should consider 15 kc/s deviation on the v.h.f. amateur bands. The QRM which would result would be horrifying. I grant that transmitters are simpler and TVI is less, but let us use less channel bandwidth, not more. Even 15 kc/s deviation would not equal double sideband a.m. for readability of weak signals—let us advocate s.s.b. if anything.

The marine v.h.f. system uses 15 kc/s deviation and 50 kc/s channelling because mariners are a conservative bunch. The decision at The Hague Convention was taken at a time when the leading countries in the v.h.f. radio telephone world were successfully changing over to 5 kc/s deviation and 25 kc/s channels. Now many countries are thinking in terms of 12·5 kc/s channelling, but here even the most ardent f.m. camps have to admit that a.m. is better.

Yours faithfully,
B. ARMSTRONG, G3EDD

Great Wilbraham, Cambs.

Identification at Mobile Rallies

DEAR SIR,—We attended several of last year's mobile rallies and came away from each of them very puzzled. We want to know why so many licensed amateurs prefer to remain anonymous at these functions.

Are they not sufficiently proud of their call-signs to identify themselves in some way? Have they, we wonder, some deep-rooted inferiority complex which necessitates them remaining incognito? Or are they just too busy to cut the call-sign from their QSL card, and fashion it into a badge by which they may be recognized?

Come out into the open, you shy violets. You went to the trouble of getting that call-sign, so let us see who you are.

Yours faithfully,
F. ALLAN HERRIDGE, G3IDG
(Life Member)
A. BRADBURY, G3OMU

Basingstoke, Hants.

National Field Day

DEAR SIR,—I sincerely hope the Contests Committee will decide against the suggestion that any mode other than A1 be used on National Field Day.

Two basic objections are that (a) the majority of clubs already experience enough difficulty in maintaining a basic 10 watt carrier for 24 hours on two stations, and, without the luxury of p.e. sets, battery drain would be further increased; (b) many rigs designed for NFD and all aerials (we hope) are calculated to cover the c.w. portions of the band only, and a great deal of reorganization and not a little expense would be called for if increased coverage were needed.

Apart from these practical objections, all keen c.w. operators will abhor the introduction of a mode which has as its main winning factor the use of superlative equipment, in direct contrast to the high degree of operating skill necessary in c.w. working.

Yours faithfully,
JOHN J. YEEND, G3CGD

Cheltenham, Glos.

Hospitality

DEAR SIR,—Having completed a brief tour of Scotland and England I feel I must put on record an appreciation of the overwhelming hospitality which has been lavished upon my wife and myself by the Amateur Radio fraternity of the various districts we have visited.

I had only spoken to most of the amateurs on the bands, never met them personally before. But as soon as I arrived at their various homes I was welcomed as an old friend. What a wonderful feeling it is; there cannot be many hobbies where this can happen—no age or class distinction, we are all on equal terms once inside " the shack."

I would like to thank GM3DUS, GM3PGX, GM3NXA, GM3AEY and GM3CIG for the hospitality afforded my wife and myself. Also G3ESR, G3LWY, G4HZ and G6AB for making us so welcome south of the border and G2BCH.

I would also like to say thank you to all those amateurs who offered us " good cheer " over the air and whom we did not have a chance of meeting for a personal QSO.

Yours faithfully,
RICHARD MOORE, GI3PLL

Limavady, Co. Derry.

Snobbery

DEAR SIR,—It becomes more and more noticeable on the air these days that a form of " inverted snobbery " has been brought into existence by those who go to great lengths to advertise the fact that they will not QSL under any circumstances. (" Never had any QSL cards printed, and don't intend to." " Don't indulge in such childish pursuits—don't waste your time sending me a card old boy, because you won't get one back.") Obviously everyone is entitled to their own opinion on the subject, but to many of us the QSL card will always be a symbol of Amateur Radio and an integral part of our hobby, and I feel there is a certain amount of obligation on any amateur station to have QSL cards available if one is requested. Times may change, but I believe the newly licensed amateur still experiences the same thrill in receiving his first batch of QSL cards, as we did many years ago, and is entitled to feel somewhat disappointed if the first station he works after receiving his licence is not prepared to confirm this memorable contact with a QSL card.

Perhaps it is that some of us are out of touch with the present trends of Amateur Radio, and perhaps it is because I myself am a " square " that I sometimes look back with slight nostalgia to the days of crystal-control when one could enjoy a QSO with a friend uninterrupted by all and sundry breaking in on the frequency (often in the middle of transmission!) and wishing to join in. Thank goodness there are still no v.f.o.'s on 70cm.

Yours faithfully,
" SQUARE PEG "

(It is not our normal practice to publish anonymous letters; in this case the writer gave his full name and address but asked that the pseudonym should be used.—EDITOR).

Neon Tube Transmitters

DEAR SIR,—I was very interested in the article by G3VA (*Technical Topics*) in the October 1963 issue, page 229, " Neon Tube Transmitters." The article brought back memories of some 30 years ago.

I myself did a lot of work on neon relaxation-oscillators during the 1920s and the 1930s; and the then popular Bulgin " I.F. Liner," a simple device emitting a modulated i.f. signal, and powered by the h.t. supply of the receiver that was being aligned, was one of the results of the work at the time.

The I.F. Liner only drew about 1mA maximum at 200V; it was very useful and it was only the war which finished it.

I found, at the time, that the ionization and de-ionization times could, indeed, be appreciable; no lamp manufacturer,

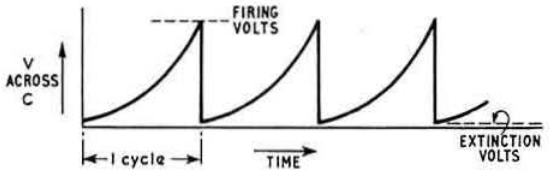


Fig. 1.

then (or possibly since), apparently studied neons towards specifically raising their relaxation-oscillation-frequency, in this respect. This is probably because of lack of demand in quantity.

As we wanted a modulated frequency, we took advantage of the steep discharge-front of the relaxation-oscillation curve, Fig. 1, to " shock " excite the i.f. tuned-circuit. This was, and still is, quite an effective method and (with 800-1,000 c/s oscillation at audio-frequency) produced damped or dying-out 465 kc/s waves, or waves of desired tuned i.f., in a train of 800-1,000 " bursts " per second (see Fig. 2b). This is to say an audio signal or modulation was given as well.

Small neons, because of their close electrodes, may often be best, and they certainly were better for this purpose than the

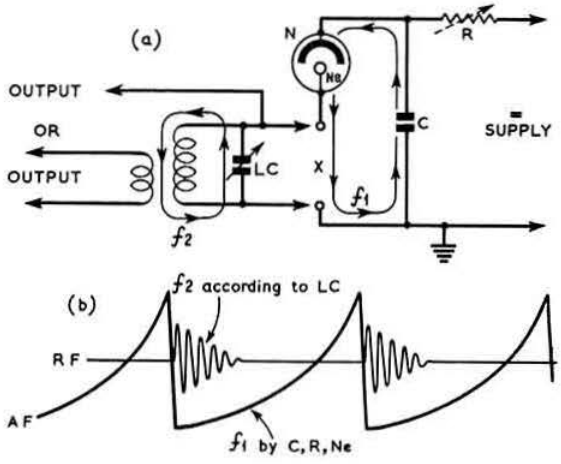


Fig. 2.

early, and possibly original, 5-Watt " Osglim " neon lamps which were generally available thirty or more years ago. (For oscillators, they had to have the resistor removed from the cap for quick discharging.) The 5-Watt " Osglims " were powerful, but the small lamps and their close electrode spacing usually gave efficient performance.

Nowadays, small neons by firms such as Philips, Hivac, and others, can strike at 60-80V., and not the normal 130, or so, volts

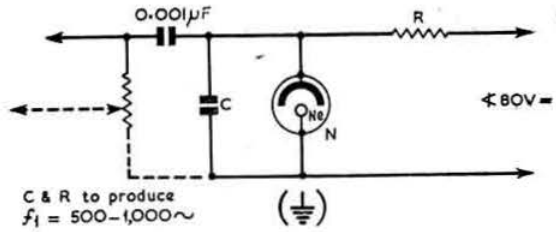


Fig. 3.

of pure neon. This is because they have treated electrodes or filling. Such small lamps often run on ¼-1mA, so much is, today, possible for relaxation-oscillators, both a.f. and r.f. or combined.

The wave-form is always saw-tooth (Fig. 1), although the near-vertical discharge-face represents (against time) part of a much higher frequency shape, and can shock-excite circuits of quite high natural frequency.

An a.f. prod, for example, as Fig. 3, will inject a modulated signal into *every* stage of *any* receiver, grid by grid, working backwards from the output stage, and at early points will give damped r.f. or i.f. for testing purposes in these stages. A 1- or 2-Megohm potentiometer, shown dotted in Fig. 3, will give a variable control of the output voltage.

It may be that the neon relaxation-oscillator, which is a very useful and very simple tool, will, in fact, now be re-discovered, after a lapse of some 30 years!

A useful tip: some neons will not strike reliably, nor consistently, in darkness. Darkness, here, means of ultra-violet and of infra-red as well as of visible light. Such neons may require a stray photon or so, each cycle, so it is not advisable to can them or to box them up, where such need exists. An alternative is to apply a tiny spot of (radio-active) luminous paint on the outside surface of the neon; or to provide a hole in the can or box and see that ultra-violet or infra-red or visible-light photons are available. Very few photons are needed, but in absence of this, ionization times may seem to be very bad, in certain uses.

Fig. 8 in the October issue seems strange to me, but I haven't tried it. The discharge-currents to the two neon lamps look as though they would produce opposing fields on the halves of the coil L1. I do appreciate that the circuit is not yours, but is a repeat. If not a shock-excitation circuit, f_1 (must) = f_2, needing double tuning!

For those who want to experiment with relaxation-oscillators, the basic circuit always must be: the Neon connected in parallel with the Capacitor, both fed through the Resistor, and the r.f. circuit inserted in series with the neon lamp only (Fig. 2a).

Coupled output is often best; it certainly helped in the 1930s to maintain tuned circuit calibration.

There is no earthly reason at all why a tuned circuit, LC, should not be crystal controlled, especially if it is a.f.-oscillations shock-excited, but crystal control of the frequency of the actual neon lamp, from the values of C, R, would be another story; but it would be a very interesting one, I feel sure.

Yours very truly,
H. T. STOTT, M.I.E.E., G2COT
Technical Director, A. F. Bulgin & Co. Ltd.
Romford, Essex.

The G2DAF Linear Amplifier

DEAR SIR,—With reference to the letter from Mr. G. M. King, G3MY, published in the January, 1964 issue of the BULLETIN, may I be permitted to make the following observations.

Rectifiers in conjunction with r.f. and audio amplifiers (linear and otherwise) have been used for a very long time and there are at least five British patents for this type of circuit in addition to my own.

The G2DAF method of amplifier operation has so many advantages that are of particular value to the amateur, it is quite beyond belief that any sideband worker could have used exactly the same method of operation and then abandoned the method as impracticable or unsatisfactory. I must therefore assume that

there was in fact some fundamental difference in regard to the method of operation.

I am prepared to discuss this matter in detail, but can hardly do so when the claim for prior originality is made by a third party.

If GW2DUR will submit to the Editor the details of his work during 1956 and 1957 together with the circuit he used and its method of operation—supported by evidence of publication in either an amateur or professional journal, or the subject matter of a lecture given to a Radio Society or to the RSGB, prior to publication of my own Patent Specification on December 19, 1961—I will consider the matter in detail and forward my reply to the Editor with a request that the full story is published in the BULLETIN.

Yours faithfully,
G. R. B. THORNLEY, G2DAF

Fulwood, Preston.

Single Sideband

DEAR SIR,—The amount of single sideband equipment on offer at the recent exhibition was not perhaps very surprising, but the accompanying pressure on the amateur to go s.s.b., taken in conjunction with the vast amount of propaganda for it in the magazines on both sides of the Atlantic, I find a little disturbing.

S.s.b. can stand on its own merits perfectly well without some of its protagonists claiming it can cure everything from bunions to the National Debt! But these merits should not be allowed to blind us to the equal merits of other forms of modulation, and I would dearly like to see someone conduct an impartial evaluation under actual amateur operating conditions of all the forms of modulation available to us at the moment, when I feel that s.s.b. might not come out as much on top as many assume it to be.

Sideband poses a number of problems of sufficient interest to make it worth the while of any amateur to experiment with, but please let not those who use it then decry any other method of modulation as antique, reactionary or just downright anti-social. Many, or even most, of the supposed advantages of sideband can be had with a.m. if an equal amount of effort is put into it and even the one unarguable advantage of s.s.b.—the lower capital cost and electricity bill—is not really significant at the low power levels we are allowed. I have sometimes heard s.s.b. exponents remarking on the almost miraculous way in which it will " get through " when a.m. apparently cannot, but I think the key lies in the fact that s.s.b. operators must, of necessity, use modern equipment while most a.m. operators are still using war surplus, and—dare I say it—the general technical ability of s.s.b. users is above that of others.

These remarks are not intended as an attack on s.s.b., although doubtless someone will insist that they are, but only as a plea for a little more balance in our appreciation of different modulation systems. Let us have fewer proposals for allowing only certain types of modulation, and less of the attitude that unless you are using the latest OK type of modulation system you are simply not " with it."

Yours sincerely,
W. BLANCHARD, ex-G3JKV

East Grinstead.

Soldering Aluminium

DEAR SIR,—Mr. Sandford's letter on the soft soldering of aluminium (December issue) is interesting, if a little off beam. Mr. Sandford is, in fact, claiming success where the whole of the soft solder manufacturing industry has failed. Rather a bold claim!

It is a well-known fact that aluminium can be soldered, but only with tin/zinc alloys, and not tin/lead ones, and in any event a flux is most definitely required. Perhaps Mr. Sandford is confusing the issue a little, when what he is in fact getting is metal adhesion, which may stand up for a short while, although true soft soldering depends upon complete fusion between both metal surfaces to be joined, and the solder alloy. It is in fact perfectly true, however, that once aluminium has been tinned with a tin/zinc alloy, an ordinary tin/lead alloy might be used for soldering on to the tinned areas, but it should be remembered that aluminium alloys and casting alloys cannot be soft soldered, neither can anodised material.

Yours faithfully,
DENNIS N. LICENCE
Technical Service and Sales,
Enthoven Solders Ltd.

London, E.C.2.

History of Amateur Radio

DEAR SIR,—With reference to the article *Club of the Month* in the January, 1964 issue of the RSGB BULLETIN, I would respectfully suggest that the Derby and District Amateur Radio Society are the recognized holders of the title of oldest established radio club in existence in this country, as far as it is possible to determine.

I have no doubts that were the minutes of various offshoots of Physical Societies, Mechanics Institutes etc., available today, we could no doubt plus up a sequence of administrative changes that has taken place in the past, to enable claims to be made, probably before 1900 in fact, as the starting date of many present day clubs or societies. However, 1911 it is for Derby, and 1909 for the Radio Club of America.

The lesson to be learned here is that it is high time the world had in its possession an up-to-date and authentic history of radio and television, unmarred by politics of any kind, which would of course include Amateur Radio in all its aspects, and above all the absolute truth, without regard to the ego, etc., of any individual or organization; likewise the deliberate omission of facts should of course not be tolerated.

In this country we have no publication comparable with *Two Hundred Metres and Down* by de Soto, or the Radio Club of America's " Silver Jubilee " and " Golden Jubilee " publications, or for that matter " *The Story of the first Transatlantic Short Wave Message* " also by the RC of A.

There are possibly a few of the original pre-1914 vintage amateurs still about, who could give us first hand information, but in the absence of the written word, the sands of time are running out, and soon it will be too late. Can I hope then, that someone will chronicle Amateur Radio and the early days of wireless, and commit to paper names, now forgotten, which should be brought to light again together with the events with which they are connected, not forgetting the early " Men of Wireless " who were not, strictly speaking, " Wireless Men."

Yours faithfully,
E. G. KENDALL, G3APA

Coundon, Coventry.

(Mr. John Clarricoats, O.B.E., G6CL, has recently accepted an invitation from the Council to prepare a history of the Society and Amateur Radio.—EDITOR).

Thanks to Liverpool Amateurs

DEAR SIR,—During the early weeks of January I spent an enforced stay at Lourdes Hospital, Liverpool and was temporarily (and purposely) robbed of my eyesight. Throughout what would otherwise have been a most boring period I was fortunate to receive regular visits from the local Amateur Radio fraternity and I now take this opportunity to express my sincere gratitude to members of the Liverpool and District Radio Society. In particular I am most indebted to G3NNW who provided an AR77, to G3IZT, G3MCN, G3SX, G4QC, G8DI and two 16-year-old SWLs, Ian Barton and David Robinson, all of whose company I appreciated so much even though unable to " see " them. Finally to G3PDC whose regular Top Band activities afforded me so much pleasure.

Perhaps one day, but in a different manner, I can repay so many kindnesses.

Yours faithfully,
ERNEST (" MONTY ") BANKS, GC2CNC.

Jersey, C.I.

The Bulletin

DEAR SIR,—In renewing my subscription to the Society, I should like to say that I think the BULLETIN is the best Amateur Radio magazine. In every issue I have so far received there has been at least one article of exceptional interest to me, while the rest have been of a very high standard.

Thank you for a year of interesting, entertaining and even exciting reading.

Yours faithfully,
G. H. SNELL, A.3558

Dorchester, Dorset.

Aerials for Four Metre Mobile

DEAR SIR,—Our station is equipped for 4m operation both from home and in the car, so that whoever is out driving can be in constant communication with home.

The mobile aerial is a quarter-wave vertical rod in the centre of the car roof. Tests have confirmed that it is essential to have a vertical radiator at home as well as the normal four-element horizontal Yagi.

We have found the most efficient aerial to be a ground plane formed by a quarter-wave vertical rod mounted on the boom of the beam (but insulated from it, and independently fed) midway between the driven element and reflector, thus using the beam elements as a " ground."

At 30 ft. high this is several S points up on any other omni-directional system tried, and most easy to construct, so there is no reason why those with a horizontal Yagi should not also have a vertical ground plane.

We now wait for the pundits to prove it cannot work!

Yours faithfully,
H. and A. CRANE, G2AVC, G3GOX

Hanworth, Middlesex.

That Biological Fuel Cell

DEAR SIR,—The electric battery powered by bacteria described in the January BULLETIN is brilliant in its initial conception, but four points seem to have been overlooked.

All bacteria and fungi produce toxic waste products which accumulate and eventually kill the very organisms which produced them. It would be necessary to clean out every cell at three- or four-weekly intervals before refilling with a fresh food supply and reinoculating the bacteria. I handle many thousands of bacterial and fungal cultures annually, and I do not know of a single species of micro-organisms which will continue to grow actively for any length of time without requiring to be transferred to a fresh food supply free of its toxic waste products.

It is probable that only one species of bacterium would operate the cell satisfactorily, although this was not stated in the report. However, unless the rice husks and water were first sterilized and introduced into the cell under aseptic conditions, and unless the air vent were plugged with a sterile filter, other species of bacteria which are always present would gain entry and suppress the wanted bacteria and render the cell useless. As in our gardens weeds always grow better than the flowers!

The growth rate of bacteria is dependent on temperature, very few being able to continue growth below about 4°C or above 45°C. How is it intended to make this type of cell work in space vehicles with their sub-zero temperatures? Sea air would also affect the bacteria, so this battery would be of little use on buoys.

By the way, has anyone considered the smell of such a battery?

Yours faithfully,
MICHAEL DRANSFIELD, B.Sc., Ph.D.,
M.I.Biol., 5N2JKO

Zaria, Nigeria.

Scoring in V.H.F. Contests

DEAR SIR,—The First 144 Mc/s Contest of the year has gone and the results are awaited with interest. But, as far as points scoring is concerned, a serious anomaly is apparent in the rules, so much so that given average conditions and a certain industrious ingenuity, the final results for leading places could be forecast.

The fact that the same rules are perpetuated in the Open Contest to come makes it imperative that there be a change, otherwise there exists a risk that the truly competitive spirit may die.

There is no doubt at all that an overwhelming bias in favour of GW stations is extant, and this applies to NFD too. The northern stations may be of the opinion that the bias is in favour of the GM's. Be this as it may, and to stick to v.h.f., there is no questioning the fact that despite equal or even greater effort and skill, a G station has a very appreciable handicap.

Outside of England, entrants can claim 25 bonus points for every G worked, plus county bonus. Now compare the G entries with the handful of GW or GM participants and it will be seen that the G has to complete a considerably greater number of QSO's over a minimum of about four or five, to maintain a fighting chance.

Neither are v.h.f. rules that allow a fixed number of points per contact of much use to those outside the heavily populated areas. Please remember those stalwarts in the more remote areas of England too, places like Cornwall and Devon, Cumberland and Northumberland; yes, even places like Bristol.

It should be stated that the Contests Committee have an arduous and frequently thankless task and this is not an attack on them but an effort to clear the air and obtain a national opinion. In short, to be constructive.

We have considered the developing situation over a number of years and to lessen aberration believe an equable system for v.h.f. scoring should be based on distance; points per mile (or kilometre). Even GI stations might then be in with a chance.

It is appreciated that computation of mileage may be tedious. For the entrant, logging is all part and parcel of any contest and at least he would know he had an equal chance. This particular problem is greater for the Contests Committee, but presumably they only closely scrutinize the leading scores.

To ease the situation, perhaps the QTH could be given on an NGR basis—as in a certain NGR square, distances to be from the centre. This would reduce the total number of locations and make possible a more rapid method of calculation. This would be fair to all and eastern stations would still be able to take advantage of Continental openings. On the other hand, they may find it more profitable to turn their beams west or north, and that some of the Continentals, in terms of distance, are not so exotic as was thought.

It is felt too, that it would be correct to further divide the c.w. contests to include a portable section since height plays such a prominent part, but we do concede that anybody going mountaineering portable in January deserves the highest regard.

A further suggestion to foster still greater interest in purely portable contests and to benefit those unable to go out themselves, is a certificate to the fixed station contributing most points to portables (NFD excluded).

This letter is lengthy, but we feel it is of utmost importance to a great many active members of the Society, and therefore we make no apology and sign as interested individuals.

Yours faithfully,

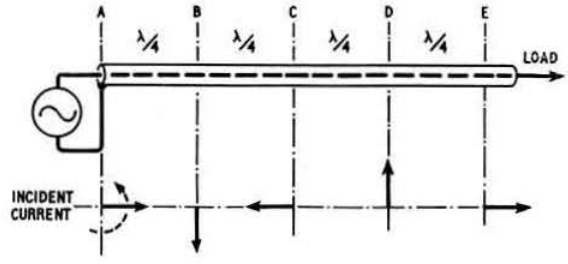
D. V. NEWPORT, G3CHW	H. J. GRATTON, G6GN
M. S. BATT, G3SJI	E. C. HALLIDAY, G3JMY
BRIAN R. JESSOP, G3NOO	A. J. RAWLINGS, G3PFC
R. F. VOWLES, G3PFD	M. B. BROWN, G3KUJ
H. W. LEONARD, G4UZ	W. P. LEWIS, G3IFV

Bristol.

Some Reflections on Standing Waves

DEAR SIR,—The article *Some Reflections on Standing Waves* by R. C. Hills, G3HRH, was to me a welcome sight in the January BULLETIN, as the topic is one of considerable mystery to the majority of radio amateurs,

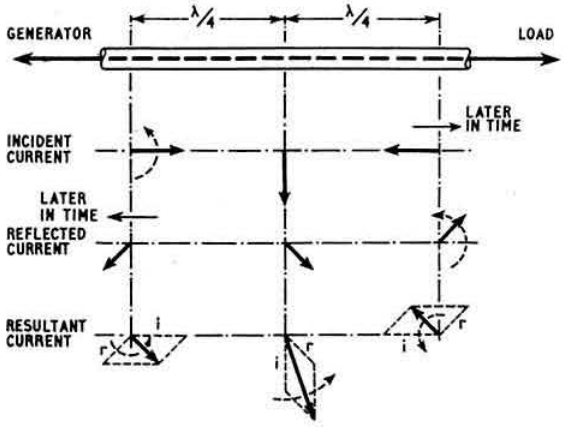
I soon found however that the treatment caused me some personal confusion since it appears to have been based on a *negative* time scale. As the writer points out, " the terminating load cannot influence the passage of the ' forward ' travelling wave " and yet it appears from Figs. 3, 4 and 5 that points nearer the load have advance information of the behaviour of the generator. Since the wave of energy is shown as travelling from left to right and conventional positive angle of vector is anti-clockwise then vectors to the right must lag vectors to the left. Fig. 3 for example, should appear as follows:



The correctness of the above diagram is verified by considering the effects of a time lapse. The current wave at point *B* must have originated as a current wave *of the same angle* one quarter cycle earlier at point *A*, thus the current at point *B* must *lag* one quarter cycle on the current at point *A*.

Similar corrections must be applied to the other diagrams in which the writer has used the vector notation.

The second statement which causes me some disquiet in view of its effects on other readers is the reference to the angle of rotation of the vector of the reflected wave. Once the " positive-anticlockwise " convention has been adopted it must be adhered to. The fact that the wave is reflected does not alter the direction of rotation of the vector representing it. Fig. 5(a) should therefore be redrawn to correct the state of affairs, as follows:



The formation of standing waves is the result of addition or cancellation of the currents due to forward and reflected waves. Assume a reflected wave equal in magnitude to the forward or incident wave, then complete cancellation would occur *at all times* at points spaced a halfwave apart. This could not occur if the concept of oppositely rotating vectors was used.

The above points do not represent the total criticism of this article. I expected, perhaps, too much enlightenment of what is after all one of the most complex of all the topics with which we have to deal. I do feel however that it has not cleared much of the mist away and, for its length, it has not achieved the writer's original aim in my estimation.

A number of elementary errors appear in wording which require correction, e.g. Fig. 4(b):

$$\emptyset = \tan^{-1}\frac{R}{X_c}$$

Fig. 10: $1/k$ is the *reciprocal* of s.w.r.; Fig. 11: the ordinate is unmarked but is presumably " absolute power loss in db."

In conclusion I would like to say that Mr. Hills' article would have been most satisfactory had it not been for the unfortunate errors previously mentioned.

Yours faithfully,
E. C. HALLIDAY, G3JMY

Winterbourne, Bristol.

DEAR SIR,—In the first part of his letter, Mr. Halliday shows, quite correctly, that by adopting an opposite (and more usual) convention for the sense of vector rotation *with time*, one can demonstrate the same result, namely that the addition at different points on a line of incident and reflected current vectors of constant magnitude (length) can, due to the change of angle between them with position, produce a resultant current vector whose magnitude changes with position along the line. Which convention is adopted is immaterial to the argument, since this is based on the relative position of the incident and reflected current vectors at each point on the line *at a fixed instant of time*, when the phase angle between them is fixed in space for any particular corresponding pair of vectors.

I refer now to the question of relative rotation and the apparent anomaly to which Mr. Halliday refers. Throughout my article, I stressed that the various vector configurations shown were those existing in space at a particular moment of time. *Rotation* has at all times been used to indicate the direction in which a particular vector must be turned, in order to obtain the next vector along the line *at that same moment in time*, and in no way refers to the change of angle with time of the vector at one particular point. If an observer examines the corresponding pairs of incident and reflected vectors at progressive positions along the line at the same moment of time, he will observe the indisputable fact that the reflected vector is rotating *backwards* relative to the incident vector. Were this not the case, then one would not have a relative rotating speed of 2ω, and consequently the maximum of the standing wave curve would not occur at every half-wavelength, as is the case in practice: Mr. Halliday has in fact confused himself (and possibly others may have done the same) by attempting to bring into the argument the element of time, when all that is needed is a knowledge of relative positions in space. The effect of time is merely to rotate *every* vector in the article in the same direction at the same speed without altering their relative positions, and is therefore irrelevant to the generation of the standing wave.

Mr. Halliday has kindly drawn attention to two omissions which occurred when the article was being prepared for publication. Fig. 4(b), at the right-hand side, should read " $\tan \varphi = R/X_c$," and in Fig. 11(a) the vertical axis should be labelled " additional loss due to s.w.r. (db)" rather than as your correspondent has suggested. The marking of the horizontal scale of Fig. 10 is quite correct in the text, and is a scale of s.w.r. There is no such thing as a *reciprocal* of s.w.r. since an s.w.r. of 2 : 1 is exactly the same as an s.w.r. of 1 : 0·5 It is marked $(1/K)$ since the text has defined K as a ratio greater than unity.

Yours faithfully,
R. C. HILLS, B.Sc.(Eng.), A.M.I.E.E., A.M.Brit.I.R.E., G3HRH

Digswell, Welwyn, Herts.

National Field Day

DEAR SIR,—I note with grave concern the amendment to the scoring in the 1964 NFD, as published in the December BULLETIN.

Being in close contact with all Belfast and District Members, and also the chief organizer of NFD effort in this area for the past three years, I may write authoritatively for all those members in this part of the United Kingdom.

It has been apparent during recent years that NFD operation from Northern Ireland—utilizing the most efficient organization, skilled operators and best equipment—presents a severe handicap to any chance of actually winning this contest. This was partially offset, however, by the bonus points on 80m and 160m. There has always been a large and enthusiastic following: each year accepting the challenge of this handicap and striving to gain a higher placing.

After observing the intention to drop the 80m bonus, members in this area now feel so discouraged as to be asking, " Is it worth entering this year?" They realize, of course, that such an enormous handicap now precludes any possibility of winning at all.

I ask the Contests Committee to seriously re-consider this decision, before irreparable damage is done to enthusiasm and morale in this and other similarly located groups. I must add that this decision has come as a complete surprise, there being no previous intimation of the Committee's intentions. In fact, is NFD to be a National Event (as the name implies) or a mere English Field Day? The former must surely imply an equal handicap (or chance) for all UNITED KINGDOM stations; the latter, quite simply a change of name!

In closing, I feel certain that all the aforegoing remarks must apply equally to Scottish participants as well.

Yours sincerely,
P. G. BOWER, GI3OFT
Area Representative, Belfast.

Belfast 5.

Can You Help?

● Keith Aggett, VK2ZHA, 72 William Street, Earlwood, Sydney, Australia, who requires the manual and/or circuit diagrams of the Wireless Set No 88 manufactured by Ekco Electronics Ltd.?

● J. Lyons, GM3GUJ, 1 Thorfinn Place, Thurso, Caithness, who would like to borrow a copy of the R209 manual?

CLUBROOM

A Monthly Survey of Group and Club Activities

News from the Newsletters

The Cray Valley *Newsletter* reports co-operation with the local Sea Cadet Corps in technical training and assistance. The Cadets' Headquarters site appears to have room for all sorts of aerial systems so there should be plenty of scope for mutual help. An ingenious, and obviously effective, long-wire aerial installation is described in the Enfield Group's *Newsletter:* it is a 132 ft. Marconi for use in a small garden. The First Class Operators' Club *Newsletter* discusses the apparent lack of activity amongst its members and hopes that this state of affairs will soon be remedied. The *Lothians Radio Amateur* gives information and a circuit diagram showing how to use a W3EDP aerial on Top Band. This newsletter also lists a number of flourishing school radio societies and mentions that the Fife Education Committee are actively encouraging amateur radio in their schools. Those who may have doubts about their ability to pass the RAE can take courage from G3RQA's article in the *MARTS Newsletter:* he went from no radio knowledge to call-sign in 10 months. A useful receiver muting system is also described in this newsletter. For the mechanically minded, the *MARS Newsletter* describes the construction of an automatic CQ caller using an old clockwork gramophone motor as the motive power. *RADIAL* gives more detailed information on the " Possum " control system for handicapped people. There seems to be almost no limit to the type of equipment which can be controlled by lightly blowing down a tube. The Wolverhampton *Newsletter* also describes an automatic CQ sender, but this one is electronic and requires the services of a tape recorder. Information is also given on a " Poor Man's Voice Control " whose main components are a pentode and a relay. *QUA* has some interesting comments on the economics of publications catering for radio amateurs and also describes the making of an electric blanket, though whether amateur construction of the latter should be encouraged is another matter.

Club Reports

Acton, Brentford & Chiswick RC. The following have been elected as officers: Chairman, R. G. Hindes, G3IGM; Vice-Chairman, R. P. Cole, G6RC; Honorary Secretary, Treasurer and Press Officer, W. G. Dyer, G3GEH, 188 Gunnersbury Avenue, Acton, London, W.3. Committee Members: J. Lovell, G5LQ; R. T. Wright, G5ZA; S. G. Collyer, G3PZK. For particulars of meetings see *Forthcoming Events.*

Bradford Radio Society. Meetings are held at Cambridge House, 66 Little Horton Lane, Bradford, 5, on the second and fourth Tuesdays of each month and start at 7.30 p.m. Morse practice classes are held by prior arrangement before the general meeting. Recent meetings have included a quiz night, a visit to the National Switch Factory at Keighley and a visit to the Spen Valley Radio Society. D. M. Pratt, G3KEP, has given a demonstration of " Inexpensive Sound Fidelity " using home built equipment. Details of the future programme may be obtained from the Honorary Secretary, E. G. Barker, G3OTO, 63 Woodcot Avenue, Baildon, Shipley, Yorks.

Bristol ARC. This club was started last year after an initial meeting of 53 enthusiasts, and membership is now approaching the 100 mark. The club is allowed to use five rooms attached to the University Settlement in Bristol on any night of the week, although official nights are Mondays and Thursdays. Talks covering the RAE syllabus have been given and it is hoped to build a club transmitter. Twelve members are building the 144 Mc/s converter featured in the October, 1962, BULLETIN. The Chairman is H. W. Leonard, G4UZ, 47 Windsor Road, St. Andrews, Bristol, 6.

Cambridge & District ARC. On January 10, a Radio Brains Trust consisting of G3GGK, G3BBY and G3PTB with G5BQ as Question Master, confronted a full meeting to deal in confident style with a wide range of questions. It was a most successful evening which will set the pattern for others. The discussion on s.s.b. on January 24 was a little disappointing, chiefly because one or two of the known enthusiasts were indisposed. However, G2CDX and G3HZP did very well in dealing with a number of questions.

Chester & District RS. The AGM was held on January 14 at which the society's first President, Mr. K. Gray, GPO Area Engineer, was installed. The Chairman, Mr. D. Wardle, G3EWZ, conducted the proceedings. A meeting will be held at 8 p.m. on March 10 at the YMCA when GW3LDH will give a talk entitled " CQ DX 160." Further details may be obtained from the Press Officer, P. J. Holland, A3784, Field House, 19 Kingsley Road, Gt. Boughton, Chester.

Civil Service RS. There was a good attendance at the meeting held on February 3 at which a team of technicians from Grundig Ltd. gave a demonstration of tape recording. Several visitors from other clubs were welcomed. At the informal meeting around the transmitter, GB2SM, on January 20, members had the opportunity of keeping in touch with absent members in Cyprus and Nyasaland and with local members on Top Band. The Honorary Secretary is G. Lloyd-Dalton, 2 Honister Heights, Purley, Surrey.

Conway Valley ARC. The junk sale held on January 9 at the Albert Hotel, Llandudno, was a great success and was attended by members of other radio clubs in the area. Meetings continue to be held on the second Thursday in each month at the Albert Hotel, Llandudno. Honorary Secretary: B. Clark, GW3HGL, Meadfoot, Tan-y-Bryn Road, Colwyn Bay.

Crawley ARC. The Annual Constructional Contest was held at the January meeting at the new Ifield Headquarters. Entries were judged by members of the Reigate Club. The winner was J. W. Swift, G3CTP, with his collapsible 30 ft. mast and 20m beam. The runner-up was A. J. Gibbs, G3PHG, who entered the 4m transmitter which helped to win second place in the V.H.F Field Day for the club. At the same meeting J. Duckworth, G3FM, gave a talk on " Crystal Grinding." On March 6 the Annual Dinner will be held at which G. M. C. Stone, G3FZL, will be guest of honour. Honorary Secretary: R. G. B. Vaughan, G3FRV, 9 Hawkins Road, Tilgate, Crawley, Sussex.

Crystal Palace & District RC. In general, the club has had a very successful year both in RAE successes and NFD placings. The Honorary Secretary is the President of RSGB, G. M. C. Stone, G3FZL, 10 Liphook Crescent, London, S.E.23.

Dunfermline RS. The President, GM3AEI, has started a radio club at Oakley School where he is Headmaster. A Visitors' Day is to be held on Sunday, March 15, at the City Hotel, Dunfermline, and RSGB members will be welcome. Monthly meetings are held in Abbot House, Dunfermline. Details from the Honorary Secretary, K. Street, GM3ENJ, 1 York Place, Dunfermline, Fife.

East London Group. A very practical approach to " Mobile Operating " was made by D. E. E. Purchese, G3LXP, when he gave a talk on this subject. From a wealth of personal experience on all h.f. and v.h.f. bands, he was able to pass on much useful information. It was a most interesting and well attended meeting. Honorary Secreatary: M. McBrayne, G3KGU, 25 Purlieu Way, Theydon Bois, Essex.

East Worcestershire ARG. The Redditch College of Further Education is running a " One Day School " on Saturday, March 14, which should be of interest to all radio enthusiasts. There will be demonstrations of equipment including amateur television and Eddystone receivers. Details may be obtained from the Chairman of the EWARG, L. Hickingbotham, G3HZG, 95 Oakenshaw Road, Redditch, Worcs.

Flintshire RS. The AGM was held on January 28 at which the following were elected: Chairman, J. T. Lawrence, GW3JGA; Honorary Secretary, A. Antley; Honorary Treasurer, L. W. Barnes, GW3PCZ/T; Committee: P. F. Jones, GW3FPF; G. R. R. Whitehead; G. Habesch. Meetings are held on the last Tuesday of each month at the Clubroom, Railway Hotel, Prestatyn. The Honorary Secretary's address is: Fairholme, Fairfield Avenue, Rhyl, Flintshire.

Farnborough Technical College RS. Meetings are held on Fridays at 7.30 p.m. A lecture on microwaves will be given on March 6, and on March 18 there will be a demonstration of high fidelity equipment. Equipment for the club station, G3POW, is now being bought. Honorary Secretary: D. T. Strike, Farnborough Technical College, Boundary Road, Farnborough, Hants.

Grafton RS. A representative from the GPO Engineering Department will be explaining the services offered to amateurs by the Post Office and problems associated with TVI will be discussed on March 13. Meetings are held on Fridays in Room 35 on the top floor of Montem School, Hornsey Road, London, N.7., from 8 to 10 p.m. The school will be closed for the Easter holiday from March 27 to April 3. A copy of the current *Newsletter* and full details of the Society's activities will be forwarded upon application to the Honorary Secretary, A. E. Bristow, B.R.S.25779, 37 Tyndale Mansions, Upper Street, London, N.1.

Halifax & District ARS. Members of the Spen Valley Club were visitors on February 4 for a sale of surplus gear. These inter-club visits are increasing in popularity. The Annual Dinner will be held at the Crown Hotel, Halifax, on March 31; XYLs, YLs and friends will be welcome subject to the maximum number of 70 altogether. There will be no speeches. Further details from the Publicity Officer, M. Whitaker, G3IGW, Rose-Dene, Wood Lane, Hipperholme, Halifax, Yorks.

Leyton ARG. The club has been running successfully since last September and fortnightly meetings are held on Tuesdays at 7.30 p.m. at the Leyton Senior Evening Institute, Essex Road, Leyton, London E.10. Visitiors will be most welcome, and it is hoped that the membership will increase. Honorary Secretary: R. W. Firmin, A3120, 9 Raglan Road, Walthamstow, London, E.17.

Lichfield ARS. The Annual Dinner and Dance was held at the end of January, at which the principal guests were the Mayor (an Honorary member) and Mayoress of Lichfield and Tom Douglas, G3BA. A successful junk sale has been held and an interesting lecture on RTTY was given by H. Saunders, G3CRE. The Honorary Secretary is V. Hickman, G3LXR, 143 Main Street, Stonnall, Walsall, Staffs.

Loughton & District RS. The society meets on alternate Friday evenings at Loughton Hall, Debden Community Centre, Rectory Lane, Loughton, Essex, which is within a few minutes off Debden Station (Central Line). On January 17 G8AB gave a most interesting talk on communication receivers with particular reference to his "Tom Thumb" version. At the following meeting G3NKX's 2m transceiver was demonstrated. The meeting arranged for March 10 will be dovoted to a talk on TVI by G3PEN: visitors are welcome. Honorary Secretary: A. W. Sheppard, G3JBS, 11 Barfields, Loughton, Essex.

Lothians RS. The lecture on TVI-proofing which was to have been given by GM3PQU on January 30 had to be postponed. In its place there was a recorded lecture on the same subject. It is hoped that this will mean an increase in local radio activity during TV hours. Perhaps GM3PQU will now provide a more modern follow-up. Honorary Secretary: L. R. Richardson, GM3AKM, 39 Silverknowes Grove, Edinburgh, 4.

Manchester & District RS. Meetings are now preceded by a session of Morse practice, and an RAE class is being arranged. Novices are welcome to both. On January 22 there was a Hi-Fi demonstration by G3OAG. This was very interesting, and at times deafening. Details of meetings may be had from the Honorary Secreatry, D. H. Poole, B.R.S.25698, 215 Greengate, Middleton Junction, Manchester.

March & District ARS. The club now has an Elizabethan transmitter operational on 3·5 Mc/s, and a 16 element 70cm array is being re-erected. There is a strong television section which is actively preparing to transmit vision and sound at the Peterborough Club's "Bucket and Spade" Rally at Hunstanton on Sunday, June 14. There are 12 licensed members of which five are /T.

Northern Heights ARS. Several well attended meetings were held in January: the first was a talk by H. Makin, G3FDC, on his 10-80m transmitter. There has been a film show, and members were guests of the Spen Valley Radio Society at one of their meetings. On March 18 there will be a visit to a tape recording centre in Halifax. The AGM is on April 15. Full details of meetings may be obtained from the Honorary Secretary, A. Robinson, G3MDW, Candy Cabin, Ogden, Halifax, Yorks.

North Notts. ARS. The fourth annual Dinner and Dance was held on January 25 and was attended by 32 members and guests. The President, G8ON, announced the engagement of Alan Jubb, G3PMR, and Heather Rollinson, A3626, which had been kept secret until it could be announced at the dinner of the club which had brought them together. Miss Anne Christoffersen, who has many amateur radio friends in her home town of Aalsgaarde, Denmark, was a guest at the dinner and won a raffle prize.

Activity-on-the-air is popular at many club meetings. This photo was taken during operation of GW3JGA/A by Flintshire Radio Society.

Plymouth RC. The clubroom will be open every Tuesday for informal discussions and Morse practice. Three members recently qualified for their licences, and when the new call-signs are issued, licensed members will outnumber the SWLs. The G5ZT Construction Trophy competition will be held on April 7, and the AGM on May 5. Honorary Secretary: R. Hooper, G3SCW, 2 Chestnut Road, Peverell, Plymouth, Devon.

Reading ARC. On January 18, the club held a very successful Dinner Social which was attended by 50 people. At the AGM held on January 25, the following officers were elected: Chairman R. Page, G5TP; Treasurer, A. Miles, G3ASU; Secretary, R. G. Nash, G3EJA; Contests Manager, E. Davies, G3PGM; SWL Representative, B. Carter. The two mobile picnics had proved so successful that it was agreed to run another two this year, the dates of which are to be announced shortly. Details of meetings may be obtained from the Honorary Secretary at Peacehaven, 9 Holybrook Road, Reading, Berks.

Reigate Amateur Transmitting Society. At the Fifth AGM held in January, C. T. Cowan, Chairman, and F. D. Thom, G3NKT, Honorary Secretary, were re-elected. R. A. Eldridge, G3RAE, is now Honorary Treasurer, and D. Norman, G3RCY, Contests Secretary. Committee Members are: J. Duckworth, G3FM; J. Ayling, G3PNA; Junior SWL C. Saveker. The new Auditor is G. E. Mac'Krell, G3KAX. Two parties visited the BBC TV studios, and apart from the interesting technicalities, amazement was expressed at the vast stock of "props" and costumes. Another event was the sending of a panel to judge the Crawley ARC Constructional Contest. Details of the future programme may be obtained from the Honorary Secretary, F. D. Thom, G3NKT, 12 Willow Road, Redhill, Surrey.

Royal Naval ARS. It is now possible for members of the Sea Cadet Corps, Instructors and Officers, to join the society. Membership is also open to all past and present members of the Royal Navy, Royal Marines, Royal Naval Reserves, Commonwealth Navies and civilians attached to these services. Anyone interested should contact the Secretary, R.N. Amateur Radio Society, H.M.S. *Mercury*, Petersfield, Hants.

Royston & District ARC. The new Honorary Secretary is C. E. Aubrey, G3RZY, 34 Rock Road, Royston, Herts.

Scarborough ARS. At the AGM held on January 9 the following officers were elected: President, G3KS; Chairman, B.R.S. 23427; Vice-Chairman, G5VO; Secretary, G8KU; Treasurer, G3NRI; Press Officer, G5KA; QSL Manager, B.R.S.18461. Meetings are held every Thursday at 8 p.m. During February, activities included a sale of surplus gear, lectures on equipment, and an evening devoted to planning for NFD. Details of future meetings from the Press Officer, F. Postlethwaite, G5KA, 11 Alma Square, Scarborough, Yorks.

South Dorset RS. At the February meeting, Mark Savage, G6SV, gave a final talk on aerial systems including a description of the aerial array at the BBC's Rampisham station. This was followed by a description of the new NFD transmitter designed and built by Don Pidgeon, G3CVF. Honorary Secretary: C. E. Biggs, G2TZ, 54 Prince of Wales Road, Dorchester, Dorset.

Southgate, Finchley & District Group. As a new venture, a second monthly meeting will be held for the benefit of novices and SWLs who will be able to discuss problems and see a station being operated. Meetings are held at Atlasta Lodge, Tottenhall Road, Palmers Green, London, N.13. Further details from the Honorary Secretary, R. Wilkinson, A3017, 33 Amberley Road, Palmers Green, London, N.13.

Spalding. There are six enthusiasts in the Spalding area who would like to start a club. Those interested are asked to get in touch with D. Polzin, 2 Ellen Crescent, Spalding, Lincs.

Spen Valley ARS. This society has embarked on a very successful programme of getting to know the members of neighbouring radio clubs: a display of members' gear was held, to which Northern Heights, Bradford, Halifax and Leeds were invited. The meeting was held in the lounge of the Heckmondwike Grammar School and was greatly enjoyed by the 75 visitors.

Stockport RS. Particular attention is being given to the interests of junior members who now have the opportunity of talking, in a group, to a senior member for 15 minutes before each meeting. New members, and juniors in particular, are very welcome and will find that the society has members interested in all aspects of amateur radio. Meetings are held on alternate Wednesdays at 8 p.m. at the Blossoms Hotel, junction of Bramhall Lane and Wellington Road, Stockport. Visitors from other clubs are always welcome. Honorary Secretary: R. R. Diamond, G3SFN, 102 Chatsworth Road, Hazel Grove, Stockport, Cheshire.

University College of North Wales ARS. This newly formed society meets on alternate Thursdays at 5.30 p.m. in the Department of Electronic Engineering, Dean Street, Bangor. There has been a film show, a talk on contest operating by GW3JI and an RSGB tape lecture on " A DXpedition to St. Pierre and Miquelon." Members enjoyed a well attended outing to the BBC medium wave, v.h.f., and TV stations at Penmon and Llandona, Anglesey. Society officers are as follows: President, J. T. Lawrence, GW3JGA; Chairman, A. H. Jubb, G3PMR; Honorary Secretary/Treasurer, M. J. English, A3088; Committee Member, D. Wright. Details of future meetings, to which all local amateurs and SWLs are welcome, may be obtained from the Honorary Secretary, c/o Dept. of Electronic Engineering, U.C.N.W., Dean Street, Bangor.

Verulam ARC, St. Albans. In January A. L. Mynett, G3HBW, provided a most interesting and enjoyable evening by describing and demonstrating his award winning transistorized communication receivers.

Yeovil ARC. At recent meetings G3BEC gave a talk on the BC221 and G3QMH gave a lecture on " The Forward Scatter U.H.F. Services " and also the first of a series of talks for younger members on " Valves and their uses." The following were elected at the AGM on January 29: Chairman, B. J. Clark, G3BEC; Honorary Secretary, D. L. McLean, G3NOF; Honorary Treasurer, F. W. Parkhurst, B.R.S.10663. Press Officer: R. K. Parkhurst, 56 Cromwell Road, Pen Mill, Yeovil, Somerset.

York ARS. The AGM was held on January 30 in the clubroom at 61 Micklegate, York, when the following were elected: Chairman, J. E. Armstrong, G3GDA; Honorary Secretary/Treasurer, W. H. Hodgson, B.R.S. 23054; Committee: A. Horner, G3FTS; G. S. Drury, S. D. Jones, C. Turner. G3FTS was re-elected ASR for 1964. The Honorary Secretary's address is: 69 Sherwood Grove, Acomb, York.

Wirral ARS. The a.m. section of the Transmitter Construction Group have now completed their metal work and are standing-by with their soldering irons at the ready. The sidebanders are still a few lengths behind. On March 18 H. Schroeder will talk on receiver servicing, and on April 1 there will be a lecture on v.f.o.'s by K. Birch, G2FOS. Honorary Secretary: A. Seed, G3FOO, 31 Withert Avenue, Bebington, Wirral, Cheshire.

Club of the Month

CRAWLEY AMATEUR RADIO CLUB

Crawley Amateur Radio Club was formed at a meeting held on October 15, 1959, at which nine people were present. In four years the club membership has increased to 39 paid-up members, of which some 25 are licensed.

The Crawley Club has an unusually high percentage of members engaged in the electronics industry, and whilst this is not unexpected in a new town like Crawley, it has resulted in an extremely keen and active membership with a wide range of interests.

One of the primary club interests is in the field of contest operating, and efforts are being made to work up efficient operating teams for the major contests, together with reserves of suitable equipment.

Home construction is tackled with real enthusiasm, and it is a measure of this constructional effort that, in the 1963 NFD, only the diesel generator was commercial. Receivers, transmitters, and all ancillary equipment were home constructed.

During 1963, a group of club members was responsible for organizing the Exhibition Station, GB3RS/GB2VHF, and the club was fortunate in winning the Exhibition Organizer's trophy for home-constructed equipment. Here it would not be amiss to pay tribute to the Crawley chairman, G3TR, for successfully persuading his XYL to allow the complete Exhibition Station stand to be erected in his front room three weeks before the show!

Crawley meet twice monthly, on the second and fourth Wednesdays in each month. The informal meeting on the second Wednesday is held at a member's house. This policy was started in the early days of the club with the object of encouraging a friendly get-together and a good look at the other man's station, and has remained a regular part of club activities.

From January this year, the main meeting is being held at the Trinity Congregational Church, Ifield, where the club enjoys the use of first-class accommodation, although, of course, there is no connection with the Church. During the year the policy has been to have at least six first-class lectures, together with other events, including the ever popular junk sale. The last-named event always causes considerable amusement as a hard-pressed auctioneer, in the shape of the club's Secretary, tries to get his own back by " lumbering " members with useful (and not so useful!) " surplus equipment."

Another popular item in the club's calendar is the mobile evening, held once a year on the Hog's Back at Guildford. This pleasant evening outing generally attracts a large number of visitors from nearby clubs.

An annual dinner is held and attendances have been steadily rising with every year. Last year's " gimmick " at the dinner was a colour film of club activities, to which were added some comedy stunts.

The club makes every effort to encourage " new blood," and regular slow morse classes are run. In addition, a committee member, in conjunction with the West Sussex County Council, is running an RAE course at the local Evening Institute, which currently has 18 members.

One feature of club life in Crawley is the keen competition between the Crawley gang and their near neighbours at Reigate—numerous gauntlets have been thrown down by both sides, resulting in fierce competition during contests.

The Crawley story is not a long one, but much has been done in the four years since the club was founded, towards putting Crawley on the amateur radio map.

Spilsby Hamfest and Junk Sale

The Third Annual Junk Sale and Hamfest has been arranged for Friday, March 20, to commence at 7 p.m. at the Bull Hotel, Halton Road, Spilsby, Lincs. There will be an admission charge of 2s. 6d. to cover expenses and light refreshments. The first part of the evening will be allocated to direct sale of equipment and will be followed by the junk sale. Previous events have been very successful and it is hoped every support will be given to this event. Further information may be obtained from N. T. Hodgson, G2ABK, The Bungalow, Raithby Road, Hundleby, Spilsby, Lincs.

Forthcoming Events

Details for inclusion in this feature should be sent to the appropriate Regional Representatives by the first of the month preceding publication. A.R.s and club secretaries are reminded that the information submitted must include the date, time and venue of the meeting and, whenever possible, details of the lecture or other event being arranged. Regional Representatives are requested to set out the copy, preferably typed double spaced, in the style used below. Standing instructions for more than three months ahead cannot be accepted.

REGION 1

Ainsdale (ARS).—March 4, 18, 8 p.m., 77 Clifton Road, Southport.
Blackburn.—Fridays, 8 p.m., West View Hotel, Revidge Road.
Blackpool (B & FARS).—Mondays, 8 p.m., Pontins Holiday Camp, Squires Gate.
Bury (BRS).—March 10 ("Transmitter and Receiver Testing"), 8 p.m., Knowsley Hotel, Kay Gardens.
Chester.—Tuesdays, 8 p.m., YMCA.
Eccles (E & DAC).—Tuesdays, 8 p.m., The Congregational Mission Church, King Street.
Liverpool (L & DARS).—Tuesdays, 8 p.m., Gladstone Mission Hall, Queens Drive, Stoneycroft.
Macclesfield.—March 17, 31, 42 Jordongate.
Manchester (M & DARS).—Wednesdays, 7.30 p.m., 203 Droylsden Road, Newton Heath, Manchester 10.
Manchester (SMRC).—Fridays, 7.45 p.m., Rackhouse Community Centre, Rackhouse, Daine Avenue, Northenden.
Morecambe.—March 4, April 1, 125 Regent Road.
Preston.—March 10, 24, St. Paul's School, Pole Street. (All meetings start with a Morse practice at 7.30 p.m.)
Southport (SRS).—Wednesdays, 8.30 p.m., Sea Cadets Camp, The Esplanade.
Stockport.—March 11, 25, April 8, The Blossoms Hotel, Buxton Road.
Wirral.—March 4, 18, 7.45 p.m., Harding House, Park Road West, Claughton.

REGION 2

Bradford.—March 10 (Junk Sale), March 24 (AGM), 7.30 p.m., 66 Little Horton Lane.
Catterick.—Tuesdays and Thursdays, 7.30 p.m., Clubroom, Vimy Road, Catterick Camp.
Halifax.—March 31 (Annual Dinner), Beehive and Crosskeys Hotel. **Northern Heights.**—March 4 (Ragchew), Sportsman Inn, Ogden. March 18 (Visit to Tape Recorder Centre, Halifax).
Scarborough.—Thursdays, 7.30 p.m., Chapman's Yard, North Street.
Spen Valley.—March 5 ("Moonbounce," by S. Marsden), March 7 ("Communications Satellites," 3.15 p.m., Griffin Hotel), March 18 ("Silicon Semiconductors," by STC), 7.15 p.m., Heckmondwike Grammar School.
York.—Thursdays, 8 p.m., British Legion Club, 61 Micklegate.

LOOKING AHEAD

March 13.—London Lecture meeting at IEE.
March 18-24.—Electrical Engineers Exhibition, Earls Court, London.
April 5.—RSGB National Mobile Rally, Texas Instruments Ltd., Bedford.
April 18.—Irish Dundalk Convention at Ballymuscannon.
April 19.—North Midlands Mobile Rally, Trentham Gardens.
May 1.—London Lecture Meeting at IEE.
May 24.—RSGB National Mobile Rally, USAF, Wethersfield.
May 24.—Northern Mobile Rally.
June 21.—Longleat Mobile Rally.
July 5.—South Shields Mobile Rally.
August 16.—Derby Mobile Rally.
August 30.—G6UT's Ham Party.
August.—International Mobile Rally, Belgium.
September 13.—RSGB National Mobile Rally, Woburn Abbey.
September 20.—Surrey Radio Contact Club 2m D/F Hunt.
December 18.—RSGB Annual General Meeting.

REGION 3

Birmingham (MARS).—March 17 ("Electrical Measuring Instruments," by Don Bates), 7.30 p.m., Midland Institute, Paradise Street, Birmingham. **(MRCC).**—March 6, 7.30 p.m., Windmill House, Weatheroak, Wythall, Birmingham. **(Slade).**—March 6, 13, 20, 7.45 p.m., The Church House, High Street, Erdington. **(South).**—March 19 ("Hints on Mobile Operation; Tape or TX Design; and TVI," by G3BTM), 7.30 p.m., Friends' Meeting House, Balsall Heath.
Cannock (CCARS).—March 5, April 2, 8 p.m., The Tavern, Bridgtown.
Coventry (CARS).—Mondays, 8 p.m., Westfield House, Radford Road, Coventry.
East Worcestershire Group.—March 12, 8 p.m., Old People's Centre, Redditch.
Lichfield (ARS).—March 17, 7.30 p.m., Swann Inn, Lichfield.
Mid-Warwickshire (ARS).—March 9 ("An Introduction to Modern V.H.F. Techniques," by G3BA), March 23 (Members' Equipment), 7.30 p.m., Civil Defence Training School, Harrington House, Newbold Terrace. Leamington Spa.
Salop (ARS).—March 12, 7.30 p.m., The Tennis Club, Harlescott Crescent, Harlescott Lane, Harlescott, Shrewsbury.
Stourbridge (ARS).—March 10, 7.45 p.m., (AGM), Foley College, Stourbridge.
Stratford-upon-Avon (ARS).—Fridays, 7.30 p.m., Flat 1, Bird's Commercial Motors, Stratford-upon-Avon.
Sutton Coldfield (ARS).—March 13, 7.30 p.m., 92 The Parade, Sutton Coldfield.
Wolverhampton (ARS).—Mondays, 8 p.m., Neachells Cottage, Stockwell End, Tettenhall.

REGION 5

Cambridge (C & DARC).—March 6 (Junk Sale), March 13 (Informal), March 20 (AGM), March 27 (Informal), 7.30 p.m., Club Headquarters, Corporation Yard, Victoria Road, Cambridge.
Cambridge University (CUWS).—March 10 (AGM), 8.15 p.m., Psychology Dept., Lecture Room, Downing Site.
Luton (L & DARS).—March 9 (Talk by a Club Member), March 16 (Bring-and-Buy Sale), March 23 (Constructional Activity Contest), 8 p.m., ATC Headquarters, Crescent Road, Luton. Also open on Mondays and Thursdays.
March (M & DRAS).—Tuesdays (constructional work on equipment for RAEN during all meetings in March), 7.30 p.m., rear of Police Headquarters, High Street, March.
Royston (R & DARC).—Wednesdays, 8 p.m., Manor House Social Club, Melbourne Street, Herts.
Shefford (S & DARS).—March 5 ("Telephone Systems," by J. Harper, G3RLJ), March 12 ("Modern House Wiring Systems and Regulations," by G2DPQ), March 19 (Second NFD Meeting), no meeting on March 26, April 2 ("Transistors." by P.Wicks, G3ROL), 7.45 p.m., Digswell House, Hitchin Road.

REGION 6

Cheltenham.—First Thurdsay in each month. March 5 (Question and Answer Session on "S.S.B."), 8 p.m., Great Western Hotel, Clarence Street, Cheltenham.
Oxford (O & DARS).—Second and Fourth Wednesdays in each month (RAE Classes), 7.15 p.m., Cherwell Hotel, Water Eaton Road, N. Oxford.

REGION 7

Acton, Brentford & Chiswick (ABCRC).—March 17 ("Principles of S.S.B.," by G3OJX), 7.30 p.m., AEU Club, 66 High Road, Chiswick.
Bexleyheath (NKRS).—March 12, 26, 7.30 p.m., Congregational Hall, Chapel Road, Bexleyheath.
Barnet (BRC).—March 31 ("Micro-miniaturization," by G. Wattson), 8 p.m., Red Lion Hotel, Barnet.
Chingford (Group).—March 6 at G3AGA, March 20 at G3NQT, Loughton 2397. **(S.C.).**—Fridays (except first in month), 8 p.m., Chingford Community Centre, Enday Hill.
Clifton (CARS).—March 6 ("Portable Operation in Rare Counties," by R. Stevenson, G3JEQ), March 21 (Inter-Club Quiz with Crystal Palace ARS, *away*), April 3 (Quiz, *home*), 8 p.m., 225 New Cross Road, London, S.E.14.
Croydon (SRCC).—March 10, 7.30 p.m., Blacksmiths Arms, South End, Croydon.
Dorking (D & DRS).—March 10 ("Aerials, and Methods of Coupling") 8 p.m., "Wheatsheaf," Dorking. March 24 (Junk Sale), 8 p.m., Star & Garter, Dorking.
East Ham.—March 10, 24, Tuesdays fortnightly, 7.30 p.m., 12 Leigh Road, East Ham.
East London District.—March 15 ("Electronics in Medicine," by F. Barnes, G3AGP), 2.30 p.m., Ilford Town Hall, High Road, Ilford.
East Molesey (TVARTS).—March 4, Carnarvan Castle Hotel, Hampton Court.
Edgware & Hendon (EARDS).—March 9, 23, 8 p.m., John Keble Hall, Church Close, Deans Lane, Edgware. Interested new members contact G3VW, 10 Holmstal Avenue, Edgware.
Enfield.—March 19, 7.30 p.m., George Spicer School, Southbury Road, Enfield.
Gravesend (GRS).—March 18, 7.30 p.m., RAFA Club, 17 Overcliffe, Gravesend.
Guildford (G & DRS).—Second and Fourth Fridays in each month, 8 p.m., City Cafe, Onslow Street, Guildford.
Harlow.—Tuesdays, 7.30 p.m., rear of G3ERN (G. E. Read), High St., Harlow. **(SRC).**—Wednesdays, 7 p.m., Edinburgh Way, Harlow.
Harrow (RSH).—Fridays, 8 p.m., Roxeth Manor County School, Eastcote Lane, Harrow.
Holloway (GRS).—Mondays and Wednesdays (RAE and Morse), 7 p.m., Fridays (Club), 7.30 p.m., Montem School, Hornsey, N.7.
Hounslow (HADRS).—Fortnightly, March 9, 23, 7.30 p.m., The Canteen, Mogden Main Drainage Dept., Mogden Works, Isleworth.
Ilford.—Thursdays, 8 p.m., 579 High Road, Ilford (Nr. Seven Kings Station).
Kingston.—March 12, 8 p.m., YMCA, Eden Street, Kingston. Morse Classes weekly on Fridays, at 2 Sunray Avenue, Tolworth.
Leyton & Walthamstow.—March 24, 7.30 p.m., Leyton Senior Institute, Essex Road, E.10. Interested new members contact A. Rix, 17 Forest Drive East, E.11.

LONDON MEMBERS' LUNCHEON CLUB

will meet at the Bedford Corner Hotel, Bayley Street, Tottenham Court Road,
at 12.30 p.m. on Fridays, March 20, and April 17, 1964
Telephone table reservations to HOL 7373 prior to day of luncheon. Visiting amateurs especially welcome.

Loughton.—March 13, 27, 7.30 p.m., Loughton Hall, Nr. Debden Station.
Mitcham (M & DRS).—March 13, 7 p.m., "The Canons," Madeira Road, Mitcham.
Norwood & South London (CP & DRS).—March 21, CD Training Centre, Bromley Road, Catford.
Paddington (P & DARS).—Wednesdays, 7.30 p.m., Beauchamp Lodge, 2 Warwick Crescent, W.2.
Purley (P & DRC).—March 6, 20, 8 p.m., Railwaymen's Hall, (side entrance), Whytecliffe Road, Purley.
Reigate (RATS).—March 21, 7.30 p.m., The Tower, High Street, Redhill.
Romford (R & DRS).—Tuesdays, 8.15 p.m., RAFTA House, 18 Carlton Road, Romford.

Science Museum (CSRS).— March 16 (RSGB Tape Recording: "Some Problems of Space Travel," by W. A. Scarr, M.A., G2WS), 6.30 p.m., Science Museum, South Kensington.
Sidcup (CVRS).—March 5 (AGM), April 2 ("Aerials," by G3ISK), 7.30 p.m., Congregational Church Hall, Court Road, Eltham.
Slough (SARS).—First Wednesday in each month, 8 p.m., United Services Club, Wellington Street, Slough.
Southgate & District.—March 12, 8 p.m., Atlasta Lodge, Tottenhall Road N.13.
St. Albans (Verulam ARC).—March 18 ("Certificates and Awards," by J. D. Kay, G3AAE), 8 p.m., Hedly Road, St. Albans.
Sutton & Cheam (SCRS).—March 17, 7.30 p.m., The Harrow, High Street,Cheam.
Uxbridge (UDRS).—March 16, 8 p.m., St. Andrew's Church Scout Hut, Uxbridge Road.
Welwyn Garden City.—March 12, (Constructors' Competition and films), 8 p.m., Vineyard Community Centre, Digswell Road, Welwyn Garden City, Herts.
Wimbledon (W & DRS).—March 13, 8 p.m., Community Centre, St. George's Road, Wimbledon, S.W.19.

REGION 8

Crawley (CARC).—March 6 (Annual Dinner), the "Grasshopper," Tilgate. March 11 (Visit to the Thames South Control Room, CEGB), for details contact G3FRV. March 25 ("Interference Suppression," by R. Beddis), 8 p.m., Trinity College Church, Ifield.
West Kent (WKARS).—March 13 ("Test Equipment;" display of members' apparatus), no meeting on March 27, April 10 (AGM), 7.30 p.m., Culverden House, Culverden Park Road, St. John's, Tunbridge Wells.
Worthing and District (W & DARC).—March 16 (Constructional Contest), 8 p.m., Adult Education Centre, Union Place, Worthing.

REGION 9

Bath.—March 11, 7.30 p.m., Committee Room, Technical College, Lower Borough Walls, Bath.
Bristol.—April 3 (Lecture by T. Withers), 7.15 p.m., Small Physics Theatre, Royal Fort, Bristol University, Woodland Road, Bristol 8.
Burnham-on-Sea (B-o-SARS).—Second Tuesday in each month, 8 p.m., Crown Hotel, Oxford Street, Burnham-on-Sea.
Camborne (CR & TC).—First Thursday in each month, Staff Recreation Hall, SWEB Headquarters, Pool, near Cambourne.
Exeter.—First Tuesday in each month, 7.30 p.m., George and Dragon Inn, Blackboy Road, Exeter.
Plymouth (PRC).—First Tuesday in each month, 7.30 p.m., Guild of Social Service Building, Plymouth. Other Tuesdays, Virginia House Settlement, St. Andrew's Cross, Plymouth.
South Dorset (SDRS).—First Friday in each month, 7.30 p.m., alternately at Waverley Hotel, Westham, Weymouth, and Labour Rooms, West Walks, Dorchester. March meeting at Dorchester.
Torquay (TARS).—First Saturday in each month, Club HQ, Belgrave Road, Torquay.
Weston-super-Mare.—First Tuesday in each month, 7.15 p.m., Technical College, Lower Church Road.
Yeovil (YARC).—Wednesdays, 7.30 p.m., Park Lodge, The Park, Yeovil.

REGION 10

Cardiff.—March 9 ("P.A. Circuitry and A.T.U.s," by D. M. Thomas, GW3RWX), 7.30 p.m., TA Centre, Park Street, Cardiff.
Port Talbot.—March 10 (lecture), 7.30 p.m., Workmen's Institute, 8-10 Jersey Street, Port Talbot.

REGION 11

Bangor (UCNWARS).—Thursdays fortnightly, 5.30 p.m., Dept. of Electronic Engineering, Dean Street, Bangor. Details from M. J. English, c/o above address.
Llandudno (CVARS).—March 12 (tape recording and slides: "Expedition to St. Pierre and Miquelon Isles"), 7.30 p.m., Albert Hotel, Madoc Street, Llandudno.
Prestatyn (FRS).—March 31 (Slow Morse, and "Animal, Vegetable and Mineral"), 8 p.m., Railway Hotel, Prestatyn.

REGION 13

Edinburgh (LRS).—March 12 (Film Night), March 26, 7.30 p.m., YMCA, South St. Andrew Street, Edinburgh.

REGION 14

Ayrshire.—Third Sunday in each month, at the ATC Hall, Mews Lane, Kilmarnock.
Belfast and District.—March 27 (Visit to Broadcasting House, BBC), 7.30 p.m. Final arrangements will be made on March 20, at Toc H, Belfast.
Glasgow.—March 6, 20, 7.30 p.m., The Christian Institute, 70 Bothwell Street, Glasgow.

REGION 16

Basildon (BDARS).—Details of meetings from G3RQT, 59 Waldegrave, Basildon.
Chelmsford (CARS).—First Tuesday in each month, 7.30 p.m., Marconi College, Arbour Lane, Chelmsford.
Great Yarmouth (GYRC).—Fridays, 7.30 p.m., in the Manager's Office, The Old Power Station, South Quay, Swanstons Road, Great Yarmouth. Details from G3HPR.
Norwich (Norfolk ARC).—Regular meetings at "The Branford Stores," Branford Road, Norwich. Details from G3NJQ.
Southend (SDARS).—Fridays fortnightly, March 6, 20 (Home Constructed Equipment Competition), 8 p.m., Executives' Canteen, E. K. Cole Ltd., Priory Crescent, Southend-on-Sea.

Contest News (Continued from page 191)

therefore, if you give us Locator, or latitude and longitude indications, we have to add to the clutter by having three sets of maps, and in neither of these latter methods is it possible to calculate the correct distances easily.

Comments concerning the length of the contest will be studied when next formulating the rules. However, to agree to all suggested times would mean extending the length to 18 hours. It is of interest to note that the leading station added over 400 to his score in the last two hours, but of course, he did not have TVI to contend with!

Other stations worked during the contest, but who did not submit logs, were G3NDF, G3KMS, G3JHM/A, G3BA, G3CLW, G3NSW, G3GVM, G3NZ, G8DT, G4OU, G5JU, G3RPE, G5MR, G3HZJ, G6OX, G3PY, G3KGU, G3EHY, G3ENY, G3CNO, G2OI, G3ION, G8TS, G3JYP, GW3, LJP, G3PLX, G3JQI, G3AYT, G3IUD, G8SM, G3PPG, G3PEN, G3LXP/A, G2AVC/M, G3PMJ, G3PY, G3NJF, G3KRX, G3SNA, G2ASL, G3RPY, GW4CG.

Closing date for the April issue
March 6

Closing date for the May issue
April 10

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

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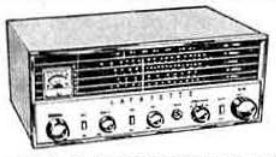

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