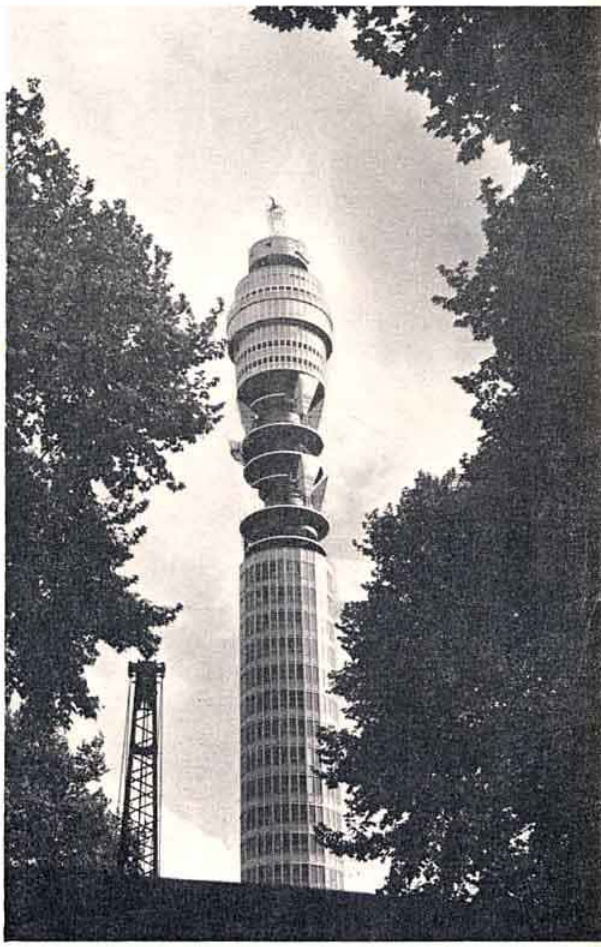
RSGB BULLETIN

NOVEMBER 1965
VOL. 41, No. 11

OCTOBER 8
GPO TOWER IN LONDON OPENED



OCTOBER 27
OPENING OF THE RSGB INTERNATIONAL RADIO COMMUNICATIONS EXHIBITION

JOURNAL OF THE RADIO SOCIETY OF GREAT BRITAIN

WEDNESDAY, OCTOBER 27 TO SATURDAY, OCTOBER 30

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Thursday - S.S.B. Night
Friday - Overseas Visitors Reception 7.30 p.m.
Restaurant open to 10 p.m.

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4/- Monthly

RSGB BULLETIN

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The RSGB Bulletin is published on the first Wednesday in each month by the Radio Society of Great Britain as its official journal and sent to all members.
The closing date for copy for the December issue is November 5.

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News from Headquarters

Representation 1966-68

A complete list of Corporate Members who have been nominated without opposition to serve as Regional or Area Representatives will appear in the December issue of the RSGB BULLETIN.

In three Regions, however, a ballot is necessary for the office of Regional Representative.

Region 8

The nominees for the office of Regional Representative are:
Mr. N. D. Mattock, G2DFG
Mr. D. N. T. Williams, G3MDO

Region 12

The nominees for the office of Regional Representative are:
Mr. A. W. Smith, GM3AEL
Mr. J. McIntosh, GM3IAA

Region 15

The nominees for the office of Regional Representative are:
Mr. J. W. Douglas, GI3IWD
Mr. L. M. Lyske, GI3CDF

Voting

Corporate Members resident in the above Regions are invited to record their vote in favour of *one* of the above candidates in the appropriate Region on a *postcard* and to send the postcard to the General Manager and Secretary, Radio Society of Great Britain, 28 Little Russell Street, London, W.C.1. to **arrive not later than November 11, 1965.**

Form of Voting Card

Election of Regional Representatives, 1966-68

I, ... being a fully paid up Corporate Member of RSGB wish to record my vote in favour of Mr. .....as Representative for Region .....

Signed .....

Call-sign or BRS number .....

Address .....

.....

Dr. John Saxton

RSGB member Dr. John Saxton has been appointed Director of the Radio and Space Research Station, Ditton Park, Slough, Bucks, in succession to Mr. J. A. Ratcliffe who retires next February. Dr. Saxton, at present Director of the UK Scientific Mission in Washington, D.C., has frequently spoken at RSGB meetings and in particular at V.H.F. Conventions.

NATIONAL FIELD DAY 1965

The Editor regrets that, for reasons beyond his control, it has not been possible to publish the report of National Field Day in this issue of the RSGB BULLETIN.

It is hoped to publish the report next month.

Annual General and Extraordinary General Meetings

Inserted in this issue of the BULLETIN sent to all Corporate members are notices convening the Annual General Meeting and an Extraordinary General Meeting.

Item No. 6 in the agenda for the Annual General Meeting is to give power to the Council to invest monies in the Company which is to purchase the Headquarters' premises when a suitable property is found. This Company, which is a public Company within the terms of the Companies Act, 1948, is called "Lambda Investment Company Limited" and was formed in accordance with the suggestions made at the last Annual General Meeting. This Company has full powers to deal in the purchase of such a property and to lease it to the Society on terms to be agreed. Mr. L. E. Newnham and Mr. N. Caws are acting as temporary Directors for the time being but as soon as shares are taken up in the Company they will offer their resignations so that the Society and Shareholders may appoint any Directors they wish.

Properties are still being looked at and surveyed but nothing suitable both as to price and situation has yet been found.

In the agenda for the Extraordinary General Meeting two matters are dealt with. The first brings the cost of a Life Membership into line with the recent increase in the subscription.

Since the adoption of the new Articles of Association in July 1964 it has been realised that there could have been misunderstanding in the status of the "Zonal Representatives," as the Council Members elected on a zonal basis are called in those Articles. It is desired that there should be no doubt that these "Zonal Representatives" are full members of the Council in no way different from any other member of Council, being entitled to hold office and to vote on any matters being discussed.

It is considered that the alterations proposed will give effect to this and remove any doubt.

REGION 4 LECTURE

COLOUR TELEVISION

This lecture will be given by Mr. B. J. Rogers of the Bush Radio Division of The Rank Organisation.

Admission will be by ticket, obtainable free of charge from Mr. F. C. Ward, Region 4 Representative, 5 Uplands Avenue, Littleover, Derby.

November 26, 7.15 p.m.

Main Lecture Theatre, Derby and District College of Technology, Kedleston Road, Derby

Low Voltage Stabilized Power Supplies

By J. A. HARDCASTLE, G3JIR*

WHEN making experimental transistor circuits or operating portable equipment at home, it is often desirable to use a mains powered supply. For ease of use this should be capable of supplying a variable output voltage and ideally should be stabilized against mains voltage and load current variations.

Now that power transistors and silicon rectifiers are readily available, it is possible to meet all these requirements using only semiconductors, thus keeping the efficiency high.

Zener Diodes

If the characteristic curve for a typical silicon junction diode, Fig. 1, is examined, it is seen that when it is forward biased, Fig. 2(a), it is fully conducting when the applied

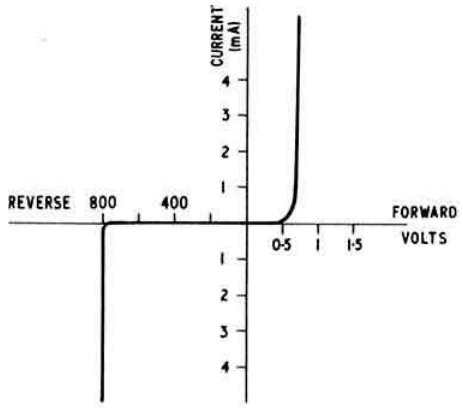

Fig. 1. Typical forward and reverse characteristics for a silicon junction diode.

voltage has reached about 0·7 volts. In the reverse bias direction, Fig. 2(b), the voltage may be increased to 800 volts, in this example, before an appreciable current flows. This reverse breakdown voltage is dependent on the quantity of impurity present in the materials used in making the

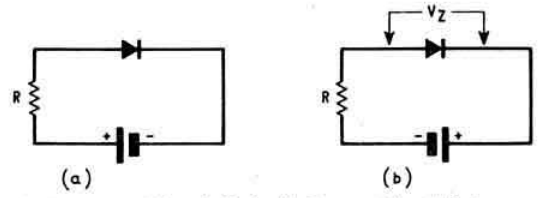

Fig. 2. (a) Forward biased diode. (b) Reverse biased diode.

diode. By carefully controlling the quantity of impurity (known as the "doping" level), the manufacturer can produce junction diodes having reverse breakdown voltages ranging from about 3 volts upwards. These are commonly known as Zener diodes.

When biased into the Zener conduction region (Fig. 2(b)), the current flowing is limited only by the resistance of the external circuit, in this case resistor R. Over a large range of current, the voltage Vz across the diode varies by only a very small amount. Thus we can say that in the Zener breakdown region the diode has a very small impedance. This makes the Zener diode an excellent voltage stabilizer and a typical circuit for low voltage application is shown in Fig. 3. Note the symbol used for the Zener diode. The electrode marked with a plus sign is usually marked on the case by a red spot and corresponds to the cathode of a thermionic diode.

Designing Zener Diode Stabilizing Circuits

The design of a Zener diode stabilizer circuit requires a knowledge of the stabilized voltage, unstabilized voltage supply and load current. It is also necessary to know whether or not the supply will ever be required to run "off load". Between them, these four factors will determine the maximum power dissipation of the Zener diode.

A typical application would be a stabilized supply for the local oscillator in a mobile receiver. The voltage of a lead-acid cell can vary between 1·8 volts and 2·5 volts approximately, according to the state of charge. This means that the

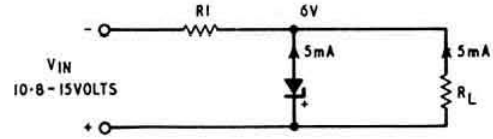

Fig. 3. Simple Zener diode stabilizer.

terminal voltage of a 12 volt car battery can swing between 10·8 volts and 15 volts and it is desirable not to allow this large variation to be passed on to the oscillator. These, of course, are very extreme conditions and are not likely to be encountered very often, but they will be useful for the typical design which follows.

Say it is decided to stabilize the oscillator collector supply at 6 volts, that the current required is 5 mA and that, for reasons given later, it is desirable to allow 5 mA to flow through the Zener diode. At minimum supply voltage the drop across R1 is $10{\cdot}8 - 6 = 4{\cdot}8$ volts, so from Ohm's Law:—

$$R_1 = \frac{E}{I} = \frac{4{\cdot}8}{10} \times 1000 = 480 \text{ ohms.}$$

The nearest preferred value, 470 ohms, will be used.

Now we must consider what happens at the highest supply voltage.

$$I = \frac{E}{R} = \frac{15-6}{470} = 19\text{mA}$$

Thus there must now be $19 - 5 = 14$mA flowing in the Zener diode. As it is unlikely that the load will be removed in this case, this may be considered to be the condition of maximum dissipation in the Zener diode.

This will be:—

$$Power = E \times I = 6 \times 14 = 84\text{mW}$$

A typical small Zener diode suited to this application

* 82 Acacia Avenue, Huyton, nr. Liverpool.

would be an OAZ202. This has a nominal voltage of 5·6 volts and a power dissipation of 260 mW.

It is worth checking on the power dissipated in R1. This will be:—

$$E \times I = (15-6)\ 19 = 171 \text{ mW}$$

If, through a fault arising, the load is removed, all the current will flow through the Zener diode and the power dissipated will be :—

$$E \times I = 6 \times 19 = 114 \text{ mW}$$

As this is still within the ratings of the Zener diode no damage would be caused by a fault in another part of the circuit.

For higher powered circuits there are larger Zener diodes available, up to power dissipations of 25 watts and more.

For amateur applications, the most important characteristic of the Zener diode is its ability to provide a stable source of low voltage. However there are other factors which affect this voltage, which are not entirely of secondary importance.

Slope Resistance

From Fig. 4 it can be seen that as the current flowing through the Zener diode alters, so does the voltage across it. Thus the steepness of the reverse characteristic shows how stable the output voltage is going to be. Note that at low currents the slope of the curve becomes flatter and in consequence the output voltage is less stable. This was the reason mentioned earlier for operating the Zener diode with a minimum current of 5mA.

The higher voltage diodes have a steeper slope or as it is preferred to express it, a lower slope resistance. For a given type of Zener diode the power dissipation allowed is constant, so that the maximum current rating is reduced as the operating voltage increases.

Temperature Coefficient

Diodes having a breakdown voltage below 6 volts have a negative temperature coefficient of about 2mV/°C, while diodes above 6 volts have a positive temperature coefficient.

At approximately 6 volts the temperature coefficient is a minimum. Since the temperature coefficient alters slightly with operating current it is difficult to select a device having zero temperature coefficient. However it is usually good enough to choose a diode operating in the 6 volt region when all but the highest temperature stability is required.

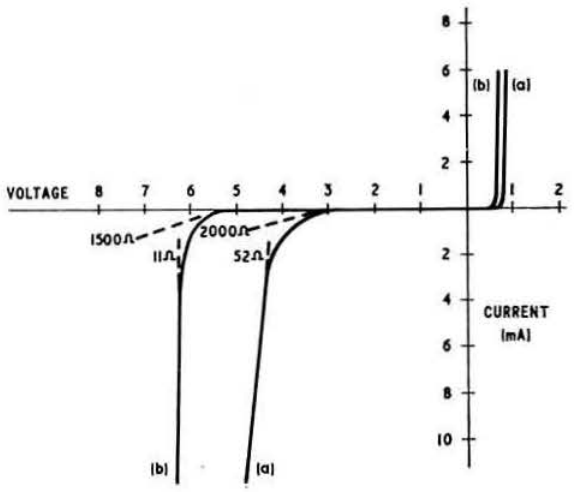

Fig. 4. Forward and reverse Zener diode characteristics showing change of slope resistance with current for different diodes.

Operation in Series

In order to obtain a higher working voltage it is possible to connect Zener diodes in series. Tnus a 5·6 volt and a 6·8 volt diode connected in series will result in a combination having a working voltage of 12·4 volts.

From the preceding paragraph it will be seen that a lower temperature coefficient will result from operating two 5·6 volt diodes in series, than if a single 11 volt diode was used.

It is not possible to connect Zener diodes in parallel in order to increase the power dissipation capabilities, as one diode would tend to take all the load. A single higher power diode must be used. These are constructed similarly to power rectifiers and have a mounting stud so that they may be bolted to a cooling fin. Even the small, 250mW types may have their ratings increased slightly by mounting on a heat sink.

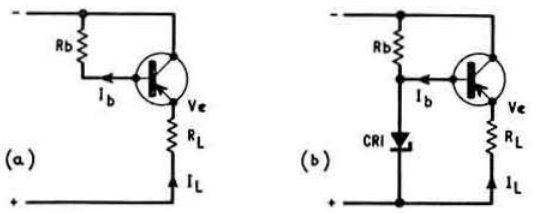

Fig. 5. (a) Emitter follower. (b) Voltage stabilizer.

Transistor Stabilized Power Supplies

A transistor connected as an emitter follower (Fig. 5(a)) is analogous to a valve cathode follower and similarly has a low output impedance. This property may be used to provide a constant voltage power supply.

As the current in the load is increased, so the base current must be increased and the base voltage falls due to the extra voltage dropped across R_b. The base-emitter voltage for a given transistor is almost constant, regardless of base current, due to the base-emitter junction behaving as a forward biased diode (Fig. 1). Thus any fall in base voltage produces a corresponding fall in emitter voltage.

In order to produce a practical circuit for a voltage stabilized supply a Zener diode, CR1, has been introduced in Fig. 5(b). This maintains the base voltage constant regardless of changes in input voltage and output load and so produces a constant output voltage.

The output voltage provided by the emitter follower is fixed by the Zener diode and if a germanium transistor is used it will be about 0·2 volts lower than the Zener diode voltage, or 0·8 volts lower for a silicon transistor. This makes the circuit rather inflexible and for this reason a detailed circuit has not been given.

Adjustable Voltage Supplies

The circuit of Fig. 6 will provide an adjustable, stabilized output voltage. A stabilized reference voltage is provided by CR1. R1 ensures that there is always sufficient current flowing to always operate CR1 in its low impedance region, even when TR1 is nearly cut off.

Potentiometer VR1 taps off a fraction of the output voltage and is used to provide base bias for TR1. Thus the collector current of TR1 may be adjusted over a wide range by VR1, altering the voltage at the base of TR2 and TR3 accordingly.

The collector of TR1 is directly coupled to the base of

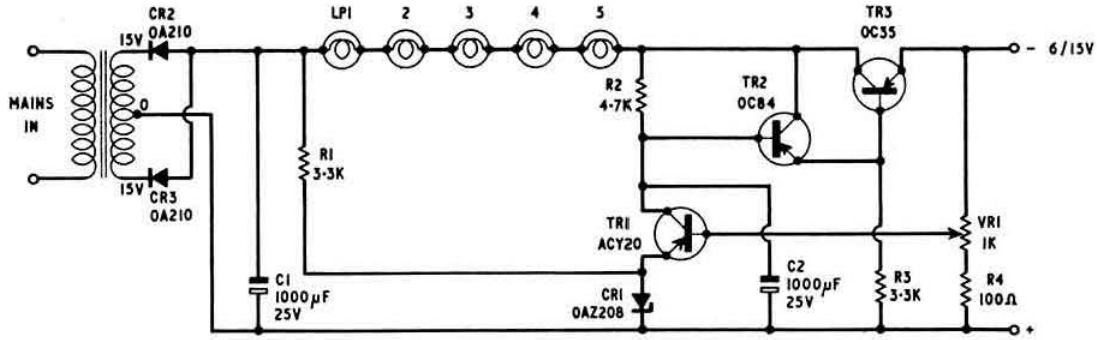

Fig. 6. Voltage stabilized power supply.

TR2 which is an emitter follower, used to drive the output emitter follower TR3. Thus the three transistors TR1, 2, 3 comprise a directly coupled voltage negative feedback amplifier, the output voltage being continuously compared with the reference voltage provided by CR1.

If the output current is reduced, the voltage will tend to rise and this produces an increase in the base voltage of TR1. This causes the collector current to tend to increase, with a consequent increase in the voltage drop across R2. The base voltage of TR2 tends to fall and by emitter follower action the base voltage of TR3 falls a like amount, which cancels the initial increase in output voltage.

The negative feedback action also reduces the a.c. ripple content in the output. This was found to be less than 10mV peak to peak on full load when observed on an oscilloscope. At lower currents the ripple is also lower.

A feature of this power supply is its inherent safety under overload conditions, which is very important if it is to be used in experimental circuit development. Five 4 volt, 3 watt lamps have been included in the collector circuit and under normal operating conditions these are only a small resistance in series with the supply. As the output current increases so does the lamp resistance (Fig. 7), which is a non-linear quantity, and increases with the filament temperature. If the output is short circuited, the current is limited only by the resistance of the lamps, but the collector-emitter voltage of TR3 has fallen to a very small value, making the power dissipated in this transistor negligible. Without the presence of the lamps, TR3 would be unable to withstand even a momentary overload or short circuit. Fuses are of no assistance either, since the transistor will burn out before the fuse blows.

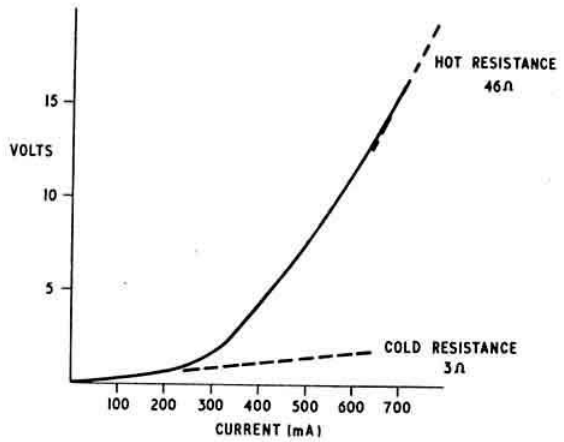

Fig. 7. Hot and cold resistance of five 4V 3W lamps in series.

Fig. 8 shows the power dissipated in TR3 at different load current and voltage settings. It shows that the power dissipation is actually less under short circuit conditions than at 400 mA.

Fig. 9 is a graph of the output voltage and current for various voltage settings. The output transistor was mounted on a heat sink 3 in. square made from 18 s.w.g. aluminium and blackened.

This is not the only method of making a safe stabilized power supply; the shunt stabilizer has the stabilizing transistor shunted across the output, where it cannot be damaged by an accidental short circuit. Two simple designs are discussed in References 1 and 2. Shunt stabilizers are most efficient when working on full load because, when off load, all the output power is dissipated in the stabilizer.

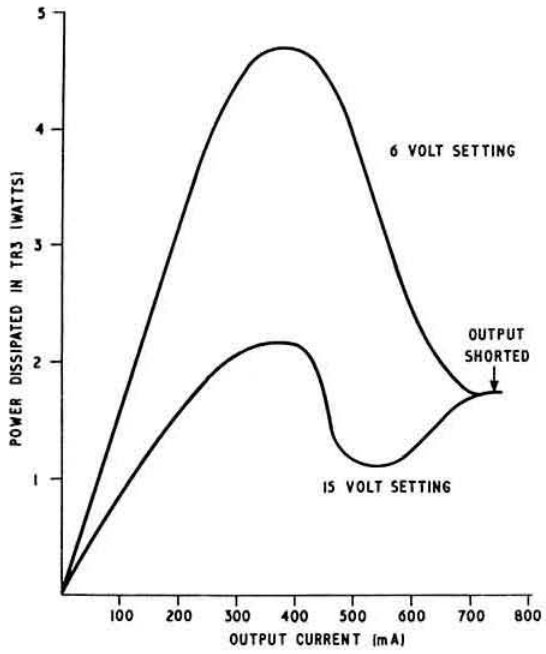

Fig. 8. Power dissipated in TR3 for varying voltage settings and load conditions.

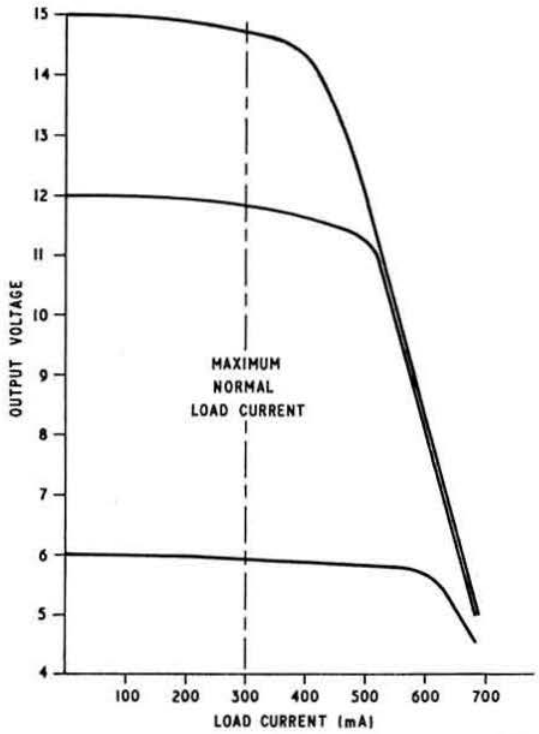

Fig. 9. Output voltage at increasing output current at different voltage settings.

A more sophisticated, and consequently more expensive protective system, uses a bistable trigger circuit to switch off the output transistor in the event of an overload. An excellent design is described in Reference 3.

Conclusion

The application of Zener diodes and transistors to low voltage stabilized power supplies has been discussed in general and a simple design for an inherently overload-proof power supply has been described. Reference has also been made to other stabilizer systems which have been used. For readers interested in a further study of more complicated stabilizing systems a short list of articles is included to provide an introduction to an already extensive literature.

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[1] RSGB BULLETIN, "Technical Topics," December 1963, p. 346.
[2] *Wireless World*, March, 1965, "Simple Transistor P.S.U." p. 138.
[3] *Mullard Reference Manual of Transistor Circuits*, Chap. 27, "Protection Circuit for Stabilized D.C. Power Supply".
[4] *Electronic Engineering*. "A Transistorised L.T. Regulator," Deichen. p. 688 November, 1959.
[5] *Electronic Engineering*, "A Simple Circuit for the Protection of the Stabilized Transistor Power Supplies," Jovanovic and Ilic, p. 521, August, 1961.
[6] *Electronic Engineering* "Transistor Power Supplies with Limited Overload Current. Ritson and Foss. p. 526 August, 1962.
[7] *Electronic Engineering* "A Transistor Voltage Regulator with Inherent Short Circuit Protection," Marshall, p. 106 February 1963.

BOOK REVIEW

THE RADIO AMATEURS' V.H.F. MANUAL. Edited by Edward P. Tilton, W1HDQ, v.h.f. Editor of *QST*. Published by ARRL. 314 pages 6½ in. × 9½ in. Available from RSGB Publications. Price 18s. 6d. postage paid.

This book, based mainly on articles which have appeared from time to time in *QST*, is packed with information and constructional details of equipment for all v.h.f. and u.h.f. bands from 50 to 2300 Mc/s and at $2 must represent very good value for money indeed in the United States.

Although 50 and 220 Mc/s are not bands allocated in the United Kingdom, there is still plenty to interest both the newcomer and the more experienced v.h.f. and u.h.f. operator in this country.

The 13 chapters, all very well illustrated with clear photographs and line drawings, include some interesting information on assessing the performance to be expected from a station band by band, a number of well-tried converter designs, mostly employing the Nuvistor 6CW4 and, designs for high, medium and low power transmitters and exciters for c.w., a.m. and f.m. Single sideband operation on 144 Mc/s is covered by the use of frequency transverters from lower frequency bands.

Aerial design and construction is treated quite thoroughly but although acknowledgement is made of G2HCG's famous skeleton slot, no designs incorporating this device are described.

A very clear description of the theory and use of the varactor diode for frequency multiplication appears in Chapter 10 where is also found comprehensive details of a pulse communication system for use on 2300 Mc/s. Chapter 12 is concerned with the causes and cure of various forms of interference, not forgetting the "public relations" aspect when dealing with complaints.

Eighteen pages are devoted to test equipment of all kinds including a v.h.f. version of the Monimatch s.w.r. indicator, but unfortunately nothing is said about interpreting the readings obtained in terms of s.w.r. In view of the importance of obtaining a good noise factor for v.h.f. and u.h.f. converters it is somewhat surprising that no design is given for its accurate measurement by means of a thermionic noise diode. The silicon diode type mentioned has its uses in lining up a receiver but is not suitable for making accurate measurements.

Much useful advice on painting equipment, plating, making r.f. chokes and v.h.f. wiring and decoupling procedure generally is found in the chapter entitled "Bits and Pieces."

The question of what to include and what to omit in a book of this description must be a major headache for the editor concerned with getting the maximum amount of current "know how" into the space at his disposal, but it is felt that extensive treatment of a transceiver using a supergenerative detector might well have been curtailed in favour of a valve data section detailing the types featured in the various designs, particularly as this information is readily available from the *ARRL Handbook*.

A final observation concerns the almost complete absence of transistor equipment (including mast-head amplifiers) for other than a short range transceiver for 50 Mc/s. An exception is a brief description of a low noise pre-amplifier for 432 Mc/s where, inter alia, it is stated that transistors are available having noise factors equal to or better than the best valves.

W.H.A.

RSGB Recorded Lecture Library

Mr. G. S Milne, G3UMI, 10 Raleigh Hall, Eccleshall, Staffordshire, has taken over responsibility for the RSGB Recorded Lecture Library from Mr N. B. Ta'Bois, G3HWG, who has been Honorary Curator for several years.

International Amateur Radio Convention, Knokke

By W. H. ALLEN, MBE, G2UJ*

WITH Bill Ingle, G3OIZ, at the controls, the British United Airways " City of Bristol " took off from Ferryfield Airport, Lydd, on the afternoon of Friday, September 17, *en route* for Ostend. On board were Len Newnham, G6NZ, Jim Foster, G2JF, the writer and his wife, all on their way to the first International Amateur Convention at Knokke, Belgium. Although the clouds were down to a few hundred feet, Middelkerk Radar lined us up with the runway for a faultless landing, to be greeted by ON4LV and ON4UM of the organizing committee of the Knokke group and Les Cooper, G5LC/ON8IZ and Fred Lambeth, G2AIW who had landed earlier in the day.

Arriving at the Albert Plage Hotel, headquarters of the Convention and distinguished by a row of flag poles on the pavement, we made our number and met other members of the hard working committee. Here was the Convention station, ON4UMV, with a KWM-2 and Geloso gear for operation on h.f. s.s.b. and a.m. respectively, and a Heathkit " Pawnee " 2m transceiver. Later in the day contact was effected with 4U1ITU and a message of good wishes for the success of the Convention received from Eric Yeomanson, G3IIR, President of RSGB, who was attending the ITU meeting at Geneva on behalf of the Society.

Count Lippens, Burgomaster of Knokke, in a trilingual speech inaugurating the Convention, paid tribute to the amateur movement as a valuable means of promoting international understanding and presented a handsome plaque bearing the arms of the town to the amateur coming from the greatest distance. This was won hands down by WA6CEB with K1RCH/ON8UD as runner-up.

It is impossible to say exactly how many amateurs and their ladies attended in all, but something over 220 calls were registered and the biggest event, the dance on the Saturday evening, attracted well over 300 people from at least eight countries.

But to return to the events of Friday. After dinner two coaches departed for Bruges, many of its beautiful and historic buildings floodlit and reflected in the waters of the numerous canals. A trip by boat along these ancient waterways, with bridges and other features picked out by lights, was an unforgettable climax to the visit.

Saturday morning and afternoon were devoted to meetings catering for varied interests including Traffic, ex-African operators, DX, s.s.b. and RTTY. Many of the British party, including ON4ZD (ex-GM2CAS), 2DHV, 2JF, 3BGP, 5LC, 6BX, 6NZ and the writer, together with some 40 ON, PA and F amateurs attended the Old Timers' meeting presided over by ON4BK who had been bitten by the radio bug back in 1912. When the 1914/18 war broke out he was the proud possessor of 600 volts of h.t. accumulators which, to escape inevitable confiscation, he sank in a canal. Two hundred and forty volts worth were recovered from the mud in 1919 and gave further service for a number of years! Reseau Belge, the original society, was ostensibly a listeners' organization; Belgian amateurs, mostly using calls consisting of a letter and a figure, were not only unrecognized officially but equated with spies if caught. However, the fear of the authorities that amateurs would provide unwanted competition to official services was at last overcome and the undercover " Groupement des Amateurs Emetteurs " was rewarded with licences in 1925. ON4BK attended the meeting in Paris that year at which the IARU was formed. By 1940 there were 250 licences in force, and during his Presidency of UBA for 13 years after the war he saw this number gradually increase until it reached some 700 at the present time.

As may be imagined, reminiscence was rife and a number of old acquaintances were renewed after the lapse of many years.

In reply to a message of greeting to all Old Timers from ON4AK, President of UBA, G5LC gave an invitation to any of those present to attend the International Meeting at the RSGB Radio Communications Exhibition in London on Friday, October 29.

The v.h.f. and u.h.f. meetings, with G5LC and ON4LN as the respective chairmen, commenced the proceedings on Saturday afternoon, followed by a lecture on v.h.f. propagation by Mr Gewillig, Chief Engineer of the Belgian Television Services. Gaby Felix, ON4FG, delivered a lecture in faultless English on meteor scatter communication, illustrating his points with tape recordings. Next was shown, by courtesy of the American Ambassador, a film dealing with the first successful reception of radar reflections from the planet Venus.

Belgian amateurs are not permitted to radiate television signals, but this did not prevent ON4RT and ON4LP from presenting first rate 625 line pictures on closed circuit originating from a home-built transistorized camera of most professional appearance. It was interesting to note that the " imperfect " Vidicon camera tube had been obtained through the good offices of the British Amateur Television Club. The final lecture of the session was on slow-scan TV and given by J. E. Tanner, G6NDT/T, who described the technical features of this less well known but no less effective mode of image transmission.

Unfortunately one can only be at one place at a time, so the writer did not see the demonstration by ON5DW, ON5DR and ON5GV of a radio-controlled model car and a lawn mower which excited considerable interest among passers-by on the sea front, to say nothing of the consternation of the youngsters dashing around in the popular pedal cars when they were hooted at by a handsome red sports car piloted by a blond doll!

If anyone had told the British contingent beforehand that they would be marching through the streets of Knokke behind the town band they would undoubtedly not have believed it, but this they did on the Saturday evening to the evident delight of the populace except, perhaps, those in held-up cars, as the " conventionaires " made their way first to the war memorial where a wreath was laid in memory of ex-ON4DS who died during the German occupation, and then to the Wiener Weinstube where the dance was held.

As mentioned before, the dance was a great success, in no little way due to the efforts of the M.C., ONL1322. G2JF and G6NDT/T were presented with gifts for their services towards the success of the Convention and G2JF was interviewed for a TV programme by ON4FG who is a well known producer of documentaries.

Not too much enthusiasm was evident for Sunday morning's events but all had recovered by the afternoon when a two metre " fox-hunt " set out, some on foot, others in cars many with full-sized multi-element Yagis on the roof. The " fox " turned out to be the man who had been observed mingling with the competitors before the start carrying a two element beam and " rush box " and apparently searching unsuccessfully for the hidden transmitter.

Little remains to be said except to put on record our appreciation of the tremendous efforts of the organizing committee which resulted in what must have been one of the most successful amateur conventions of all time. An even better event is promised for next year, so try and get there—you won't be disappointed.

* 24 Arundel Road, Tunbridge Wells, Kent.

TECHNICAL TOPICS By PAT HAWKER, G3VA

Hybrid Transceiver . Stable Transistor Oscillator . Using Line-output Valves for Class C and AB1
Locked Power Oscillator for 1·8 Mc/s Transmitter . 1·8 Mc/s Aerial Network Switching
Audio Noise Limiter . Bias Regulation . Lightning Protection
H.F. Crystal Filters . Transmitter Tips . More on Ground Planes

THE recent task of delving back through the past seven years of *TT* in the process of putting together the new RSGB publication *Technical Topics for the Radio Amateur**, even though it has kept us off the bands for a couple of months, has given us a new insight into the steady advance of Amateur Radio circuitry and techniques during this intensely interesting period. But fortunately we found that most of the items included in *TT*, even in the 'fifties, seem to have withstood the passage of time surprisingly well. For although a great deal that is new has come along, particularly in solidstate circuitry, most of the circuits and topics that were being discussed then are still pertinent to the amateur station today.

We are hoping therefore that even those members who have borne with us over the years and read the original articles, will find this 100-page re-arrangement of selected material into specific subjects very much more convenient to use than having to hunt back through the many issues to find a particular item. At least we have tried to pack as much practical information into the book as we could.

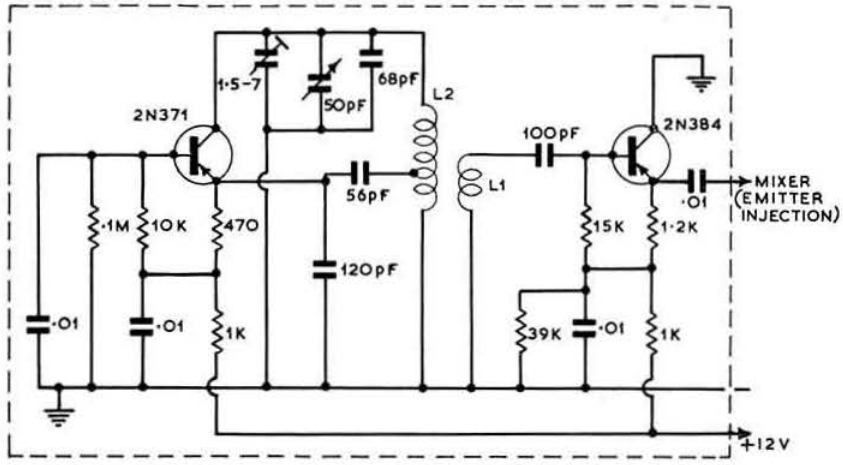


Fig. 1. The v.f.o. used in the receiver section of the W2KYO hybrid 144 Mc/s transceiver. This tunes over about 10·7—12·7 Mc/s and is used for the second frequency conversion (crystal-controlled first oscillator). L1 and L2 are from an American "Miniduct 3003"; L1, 2 turns air wound, ¼ in. diameter; L2, 21 turns air wound ¼ in. diameter, tapped 2 turns from earthy end.

Hybrid Designs

The next few years are bound to see a much more pronounced incursion of semiconductors into amateur stations, particularly one feels in the hybrid form of mixed valve/solidstate units, akin to the fashion which is creeping into domestic television. Even now it remains difficult or expensive to achieve really good dynamic range into the front-end of solidstate h.f. receivers and to put out tens of watts in fixed station transmitters.

A good example of this design approach, and one which allows good use to be made of the small size of transistors, can be found in W2KYO's 144 Mc/s a.m. transceiver (*RCA Ham Tips*, Spring and Summer issues, 1965). He combines transistors with the small RCA Nuvistor valves, using a Nuvistor front-end to the receiver, and all Nuvistors for the crystal-controlled transmitter for which the final is a pair of 7587s. The actual input power is not stated but from an earlier W2KYO article on using Nuvistors for transmission we suspect that maximum power is about 7½ watts; the rig has been used for contacts of over 100 miles. Apart from the six Nuvistors, all other active elements are solidstate. No ganged circuits are used, and the receiver has a broad-tuned Nuvistor (triode) r.f. stage and 7587 mixer with the same crystal-controlled 7586 oscillator that is used for the transmitter; followed by a broad-tuned first i.f. centred on 10·7 Mc/s then converted down to 1 Mc/s by means of a two stage v.f.o. covering roughly 10·7-12·7 Mc/s. It is claimed that the transistor oscillator and buffer (see Fig. 1) are extremely stable.

Using TV Line-output Valves

Although the professional designer has a fairly wide choice of power amplifier valves designed specifically for h.f. and v.h.f. applications these tend to be rather more expensive than valves designed for the consumer or entertainment field. Amateurs have always drawn on such valves for use in transmitters. At the present time, probably the best valves available are those intended for use in the line output stages of television receivers.

Such valves have to be capable of high peak currents—a most valuable characteristic for s.s.b.—and can really knock over anode current meters at relatively low h.t. Unfortunately there are some snags. Most British types are designed for 0·3 amp series heater chains and tend to have odd heater voltage ratings (though some are also available

* Available from RSGB Headquarters, price 10/8 including postage.

with 6·3 volt heaters). For instance the PL500 has a 27 volt heater. Secondly, manufacturers do not normally publish data showing operating conditions for their use in r.f. applications.

Some remarks on this subject were noted in the *QST* (September, 1965) review of the Swan 350 transceiver which uses two 6HF5s running at 350 watts p.e.p. *QST* points out that the limitation of this type of valve for s.s.b. is bulb temperature.

It was therefore with considerable interest that we discovered that in fact Sylvania have prepared a most useful report (by W. D. Murphy in *Sylvania Industrial News*, November/December, 1964) covering six of the most popular American line-output valves (or " sweep tubes " as they are termed). Although the valve types are not readily available in the UK, it has been confirmed with the Sylvania Department of Thorn-AEI Radio Valves & Tubes Ltd that these valves could be supplied on a special order basis to individual amateur constructors (it should be noted that some of them use the recent 9-pin and 12-pin bases). Head office of Thorn-AEI is at present at 155 Charing Cross Road, London, W.C.2, but is due to move at the beginning of 1966.

The valves covered in the Sylvania report include four designed for black-and-white television having anode dissipations (continuous rating) of about 17 watts, and two larger 25-30-watt types intended primarily for colour television receivers which, due to the large neck diameter of shadow-mask tubes, need appreciably more deflection power at good linearity.

A single 6HF5, for example, is unofficially rated at up to 116 watts input in class C providing an output of 77 watts at 30 Mc/s. In class AB1 for s.s.b. applications a peak envelope power output of some 58 watts can be achieved at an efficiency of 43 per cent. A design by G3NSN for a linear using four 6HF5 valves was discussed by G2DAF in the May BULLETIN.

The accompanying table shows the Sylvania suggested ICAS (Intermittent Commercial and Amateur Service) conditions for the valves; this rating is normally 25 per cent higher than the CCS (Continuous Commercial Service) rating. Anode dissipation was measured by recently developed infra-red temperature measuring equipment. The original report gives full details of the conditions under which the tests were carried out, using the typical p.a. shown in Fig. 2.

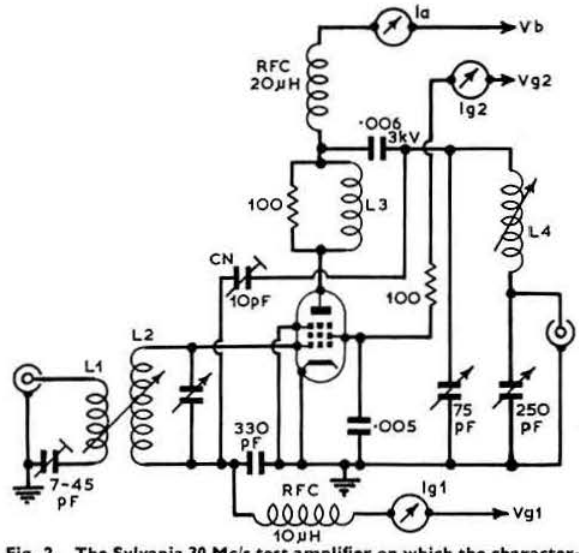


Fig. 2. The Sylvania 30 Mc/s test amplifier on which the characteristics of the line output valves were obtained.
L1, 5 turns, 16 s.w.g. enam., ¼ in. diam. close wound.
L2, 7 turns, 16 s.w.g., enam., ¼ in. diam., close wound.
L3, 4 turns, 18 s.w.g. enam., ¼ in. diam., ¼ in. long, wound over resistor.
L4, 9 turns, 14 s.w.g. enam., 1 in. diam. 1 in. long, ⅞ in. diam., brass slug.

Class C Operation (ICAS) 30 Mc/s.

Type	Vg1 V	Vg2 V	Vb V	R.F. g1 peak V	Ig1 mA	Ig2 mA	Ia mA	Drive (grid) watts	g2 dissip-ation watts	Anode Input watts	R.F. Output watts	Effi-ciency %	Anode dissip-ation watts	Circuit Loss watts	Probable upper Frequency (Mc/s)
6GJ5	—75	200	500	61	5·0	14·9	180	0·43	2·99	90	62·7	69·5	22	5·3	150
6HF5	—85	140	500	67	8·0	12·5	232	0·76	1·75	116	77·0	66·0	35	4·0	60*
6JB6	—75	200	500	61	5·0	13·3	180	0·43	2·66	90	62·7	69·5	22	5·3	145
6JE6	—85	125	500	72	8·0	17·2	222	0·82	2·15	111	76·3	69·0	30	4·7	60
6JM6	—75	200	500	57	4·0	13·7	180	0·32	2·72	90	61·1	67·9	22	6·9	150
6JG6	—80	150	450	67	8·0	20·0	202	0·75	3·0	91	63·0	69·3	21	7·0	150

* One grid connection (75 Mc/s with two grid connections).

Class AB1 Operation (ICAS) 30 Mc/s

Type	Vg1 V*	Vg2 V†	Vb V†	Ia zero signal mA*	Ig2 mA	Ia mA	Anode Power zero signal watts	G2 dissip-ation watts	Anode Input Power watts	Power Output R.F. watts	PEP watts	Effici-ency %	Anode dissip-ation watts	Circuit Loss watts
6GJ5	—43	200	500	30	3·8	85	15	0·76	42·5	17·5	35·0	41·5	22	3·0
6HF5	—46	140	500	40	4·5	133	20	0·63	66·5	28·8	57·6	43·0	35	2·7
6JB6	—42	200	500	30	4·2	85	15	0·84	42·5	17·5	35·0	41·5	22	3·0
6JE6	—44	125	500	40	3·9	110	20	0·49	55·0	23·4	46·8	42·6	30	2·6
6JM6	—42	200	500	30	4·4	85	15	0·88	42·5	18·3	36·6	43·1	22	2·2
6JG6	—35	150	450	30	4·5	98	13·5	0·67	44·0	18·9	37·8	43·0	21	4·1

* Grid adjusted to indicated zero signal anode current.

† Optimum conditions for providing best linearity and efficiency.

That the valves can be operated with considerably more than 500 volts on the anodes is suggested by a number of designs, including that of G3NSN. Care must, however, be taken with anode dissipation which could lead to excessive temperatures. The *QST* review of the Swan 350 points out that care must be taken in tuning up, because of the very heavy out-of-resonance anode currents.

The figures for the probable upper frequency limit of operation are based on 75 per cent of the input self-resonant frequency, and v.h.f. operators will be interested to note that a number of these (but not the 6HF5) should prove suitable for efficient 144 Mc/s operation. Note that 6JB6 and 6GJ5 differ only in that the former has separate pin connections for beam-forming plates; both have a 9-pin novar base. The 6JM6 has a 12-pin base with lower peak current capabilities. The 6JG6 is designed specifically for low h.t. television applications. 6JE6 has a 9-pin novar base, and the 6HF5 a 12-pin base. The 6JE6 and 6HF5 were designed for colour television.

Sideband operators who have followed G2DAF's comments on these valves will already be aware of their potentialities, but it is felt that their use for class C and v.h.f. applications may have been overlooked, and that for all modes of operation the work carried out in the Sylvania laboratories is well worth re-publishing. Our thanks are due to Mr E. B. Munt, Thorn-AEI publications editor, for making available to us the copy of *Sylvania Industrial News*.

Ideas for 160

The latest edition of the IARC's *Interadio—4U1ITU Calling* international radio journal is an attractive example of Swiss printing—and a tribute incidentally to the ability of IARC to pull many well-known firms into its advertising columns, plus of course, a wide selection of very readable articles.

In the circuitry section, we noted particularly the article "The Forlorn 160-metre Band" by HB9CM presenting a remarkable number of useful looking ideas in two pages. Fig. 3, for example, shows his way of overcoming the very common problem of how to operate on 1·8 Mc/s when the main transmitter covers only 3·5 Mc/s upwards. His solution is the "locked" power oscillator synchronized by a 3·7 Mc/s signal from the driver stage of the main transmitter. This is a modern version of the famous Goyder lock of the 'twenties, and HB9CM reports that the rough T6C note of the unlocked power oscillator changes into a stable T9 note when fed with about 40 volts peak synchronizing signal (very little power needed) within the limits of about 5-20 kc/s. HB9CM points out that this technique can be used with almost any type of power oscillator having a dynamic *Q* of about 15, with synchronization applied to the cathode,

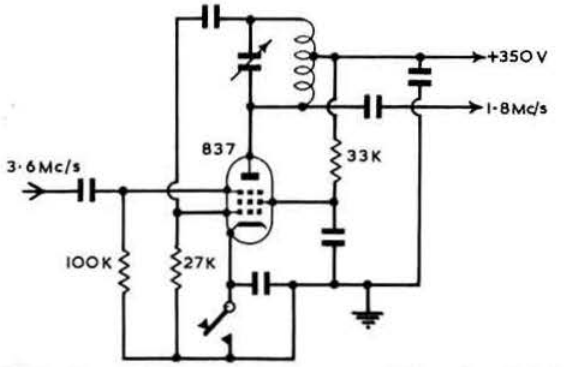


Fig. 3. 10 watt, 1·8 Mc/s locked power oscillator described by HB9CM in Interadio. Capacitor values were not given in original article.

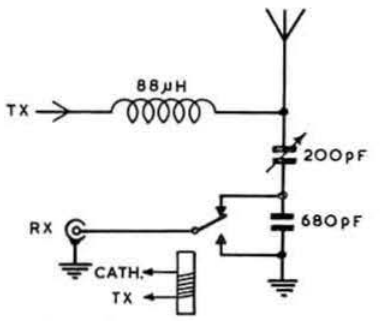


Fig. 4. How HB9CM connects his receiver aerial into the main transmitting aerial coupling circuit. In his case the receiver cable is connected to his front-end signal frequency Q-multiplier.

screen, or preferably, as in Fig. 3, to the suppressor grid.

With this type of rig it is, of course, essential to ensure that the oscillator remains in lock at all times.

Also from the same article comes the suggestion shown in Fig. 4 for connecting a receiver into the tuned transmitter aerial network, by means of a low impedance, loosely coupled, switchable link. He also provides information on a prototype signal-frequency *Q*-multiplier used at the front-end of a receiver to reduce cross modulation from powerful signals,

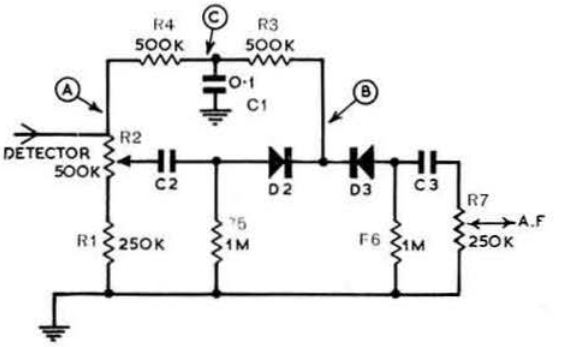


Fig. 5. The HB9CM version of the DL3XW audio noise limiter. The 250K ohm fixed resistor is R1; the input 500K ohm variable is R2; the 500K ohm resistors between points A-C and C-B are R4 and R3 respectively; R5 is the 1M ohm resistor from the junction of C2 and D2; R6 is also a 1M ohm resistor from the junction of D3 and C3, while R7 is the 250K ohms output variable resistor. C1 is 0·5 μF from point C to earth.

using a 6AU6 with controlled regeneration and 6C4 cathode follower to connect the aerial signals to the receiver; he is at present working on an improved input circuit for this device.

Improved Audio Noise Limiter

HB9CM also provides details of an audio noise limiter said to have been developed by DL3XW and described as "one of the best a.f. limiting circuits I have ever used": see Fig. 5. The actual diode types are not specified but are described as silicon diodes. The following explanation is given of the functioning of the circuit:

"Two paths are to be considered. The d.c. component flows through R4 -R3D2 -R5 and also D3-R6. At point *C*, the a.f. component is stopped by C1. At point *B* you have a d.c. potential proportional to the i.f. carrier value. The direct current opens the diodes D2 and D3, so that the a.c. audio frequency can pass through R2-C2-D2-D3-C3 and R7. If a negative impulse overcomes the positive potential at point *B*, D2 closes the path. Similarly D3 reacts to positive impulses. The setting of R2 allows the limiting to be chosen as a function of the beating modulation percentage. Both

diodes are silicon diodes which, thanks to their very high reverse resistance, effectively block the a.c. path."

In some ways the device is thus not unlike the Collins noise limiter circuit described in *TT* in April, 1962.

Bias Regulation

B. Priestley, G3JGO, who has contributed a number of useful ideas to *TT*, sends along details of a regulated bias supply (Fig. 6) which he thinks would be suitable for a linear amplifier. He has carried out bench tests which have verified that the circuit has the expected characteristics, though it has not so far been tested in practice in a linear amplifier.

G3JGO writes: "The basic circuit is a simple shunt regulated bias supply with the advantage of not needing an individual mains transformer. On reading about the National protection system for class AB2 or B linears, it was realized that the circuit could be readily adapted to do this: Fig. 6.

"Grid current in the linear flows against the bias voltage, and thus increases the current in V1, until it goes into grid current, when the terminal voltage goes much more negative as the system drops out of stabilization. A large grid resistor

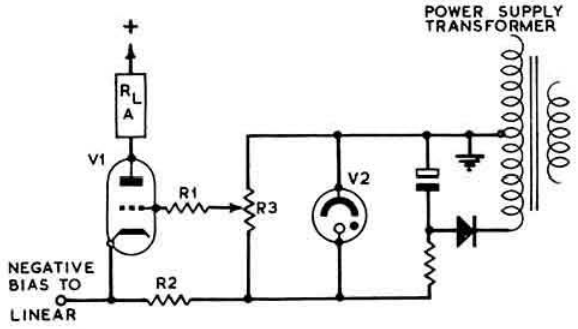


Fig. 6. G3JGO's suggested drive limiting bias circuit for linears. R1, 1M ohm, R2, 10K ohm, R3, 1M ohm (output voltage control). V1, 6J5, V2, VR75/30 etc.

in V1 enhances the grid current limiting. Conversely, a load on the bias circuit, due to a gassy valve, etc, reduces the current in V1 and could be made to drop out an h.t. interlock relay. The positive supply to V1 anode was needed as the output voltage was only —50; for 100 volts or more it can be earthed, but a separate heater supply is advisable."

Lightning Protection

In the UK we are fortunate in not being in one of the main thunderstorm areas—storm statistics range from over 200 per year in Java to about one per year in the Sahara—and lightning protection is not always taken very seriously. But recently we came across an informative brochure on lightning protection for v.h.f. aerials systems compiled by Pye Telecommunications.

This points out that with a high v.h.f. aerial the lightning hazard is at its worst, but that in many parts of the world the possibility of a direct strike is so remote that normal earthing provided by the use of metal masts is felt to be adequate. Under these circumstances, the aerial itself may be damaged by a strike, but the possibility of a hazard to life is "extremely unlikely."

The brochure suggests that non-metallic structures may need to be adequately protected by an earthing strip taken to a ground plate by the shortest possible route—but notes that this can involve a copper section 1 in. by $\frac{1}{8}$ in. for structures up to 60 ft. high, and 1 in. by $\frac{1}{4}$ in. above that height. Such earthing strips should not contain any bends of less than 18 in. radius.

Rising water main earths are considered unsuitable for this application, and the only effective and safe method is to earth to a plate of high conductivity, buried several feet from any buildings. The earth plate should be 2 ft. to 3 ft. square and not less than $\frac{1}{16}$ in. thick. Alternatively, it is suggested that $\frac{1}{2}$ in. diameter copper rod not less than 4 ft. long can be used.

Elsewhere, we noted recently the suggestion that excellent earths can be made by burying an old discarded copper hot water tank, often available for a few shillings from builders' scrap.

The brochure makes some useful points on the subject of static discharges, stressing that during stormy weather one of the disadvantages of a high aerial is its ability to accumulate static charges which, unless dispersed, can cause high noise levels in the receiver. Static charged rain can also be a source of similar trouble.

It is pointed out that the simplest way of ensuring a low level of static or corona is to use an aerial having a folded element which has a low-impedance d.c. path between each element and ground.

Corona discharge from the tips of arrays can be tackled in several ways. Pye suggest the fitting of metal spheres (about 1 in. in diameter) to the tips of aerial rods. Another corona discharger device that was originally introduced for use with rod receiving aerials and has a split pin to plug into the end of an aerial rod, comprises essentially a fluffy impregnated wick inside a protective cap.

The Pye brochure is concerned mainly with the fitting of the high, usually metallic, aerial supports of the type used for v.h.f. two-way mobile radio. But it is worth noting that they make the general point that masts on high buildings should be fitted with suitable devices to protect the buildings and recommend that such work should be carried out by firms specializing in lightning protection. It is worth thinking about if one has a particularly exposed mast.

H.F. Crystal Filters

There is still a good deal of interest in h.f. crystal filters, particularly for s.s.b. applications, although they are also of considerable interest for those wishing to build a high-performance single-conversion receiver. We noted, for example, a McCoy filter in the recently announced Racal military 5 watt s.s.b. packset. A detailed article on this subject by DJ5RH appears in *DL-QTC* (August, 1965) from which Fig. 7 has been extracted. It is stated that this filter, based on FT243 crystals, can provide a nose (—6db) selectivity of 2·4-3 kc/s and the passband increases to only 6-7 kc/s at the —60db points.

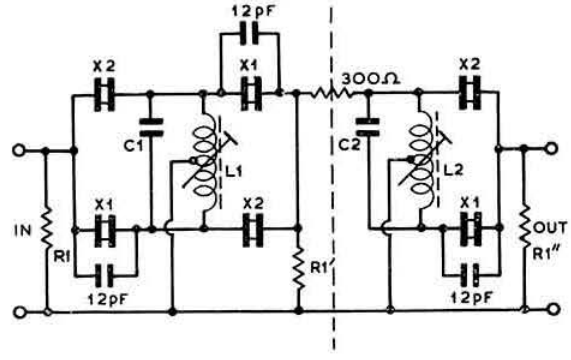


Fig. 7. H.F. crystal filter using FT243 crystals by DJ5RH. X1, X2 are separated by 1·7 kc/s in series resonant mode. C1, C2, 330 pF. L1, L2, 1·4 μH on 6mm diam. former. R1, R1' and R1'' are 560 to 820 ohms.

A further rather specialized use of h.f. crystals for amateur and commercial use, which we admit is new to us, is described by Stuart Meyer, W2GHK in the 1965 *Interadio* already referred to. This consists of the insertion of an h.f. front-end crystal filter with low attenuation in the passband directly between the aerial and the receiver, with no other modifications to the receiver itself. This can provide the very desirable characteristic of high selectivity before the mixer stage so helpful in reducing cross-modulation and blocking. He indicates that multiple-section crystal filters " at modest cost " (though no indication is given of what " modest " means in £.s.d.) have been developed for Hammarlund with sufficient nose bandwidth to cover a reasonable portion of an

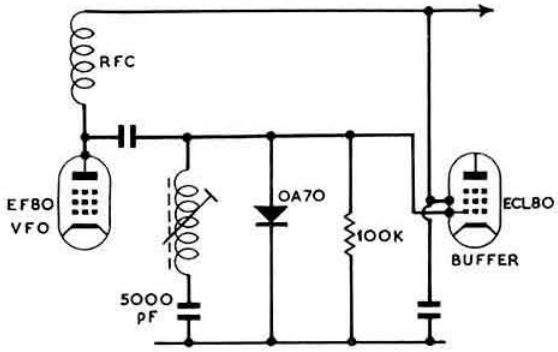


Fig. 8. BRS26039 recommends the use of a crystal diode to reduce oscillator " pulling ".

amateur band, but providing some 80-100db attenuation outside these limits. A response curve is given for a 14,110 kc/s unit, showing that it could be used over about 14,095-14,125 kc/s or rather more on strong signals, with the —80db points at roughly 14,070 and 14,150 kc/s.

Such filters could overcome cross-modulation and image and certain other forms of spurious responses particularly with multiple conversion receivers or with single-conversion units suffering from image. Prototype filters were used during the 4U1ITU multi-transmitter operation last May when two and sometimes three adjacent 1 kW transmitters were operating simultaneously in the 14 Mc/s band. It is stated that filters of this type are currently available for frequencies in the 14, 7 and 3·5 Mc/s band (though nose bandwidth on 3·5 Mc/s is presumably appreciably narrower than on 14 Mc/s), and the units can also be produced with care for 21 and 28 Mc/s.

Transmitter Tips

An informative letter and selection of five useful-looking circuits have come along from Ivor Glyn Rees (BRS26039) who, despite the high BRS number, is no stranger to transmitter design and whose ideas have been air-tested by G3PKW. Among the circuits is one for a simple ECL80 clamp modulator for a 40 watt rig which we hope to refer to in a later *TT*.

Meanwhile Figs. 8 and 9 show two dodges he submitted based on conventional crystal diodes. Fig. 8 is intended to increase oscillator stability by reducing " pulling " on a v.f.o. by the succeeding stages. BRS26039 states that he assumes that in the arrangement shown the diode functions as a steady load on the v.f.o. and reduces reflected loading effects from the later stages. He connects the screen grid of the buffer valve to the stabilized h.t. line as a further precaution; the anode is run at maximum h.t. from a non-stabilized supply. The circuit, he states, has proved highly successful and improves the efficiency of the buffer stage as a low power class C amplifier.

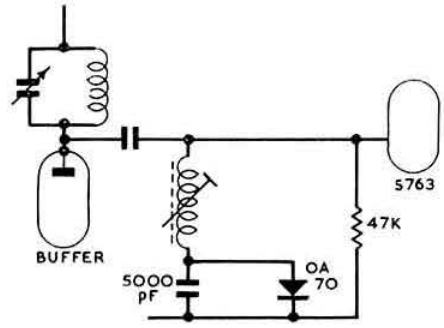


Fig. 9. Another BRS26039 suggestion—the use of a diode to improve efficiency of a driver or doubler stage.

Fig. 9 shows a basically similar idea for improving the efficiency of a doubler stage by the use of a diode. The circuit also improves the efficiency of the stage when it is run as a buffer. These ideas have been incorporated in a field day transmitter.

Multi-band and Low-angle Ground Planes

Another remarkably interesting letter, though again we shall not be able to do full justice to it here, has come along from George Barrett, ZD7IP (former G8IP, ZC4IP, 5B4IP) on St. Helena who for long has been a firm and most knowledgeable advocate of ground plane aerials as compared, for example, with trap verticals which he considers throw away power at low angles in the process of trapping off lumps of the radiating element.

He was stirred to write by finding himself credited (*TT*, July, 1965) as the originator of the " 113° " ground-plane with series capacitor, and points out that most of the basic ideas stem from a study of Laporte's standard textbook on aerials. He refers in particular to the section on medium-wave vertical radiators which contains a series of charts on feed impedances and radiation patterns which he has found to give excellent results when applied to amateur-band ground planes. He has found it possible, by adopting these ideas, to design multi-band ground planes entirely devoid of traps. In fact with the aid of a relay-switched *L*-network at the base of the radiator and a wafer switch at the operating position he could put a vertical on 7, 14 or 21 Mc/s, operating on each band as a properly matched ground plane with all its built-in harmonic rejection and with every inch of the vertical radiator helping to form the lowest possible radiation angle on all bands.

Prime factor in the design procedure is to forget about " electrical length " of the radiator but rather to think of it in terms of physical lengths, on the basis that $984/f$ gives the length in feet of a 360° physical wavelength. The interesting point is that as the length of the radiator is increased the radiated power is concentrated more and more at low angles, up to a maximum of about 220-225° when secondary high angle lobes start to appear. With 220° gain at low angles is about 3db compared with the conventional electrical quarter-wave element.

For this reason George is convinced that the usual technique of shortening a quarter-wavelength radiator to obtain electrical resonance is the wrong approach. From Laporte it can be seen that at lengths of about 110° and 220° (figures quoted from memory), the resistive component of the feed impedance passes through 75 ohms; 110° having a series inductive reactance, and 220° having a series capacitive reactance. All that is needed to make the feed point purely

resistive is to insert series capacitive reactance for around 110° (as in the May *TT*) or series inductance for 220°. A variable capacitor or inductor allows setting up to be done simply with an s.w.r. meter.

Furthermore since the physical lengths of these two arrangements are related by 2 : 1 a 28/14 Mc/s aerial can be made by adjusting for 220° at 28 Mc/s and having a relay-switched coil/capacitor at the base of the radiator.

Alternatively, for a 7/14/21 Mc/s ground plane, the element can be made 220° on 21·1 Mc/s and the radiator will then be about 147° on 14·1 Mc/s and 74° on 7·1 Mc/s, and all three lengths can be matched by means of relatively simple *L*-networks at the base of the radiator. George used a number of pre-set air-spaced Command capacitors and a surplus Ledex relay; after matching, the capacitor rotors were clamped. The result, "a lovely aerial for the experimentally minded amateur to tinker with and the reward of excellent results on DX." All those who heard George knocking them off from Cyprus will appreciate these remarks.

It would be good to see a full length article on these multi-band ground planes, though apparently the notes are in the UK. At least we hope this much abridged precis of the letter from ZD-land will result in even more interest in ground planes. It makes us feel decidedly humble to recall that when we started off this series of remarks on ground-planes (*TT* March, 1965 with the notes provided by OZ5S) we had the temerity to suggest that most of what needed to be known about them had already appeared in the *Handbooks*!

Trees as Aerial Supports

By G. I. Turner, G3DGN*

FOR the lower frequency amateur bands, particularly Top Band, an accepted general rule for small garden aerial installations is to put up as much wire as possible, as high as possible. Trees are often available but it is generally difficult to take advantage of their full height. The writer solved his tree support problem by archery, raising his Top Band aerial remote end from 20 ft. to 60 ft. above ground.

* 88 Ram Gorse, Harlow, Essex

A 38 lb, 59 in. wooden bow with a 27 in. wooden arrow was used. This is standard beginner's archery equipment, 38 lb. being the pull needed to use the full length of the arrow. The arrow was blunted for safety reasons and to prevent its sticking in the trunk or branches of the tree. Light twine (120 ft.), twice the estimated height of the "target" (a small fork near the top of the tree) was coiled in large loops so that it would uncoil freely without snagging. The twine was tied to the arrow just in front of the flights (feathers).

After initial practice in an empty field it was found quite easy—standing about 20 ft. from the base of the tree—to fire the arrow through the chosen fork. Unfortunately the first arrow is still up the tree—it was so light that the drag of the twine left it dangling near the top. Pulling back the twine caused the arrow to rotate round a branch, tieing itself to the branch, the twine eventually breaking half way up. The new arrow was weighted with a small box spanner taped over the tip and this proved successful though the flight trajectory had a wobble.

A terylene cord was then tied to the string, pulled over, and made into an endless loop to avoid having to repeat the archery in the case of aerial breakage. The aerial insulator was attached to the cord knot with sufficient line for the aerial to clear the top branches. The cord was pulled and the aerial end went smoothly up into position. Tree sway is allowed for at the house end with "luggage rack" elastic.

Inexperienced archers should be very cautious as even blunt arrows can break windows, bruise people and disturb neighbours. Local archery club members may be willing to exercise their skill in the interests of Amateur Radio and the method could be used for temporary outside events such as National Field Day.

TV Reception in Fringe Areas

The GPO Liaison and TVI Committee wishes to compile a list of television receivers known to be satisfactory—from an Amateur Radio point of view—in fringe areas. Members are invited to co-operate in compiling the list; details should be sent to the Committee at Headquarters.

AMATEUR RADIO SPACE COMMUNICATION

Reports made at the Third Annual Convention of the International Amateur Radio Club, Geneva, on September 18-19

By G. M. C. STONE, G3FZL*

EACH year the proceedings of the IARC Annual Convention includes a progress report on various aspects of Amateur Radio Space Communication and this year was no exception. In fact, both the *OSCAR* and German *ARBA* (Amateur Radio Balloon) projects were discussed, *OSCAR* being covered by the originators of the project, Bill Orr, W6SAI and Bill Eitel, W6UF and the *ARBA* project by Edgar Brockman, DJ1SB. A session on moonbounce was conducted by Hans Lauber, HB9RG, Johnny Raetz, HB9RF and Ed Krahé, DL9GU. The following is a summary of the discussion.

OSCAR III

Bill Orr, W6SAI, explained the reasons for the difficulties experienced with *OSCAR III* which had been noticed by most participants. In many respects *OSCAR III* was very successful with over 150 different QSOs being recorded, and a considerable amount of data has been sent to *OSCAR* Headquarters, for processing. However, many more QSOs would have occurred had it not been for a reduction in the translator receiver sensitivity by about 15db, caused firstly be excessive white noise from the translator transmitter entering the receiver, and secondly by the failure of the 145·95 Mc/s tracking beacon power amplifier transistor, which grounded the aerial owing to the diode action of the defective transistor. This caused cross modulation of radiated white noise into the translator receiver passband. Evidence of this defect was the weakness of the tracking beacon signal, though this was not absent as most people believed, and also the sawtooth nature of the noise output as received on the ground which was first attributed to the tumbling of the satellite. This was, in fact, due to the a.g.c. time constant of the translator receiver reacting against a saturation white noise level at the input. Thus the only QSOs were achieved by those people who could deliver a signal stronger than this noise input to the translator receiver. This effect has since been reproduced exactly in the laboratory.

Another failure was the premature loss of the translator function owing to loss of battery voltage after two weeks. The wet cells used are housed in a magnesium case containing pressurized nitrogen, and the pressure seal almost certainly failed. Information from the manufacturer indicates that this is a known defect.

Bill Eitel, W6UF, made some very interesting comments comparing the professional to amateur approach in satellite design and construction in the USA. The professional tends to over-design, insisting on ultra reliable components and using many new techniques, whereas the amateur uses ordinary components, simple manufacturing techniques and yet, to date, has achieved remarkable success. It is particularly interesting to note that the failure in *OSCAR III* was due to the failure of the only space-approved component which was the battery! Another interesting fact is that *OSCAR III* needed some 2½ years and 8000 man hours of development time, mainly contributed by W6VMH.

OSCAR IV

In spring of this year, the *OSCAR* association was invited to provide an experimental satellite to be carried by a Titan moonshot rocket, which will probably be launched in December 1965. The Titan will initially be placed into a "parking orbit" of some 600 miles altitude, which, incidentally, is within the Van Allen radiation belt, where it will remain for three quarters of a revolution. The motor will then be re-started and the rocket will rise to a semi-synchronous orbit at 18,500 miles. That is, its rate of rotation relative to the earth will be so slow that it will be within radio contact of a fixed point on the earth for about four days at a time. Owing to the short time available for development, *OSCAR IV* will not be a translator satellite but will instead contain simple beacons radiating on 144, 432 and 1296 Mc/s. A telemetry channel to transmit solar radiation data may also be included. The launch of the Titan will be unclassified from the security aspect and thus adequate notice can be given, unlike *OSCAR III* which was part of a military launch. *OSCAR IV* is a 19 in. cube weighing 15 lb. and powered by silicon solar cells which cover the outside faces. It is also spin stabilized.

OSCAR V

OSCAR V will be a low altitude translator satellite similar to *OSCAR III* and this will probably be launched during Spring 1966.

ARBA Project

Project *ARBA* was originated in Germany by Professor Muehleisen to study phenomena associated with the propagation of v.h.f. radio waves through the tropopause. The early *ARBA* balloons carried a simple beacon radiating on 145·8 Mc/s. Amateur Radio observers, organized and co-ordinated by Edgar Brockman, DJ1SB for the Deutsche Amateur Radio Club, rendered reception reports of signals received as the balloon passed through the tropopause at an altitude of between 9 and 14 km. As it rises, it is possible, due to the very marked temperature inversion which occurs in the tropopause, to get multipath propagation phenomena which can cause a complete cancellation of the signal for short periods of time. These balloons rise to an altitude of about 30 km before they burst, the radio equipment then being returned to earth by parachute.

After the success of the *OSCAR* project a German amateur of outstanding ability, DJ4ZC, designed and constructed under his own resources a translator device having very similar properties to *OSCAR III*, receiving on 144·1 Mc/s ± 25 kc/s, and retransmitting on 145·9 Mc/s ± 25 kc/s with an identity beacon on 145·95 Mc/s. A particularly interesting feature, unique to the DJ4ZC transponder, is the use of a crystal bandpass filter on the receiver input operating at 144·1 Mc/s using 9th overtone resonance crystals.

It was planned to launch the first DJ4ZC translator named *ARBA 15* on August 20, but this was cancelled as Professor Muhleisen was away on a meteorological expedition to S. America. However, the first translator was released from Holland on August 29 and as has already been reported, was very successful, performing almost without a fault of any kind. Tape recordings of signals received by DL9GU were played to the Convention in which several well

* Chairman, Scientific Studies Committee

known British call-signs, including G3MED, were heard. The only defects found after the recovery of the translator concerned a transistor in the i.f. stage which tended to become unstable and led to the abrupt cutting off of signals occasionally and also the sudden cessation of signals which occurred due to the shock of the parachute opening which caused the breakage of the aerial system (crossed dipoles). The next translator *ARBA 16* was launched on September 25.

The DJ4ZC translator was a beautiful example of first class home construction. All present, including the *OSCAR* representatives, were very impressed with the DARC efforts in this field and Bill Orr, W6SAI, offered to discuss the project with DARC with a view to placing a DJ4ZC translator in orbit.

Moonbounce (EME)

HB9RG and DL9GU discussed the problems that they had overcome to achieve success and presented a strong case for the concentration of EME work in the 1296 Mc/s band where the theoretical signal-to-noise ratio of their system is + 2db compared with −6db on 432 Mc/s. Examples of their receiving equipment including the parametric amplifier were displayed. They concluded by stressing that moonbounce communication was no one man project but that a hard working closely knit team was essential.

The Future

Bill Eitel, W6UF and Bill Orr, W6SAI discussed the future possibilities in amateur space communication. It seems likely that an *OSCAR* can be placed on the moon in the next few years. In two to three years it is hoped to place an amateur beacon on a space probe travelling out of the solar system so that signals can be tracked to the limit of receiver sensitivity. There are plenty of space vehicles with room for amateur satellite projects and any group of amateurs is invited to make proposals to the OSCAR Association to participate in the work.

The future has great possibilities with radio amateurs playing an important part in the development of space communication. The problems are less likely to be technical, although these will, of course, present a considerable challenge, but rather legislative in the authorization of v.h.f./u.h.f./s.h.f. amateur space communication (the only band authorized for this purpose at present is 144-146 Mc/s). It will be vital at future frequency allocation conferences of the I.T.U. to defend the frequencies above 30 Mc/s allocated to amateurs, as it is in these bands that the communications of the future will be concentrated. The extensive use of translator or relay satellites could give a world wide coverage and Bill Eitel considered that v.h.f. Amateur Radio of today was in much the same position as h.f. Amateur Radio was in 1922—no one could really foretell the future.

This session was closed on this stimulating theme which foretells that Amateur Radio will continue to play a vital role in the development of world wide communication and that the v.h.f./u.h.f./s.h.f. bands will be the key to the future.

RSGB President, Eric Yeomanson, G3IIR, operating ON4UB during his recent visit to the National Station of UBA.

RSGB Intruder Watch

Correspondence for the Intruder Watch should be addressed to the Honorary Organizer, RSGB Intruder Watch, Radio Society of Great Britain, 28 Little Russell Street, London, W.C.1.

Receipts

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

RADIO AMATEURS' EXAMINATION

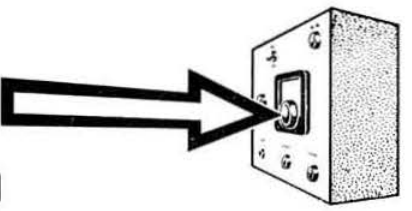
Thursday, December 9, 1965

MARY WARD HALL
5 TAVISTOCK PLACE
LONDON W.C.1.

The examination will commence at 6.30 p.m.

Applications to sit the Examination at the above centre, which is near Russell Square Underground, should be sent to the General Manager, Radio Society of Great Britain, 28 Little Russell Street, London W.C.1, to arrive not later than **Monday, November 1, 1965.** Applications must be accompanied by a remittance for the City and Guilds of London Institute fee of £1.10.0, plus, in the case of non-members of RSGB, a local fee of 5s.

PROGRESSING THROUGH AMATEUR RADIO



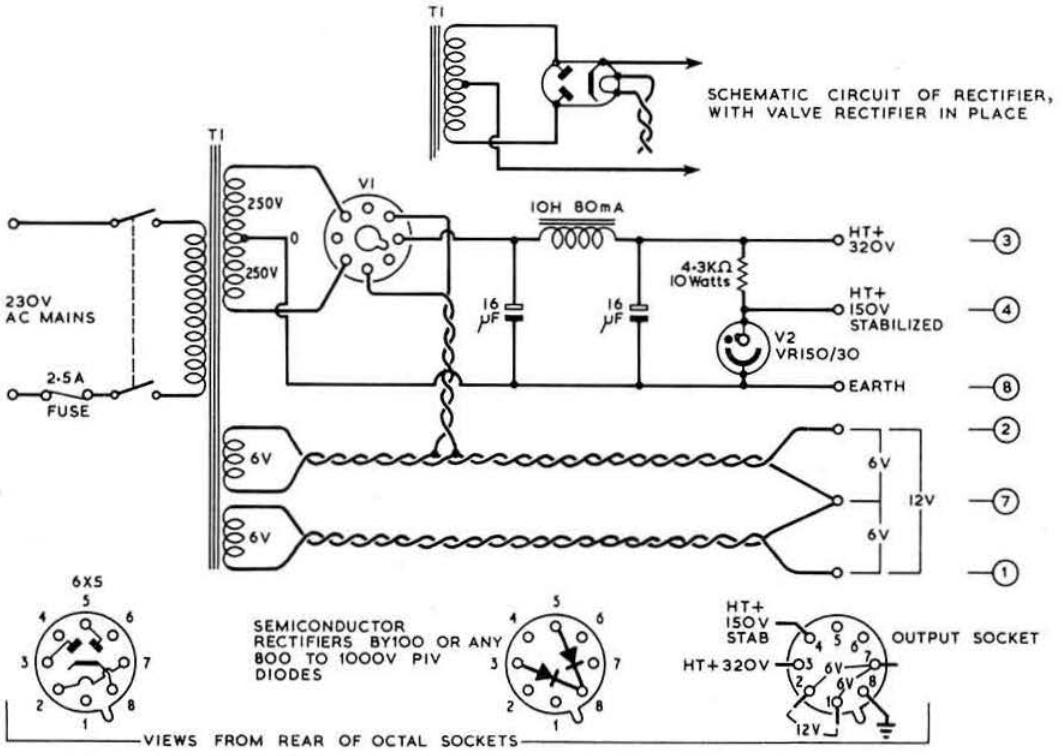
Part 6 *Power Supplies*

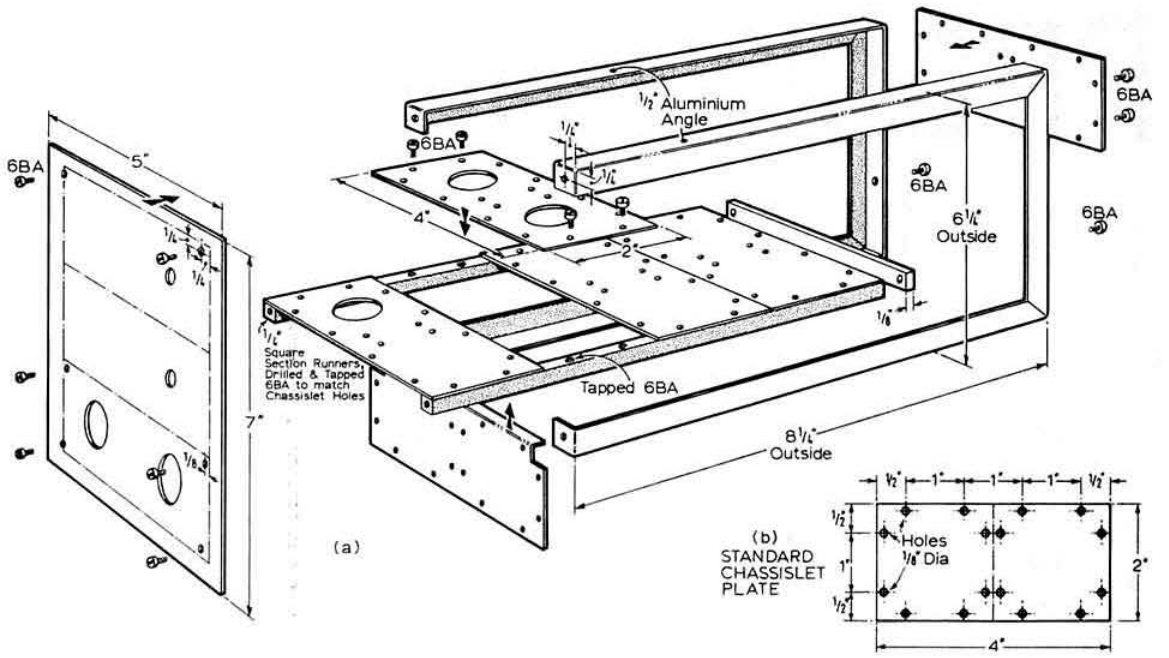
By K. L. SMITH, B.Sc., G3JIX *

RADIO and electronic equipment requires electrical energy to operate the circuits and devices used, and the rate at which this energy is used depends upon the size of the equipment. A rig for portable use would be designed to make the minimum possible demands on the source of energy, which may be a car battery, or dry cells. Mains operated equipment installed at a fixed station can be relatively high powered and the power supply is correspondingly heavy and bulky, but it can be stood on the floor of the shack. The power supplied to a rig may be a small current conveyed under a large voltage, or may be a relatively large current from a low potential source, depending upon the nature of the devices being operated. Remember Watts = Volts × Amps. The *rating* of the components used must be watched, and the power supply designed accordingly. The voltage working is important and to exceed it results in breakdown of insulation etc. Maximum current ratings are also important and protection here can be carried out with appropriate fuses. The third rating is the power dissipation capability. To overdo it in this direction means burnt out resistors, melting valve anodes, and U/S transistors etc. Just how much power can be dissipated as heat is a *function* of the ease with which it can be removed, i.e., it depends on the ventilation and heat conduction paths. Thus high powered transmitting valves have a fan supplying a cooling draught, and transistors that are required to handle power are mounted on a *heat sink*.

Valves require a low voltage at a fair current to heat the cathodes. There are two types, a *directly heated cathode* which must be heated by a direct current. Tnis type of

* RSGB Education Committee.





cathode is generally designed for battery operation, and valves of the 1T4, 1R5 etc. series are rated at 1·25 volt at currents of some 50 to 100 mA. The other type of cathode is *indirectly heated*, and can be operated by a direct or alternating current. Most valves of this type are rated at 6·3 volts at current ranging from 150 mA to nearly an amp. or so. There are valves which operate with 12 volts across the cathode heater, and some can be wired to operate on 6 or 12 volts by appropriate connections to the base. Other valves have high voltage heaters which operate at constant current so that they can be wired in series and connected directly across the 230 volt mains. Television receivers usually have these " universal " types incorporated.

The other electrodes in valves require operating voltages. Thus the anode must be biased positively in order to attract the electrons across the vacuum from the cathode and set the anode current to the appropriate value. The control grid (grid 1) is biased in the negative direction to control the electron stream and set the operating point to the correct value, about which the signal varies. The screen grid (grid 2) in tetrodes and pentodes is biased positively, otherwise it would oppose the electron flow too much. All these voltages must be smooth steady values. In other words, it is essential to use a d.c. source. If batteries are used, there is no difficulty, but if the a.c. mains is employed the a.c. must first be changed to d.c. (*rectified*) and any ripple remaining must be smoothed out, because it would produce a hum on the signals. Voltages for anode supplies, known as the *high tension positive*, h.t.+, range from about 90 volts for battery valves, 250 volts for normal small receiving valves and 750 to 1000 volts for medium power transmitting types. Screen grid voltages are often around 75 per cent of the anode values, and are obtained from the same h.t.+ line using resistors. Negative grid bias is usually around —2 to —12 volts, but transmitting amplifiers may require —100 volts or so. Grid bias is very often obtained automatically by the circuit action but batteries are sometimes used, especially in transmitters.

Transistors demand a different approach to the problem. They have no heaters, and do not require a high tension supply. All transistor biasing voltages are relatively low; the usual small transistor supply is 9 volts. Voltages of 24 or in exceptional cases up to say 60 volts may be encountered in power amplifiers or in special circuits. Correspondingly, the current requirements are greater and a few amps may be quite ordinary in power stages. Therefore, a transistor power supply must develop a smooth d.c. at a relatively low voltage. Bias *voltages* were mentioned, but as we shall see later when discussing the devices in more detail, it is *current* biasing that operates transistors. The appropriate currents must be applied to set the operating point, not voltages as in the case of valves.

We now describe the construction of two power packs, one suitable for supplying small valves, such as those used in receivers, or 10 watt transmitters. The other is a transistor supply for experimental work with semiconductors. The apparatus appearing in the constructional articles of this series will make use of these units, and it is worth making them up because it is very convenient to have a standard power source always available for experiments, tests etc. Also, they should make a good project for beginners to tackle.

High Voltage Power Supply

Nowadays it is almost universally true to assume that the supply mains from the Electricity Authorities feeding domestic and other premises is alternating current. The frequency of this a.c. is standardised at 50 cycles per second, and electric clocks count the number of cycles in order to tell the time. The pressure of the mains supply is also becoming standardised at 230 volts, although for heavy power work 440 volts is sometimes used, on what is known as the " three phase " system. The great advantage of a.c. is that transformers can be used to step the voltages up or down, but, if raw a.c. was used in radio equipment, a loud 50 cycles per second note would be continuously emitted from the 'phones or speaker. Steady d.c. is required as mentioned above.

It is a property of thermionic valves and certain arrangements of semiconductors that they will allow current to pass

in one direction only. Use is made of this in both the power packs described here (and for that matter, in the vast majority of others). This property is called *rectifier action*, and the device is known as a *rectifier*. Rectification produces pulsating d.c. from an a.c. input.

Inspection of the circuit of the h.t. power pack in Fig. 1 shows that two rectifiers are used (either valve or semiconductor). On one half cycle of the a.c. waveform appearing across the 250-0-250 volts secondary of T1, the top diode anode, for instance, is driven positive and it conducts electrons from cathode to anode easily. At the same time the other rectifier is off and no flow takes place there. On the next half cycle, the top diode cuts off with the negative peak now on its anode, but the bottom one comes on. Electrons flow out of the transformer centre tap (which becomes the negative terminal), and into either one or the other cathode, depending on the polarity of the a.c. waveform. Thus current always flows out of the negative terminal and into the positive one, albeit in pulses. Because both half cycles of the a.c. are used, this circuit is known as a *full wave rectifier*. The capacitors C1 and C2, together with the choke *L*, serve to *smooth* the pulsating d.c. into a steady level. C1, the reservoir capacitor charges up on the first pulse, then empties over the period between pulses and has its charge replenished by the next pulse. L1 resists any rapid changes in current flow, and this tends to produce a steady level. C2 charges up and helps to remove any remaining ripple. Because both *half* cycles produce a current pulse, the pulse frequency is double the a.c. value. Any ripple that remains will give rise to a 100 c/s hum in the equipment.

If one rectifier and the half of the transformer winding associated with it is removed, the circuit becomes a *half wave rectifier*. The smoothing operation is more difficult to achieve for C1 has to keep the current up over the whole time of the " missing " half cycle. Any ripple and hum produced this time will be at 50 c/s.

The effective value of the a.c. supply is known as the r.m.s. value and is 0·707 of the peak figure. The transformer is rated with r.m.s. values, but C1 charges to the peak value, and if the smoothing is effective, it loses very little voltage over the period between the pulses. Certainly when no current is drawn the voltage between the output terminals will be the peak value. In this case, $1{\cdot}414 \times 250 \simeq 350$ volts, so that the voltage working for C1, C2 and the components in the equipment being used, should be rated to comfortably stand this value.

If varying demands for current are made on the power pack, then variable voltages are " dropped " across the resistances of the choke, rectifier and transformer windings. This means the output voltage varies with the current drawn, going down as the current goes up. The extent to which any power pack suffers from this effect is discussed in terms of its *regulation*. If the mains voltage changes, the output will also change. These variations can upset the stability of the equipment being supplied.

In order to have a supply whose voltage is fixed, or *stabilised* for current variations within a certain range, the neon tube (V2 in the diagram) is used. A gas discharge tube has the property of maintaining the voltage across itself very constant when it is glowing, so the above mentioned variations in the current are largely offset by using it. The voltage at which a neon tube operates is fixed during manufacture. The one chosen here gives 150 volts output for current variations of 5 to about 30 mA. It is important to choose the correct value for *R*, which is found as follows:

The data gives the figure 40 mA as maximum for the tube chosen. If the unstabilised h.t. is assumed to be 320 volts, then with the above current flowing, R must " drop " the difference, 320 — 150 = 170 volts.

Therefore $R = \dfrac{170}{\dfrac{40}{1000}} = 4250 = 4{\cdot}3\ \text{K}\Omega$

to choose a standard value.

The power rating of this resistor must be at least:

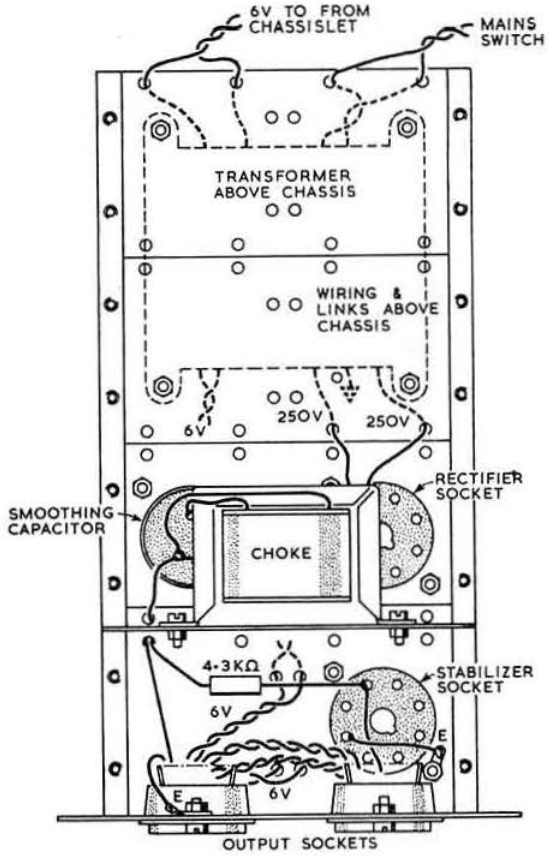
$$I^2R \text{ watts} = \left(\frac{40}{1000}\right)^2 \times 4300 \simeq 7 \text{ watts.}$$

The chassis for this power pack, and for many of the future items of equipment designed for this series is based on a module system. The standard plate is called a " Chassilet " by the young members of the club where the idea originated, and the method has a number of advantages. If a few plates are made up at odd moments, quite a collection can be accumulated, and when construction starts, each sub-assembly is quickly made up then bolted down, and interconnected. Neat construction necessarily follows from the use of modules of this type.

Fig. 2(a) and (b) shows the standard dimensions of the Chassilets for complete interchangeability.

The mains transformer is an upright mounting type, and is fixed on to two chassis by screws passing through holes which are an example of the occasional " non-standard " drillings that must be carried out on the plates. Into the " standard " holes, feedthrough connectors are fitted and the transformer connections made to them so that the whole thing becomes a unit ready to be dropped into place and screwed down onto the side members. The octal valveholder for the rectifier valve or semiconductors is screwed down on to a plate, together with the smoothing condenser. The last plate in the

(*Continued on page 748*)



Some Thoughts on ECHO II

By Raphael Soifer, K2QBW/K1WXZ*

IN September, 1964, the writer prepared a four-page report summary on the state of the amateur radio *ECHO II* programme, primarily as a supplement to the original system plan and intended for readers of that document[1]. Due to the apparent need for some form of statement at that time, however, copies of the report were released to NASA and to certain of the recognized radio amateur organizations and publications. As is usual in such circumstances, release of the report led to several perfectly justified comments by individuals and groups who felt that the original wording did not adequately convey the true nature of their contributions. The writer wishes to assure all, however, that what occurred was most unintentional; in fact, he was most grateful for their suggestions which led to the preparation of this " second edition." In this paper, the specific references to points discussed in the thesis have been reworded to make their meanings more clear to non-MIT readers—the thesis being accessible only at that institution—and whatever other deficiencies existed in the first version have also been repaired. It is felt that the following does constitute a fair and objective statement of the programme's status in the first month of 1965.

The NASA Goddard Space Flight Center described *ECHO II's* launch on January 25, 1964 and subsequent performance in orbit as highly successful. The satellite's orbit has been very close to nominal, and its performance as a microwave communications relay has been quite satisfactory. Although the same feeling does not extend to all the results emanating from our own amateur programme described here, neither the satellite nor the amateur is to blame; in fact, congratulations are in order for the findings which have been made, findings of importance not only for *ECHO II* but in all future amateur space communication experiments. Before turning to these, however, it must be noted that no official two-way contact has been made in the amateur bands using *ECHO II* nor has verified two-way exchange of information taken place as was the case five years ago[2].

From a communication viewpoint, the best showing to date was made by W6DNG of Long Beach, California and W0IC of Denver, Colorado during the summer of 1964 when a signal tentatively identified as that of W0IC was recorded at Long Beach. As the call-sign was not observed, positive identification could not, of course, be established. Calculations made by David Bray, K2LMG, based on the path parameters, predicted a Faraday rotation of 180° per second, which conforms well with observed results at W6DNG. Path loss calculations based on W0IC's kilowatt 144 Mc/s transmitter and the large steerable multiple-Yagi arrays used at both ends confirm that signals of the weak nature heard in the tests were theoretically predictable, i.e., the stations and aerials were adequate for *ECHO II* reflection over the path involved at the time, given the satellite position. Failure to make two-way contact, however, was attributed to the fact that both stations used linear polarization rather than circular, resulting in serious degradation due to the Faraday rotation already discussed. What could have been a full QSO was reduced to a few signal " pings," because of polarization fading. However, the fact that signals were heard over this 800-mile path is ground for hope: *it can be done*!

Other amateurs were not so fortunate, chief among these being the K2LMG-W0IC duo attempting an unprecedented 1500-mile New York-Colorado contact, also at 144 Mc/s. The problem here, as at most other stations, was simply inadequate aerial gain to overcome the higher path losses stemming from the greater distance. In November, 1963, however, these two stations did reflect inaudible signals from the moon at 144 Mc/s; cross-correlation analysis by computer showed a signal-to-noise ratio of —11db over the moonbounce path. With the satellite at its optimum position, *ECHO II* signals should be 5 to 6 db stronger than moon-bounce over this particular path and satellite altitude. Nonetheless, no signals were heard using *ECHO II*. By contrast, the theoretical signal-to-noise ratio for W6DNG-W0IC under similar conditions with *ECHO II* is *plus* 3db, giving rise to a belief that the practical ratio threshold for audible reception at this frequency is somewhere between —1 and —3db. This, of course, is for a c.w. signal being received at comfortable speed by a trained operator using adequate equipment. Perhaps this figure could be reduced using phase-lock detection, but earlier speculation based on a statistical sampling theory that values as low as —15db could be utilized has been proven invalid for v.h.f. conditions, at least for the unaided ear.

Several amateurs were specifically on the lookout for special propagational effects. Among these was scintillation, on which observations were requested for NASA by W1AW bulletin. Except for the Faraday effect already noted, no such condition has been observed to date. Also of interest were signals reflected by sporadic ionization resulting from collision between the satellite and fast-moving streams of radioactive particles, such as Van Allen leakage. These returns were expected to have appeared sporadically at frequencies removed by Doppler effect as much as 75 kc/s from the transmitted frequency, in bursts lasting up to several seconds. Their observed frequencies would be rapidly varying as a result of changing relative stream velocity, with respect to the path geometry. That no such signals were observed is hardly surprising, considering that they might show up at any point in a 150 kc/s spectrum which must be covered with a receiver having a 500 c/s passband imposed by other system constraints, and also in view of the aerial gain difficulties already mentioned. These negative findings confirmed the view expressed in the June, 1962 *QST* article that the best chance of these signal returns occurring will come some years in the future, when, because the satellite will have fallen to a low altitude, high-velocity stream interactions will no longer play the dominant role, and anticipated ionization returns will be at or near the Doppler component resulting from passive satellite reflection. Only then would there be much hope of finding it!

One of the big question-marks prior to lift-off was the aim-and-shoot tracking technique, in which the communications aerial is aimed before the pass at a predetermined azimuth and elevation, derived from orbital predictions received from Government tracking stations several days or weeks in advance. Available evidence, based on optical sightings as well as radio observation, has, however, confirmed that the satellite is consistently within azimuth and elevation limits prescribed by the aerial patterns; tracking information supplied by NASA and the Smithsonian has met or exceeded all accuracy requirements of the techniques.

This summary of post-launch results has so far not considered the many benefits to the v.h.f. amateur, both direct and indirect, or the pre-launch efforts both in education and engineering development. The writer feels that the selectively-aimed publicity accompanying the programme in the

(*Continued on page 756*)

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QUICKSTARTING ON "SEVENTY"

An approach to reception problems on the 432 Mc/s band

By Jack Hum, G5UM*

SUGGESTIONS for making a quick and easy approach to reception on the 144 Mc/s amateur band were offered in the two articles about the "Quickstarter" converter which were published in the RSGB BULLETIN in January and February, 1964. From the ensuing correspondence it became evident that many readers had ideas about adapting the original design for other bands, and the writer has since heard that 4m versions are in operation.

Adapting the "Quickstarter" for 4m is not a complex task, but this does not apply to 70cm. Yet the request to do so has been made sufficiently often as to indicate that a very real demand exists for a u.h.f. version. The following notes, which are offered by way of assistance to those who aspire to receive on 432 Mc/s, suggest how the desirable "quick start" may be achieved without, in fact, using the original "Quickstarter" design as a basis.

The Aerial

In all v.h.f. and u.h.f. activity the aerial is the key component. Since the dawn of Amateur Radio the key to success has been "get as much wire out as you can—and as high and in the clear as possible." The same goes for v.h.f. and u.h.f.—except that for "wire" read "metal", meaning the element rods of the intended aerial array.

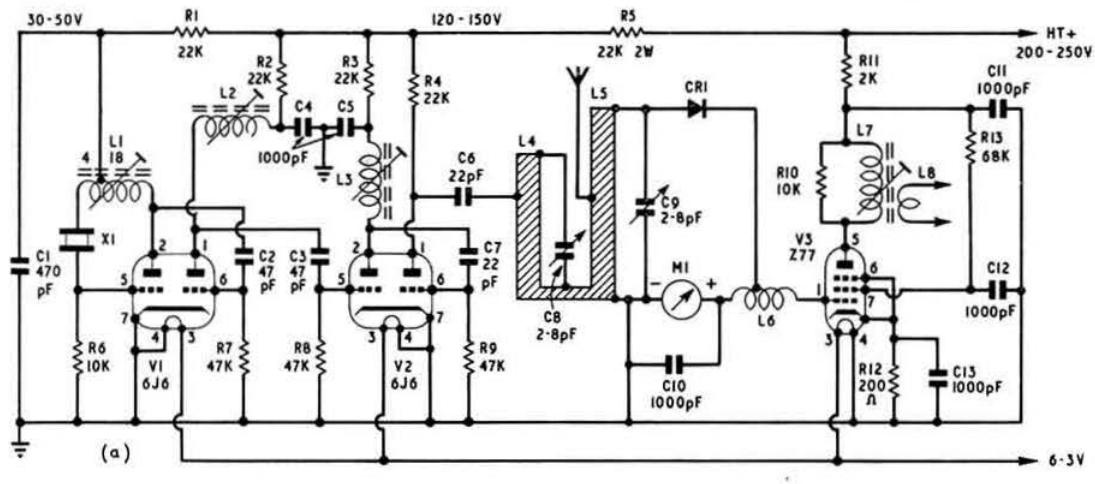
Disappointment with results achieved on 2m has been nailed down in nine cases out of ten to disregard of this axiom. On 70cm it is of even greater importance.

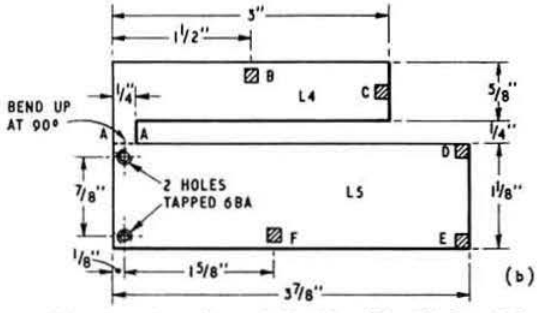
The thing to do before all else, then, is to invest in the highest-gain aerial you can afford, and erect it on the highest point in the establishment, while keeping the base of the supporting mast within reach for turning. So inexpensive are commercially-made arrays these days that the reader will no doubt prefer to purchase one of these rather than go to the trouble of fabricating a device of his own that may not be so well engineered.

And what size to start with? A 6-over-6 is a convenient starter, not forgetting the low loss feeder to go with it. The standard Belling Lee type co-axial terminations will be found to be perfectly adequate with low-loss at 432 Mc/s, provided they are properly waterproofed. This is most important.

The quick-start to 70cm, then, begins at the aerial, and

* "Wyldes," Burnham Green Lane, Bulls Green, Knebworth, Herts.





▨ — CONNECTION POINTS
B — ANODE 6J6
C — TRIMMER C8
D — TRIMMER C9
E — CRYSTAL DIODE CLIP
F — FEEDER SOCKET

MAT. 18swg. BRASS SHEET.

Fig. 1(b). Dimensions of the strip line L4 and L5 which is made from a single piece of 16 s.w.g. brass and spaced $\frac{1}{4}$ in. from the chassis, fixed at right angles to each other in a corner of the chassis.

Fig. 1(a) The 432 Mc/s crystal controlled converter due to Frank Smith, G2DD, is recommended by G5UM as a simple-to-build and very effective "Quickstarter" for the aspirant to the 70cm band. This is the circuit as it appears in the *Amateur Radio Handbook*. C1, 4, 5, 6, 10, 11, 12, 13, midget mica; C2, 3, 7, ceramicons; C8, 9, 3-8 pF Philips trimmers; CR1, silicon diode type CV102 or CV103; L1, 22 turns, 22 s.w.g. enam., close wound, tapped at four turns; L2, six turns, 20 s.w.g. enam., close wound; L3, two turns, 20 s.w.g. enam., close wound; L4, 5, see Fig. 1(b); L6, 22 turns, 32 s.w.g. d.s.c., close wound, centre tapped; L7, 37 turns, 32 s.w.g. d.s.c. close wound; L8, four turns, 32 s.w.g. d.s.c., wound at earthy end of L7 (all coils except L4, 5, are close wound on $\frac{3}{8}$ in. diam. Aladdin formers, and should have high frequency cores); M1, 0-500μA; X1, 35 Mc/s overtone crystal (see text).

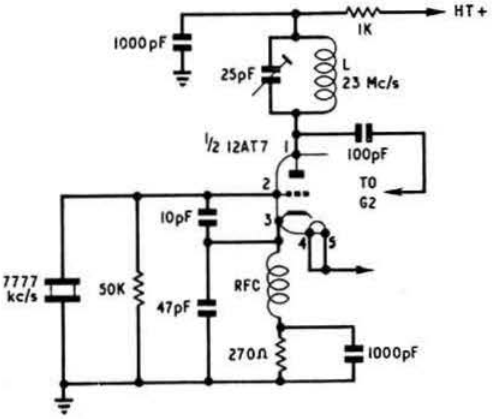


Fig. 2. Constructors who prefer the simplicity of the Colpitts harmonic oscillator to the overtone mode are recommended by the writer to modify the crystal oscillator stage in the manner shown here. RFC is any small choke or 100 turns of thin wire on a 1 Megohm resistor; L is 12 turns on ¼ in. former. G2 above refers to the grid of the other half of the valve.

guarantees that whatever other disappointments may lie ahead they will not begin " up top ".

The Converter

Having installed a good and adequate aerial system we may next address ourselves to the converter itself. As has already been indicated, this will not be a modified version of the 2m " Quickstarter " for the very good reason that there already exists a design of converter which, as a tool for achieving a quick start to 432 Mc/s listening, cannot be bettered. It is the one due to Frank Smith, G2DD, originally developed over ten years ago and still not outdated. A current version of this converter appears in the RSGB *Amateur Radio Handbook*, and its circuit is reproduced in Fig. 1. It is a crystal-controlled design intended to feed into the main station receiver used as a tunable i.f. strip.

Two small changes to the G2DD converter which the writer made as a matter of personal preference were (i) to use a 12AT7 as the first valve in place of the 6J6, simply because it happened to be available; and (ii) to re-arrange the crystal oscillator to the Colpitts configuration in place of the overtone mode originally recommended.

A word or two of explanation is required to justify this

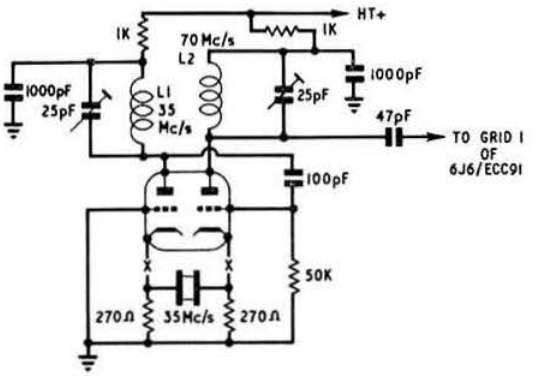


Fig. 3. The Butler oscillator for use with overtone crystals. L1 is ten turns and L2, five turns on ¼ in. former. If the oscillator fails to start or is unstable insert 10 ohms resistors at points X.

second modification. The newcomer to v.h.f. and u.h.f. converter construction can be faced with many futile hours of trying to tame an overtone crystal oscillator that insists on " going off " when the crystal is removed! If overtone crystals produced specifically for the purpose are not used—for instance if a surplus FT243 type is pressed into service—the output frequency will not be an exact multiple of the marked value. This can cause some confusion when searching for calibration points on the tunable i.f. range. In the course of building two of the G2DD converters the writer rearranged the crystal oscillator circuit as shown in Fig. 2.

Use of a crystal at 7777 kc/s is not, of course, mandatory —unless you wish to confine your expenditure to 5s. for one of the excellent 10X variety available from the usual sources. One of the minor drawbacks to starting the oscillator chain on a low frequency such as this is the greater possibility of unwanted " birdies," or spurious signals, appearing in the receiver tuning range. To provide the required local oscillator voltage for 70cm the frequency of a 7·7 Mc/s crystal must be multiplied by no less than 54 times—and at each multiplication stage arises the possibility of generating the unwanted harmonics that cause the " birdies " in the i.f. strip. There is indeed much to be said for starting at a rather high frequency. One of the 35 Mc/s crystals available cheaply from BULLETIN advertisers can be used in a Butler overtone oscillator circuit as shown in Fig. 3, requiring a multiplication factor of only 12. Table 1 shows the multiplication factors required for a 12-14 Mc/s tuning range. It is not necessary to stick to 12-14 Mc/s, of course, a common alternative being 28-30 Mc/s which lies within a range on an amateur-bands only receiver.

The whole converter will fit snugly into a chassis measuring 4½ in. × 3½ in. × 2 in., these being the dimensions of one of the Eddystone diecast boxes. A photograph of G2DD's unit is shown in the *Amateur Radio Handbook*, and it is recommended that the constructor follows the layout to be fairly certain of achieving optimum results without experimenting with the positions of the lines or other components.

Sucking Devices

It is of paramount importance to check the frequency of each multiplier stage as it is brought to resonance. Up to the 140 Mc/s stage the absorption wavemeter used to align " The Quickstarter " is pressed into service (the picture repeated herewith as Fig. 4).

Above 140 Mc/s a new absorption wavemeter will be required to indicate, by sucking r.f. from the local oscillator line in the converter, that 420 Mc/s has been reached. Details of this particular sucking device are in Fig. 5.

To overshoot or undershoot any of the oscillator chain harmonics is to court disappointment. An accurately calibrated " absorber " will guarantee success—and even if it is not possible to get the device shown in Fig. 5 calibrated at the QTH of a nearby 70cm worker, do not despair; the mechanical details given in the photo will ensure that you hit the band.

To tune up the converter, watch the movement of the needle of the microammeter in the diode mixer lead as you

TABLE 1

Oscillator Chain Multiplication Steps for 12-14 Mc/s I.F.

Starting Frequency 7777 kc/s	*(Colpitts Oscillator)*
Triple in First Half 12AT7	23,331 kc/s
Triple in Second Half 12AT7	69,993 kc/s (say 70 Mc/s)
Double in First Half 6J6	140 Mc/s
Triple in Second Half 6J6	420 Mc/s
Starting Frequency 35 Mc/s	*(Butler Oscillator)*
Tune First Half 12AT7	35 Mc/s
Tune Second Half 12AT7	70 Mc/s
Tune First Half 6J6	140 Mc/s
Tune Second Half 6J6	420 Mc/s

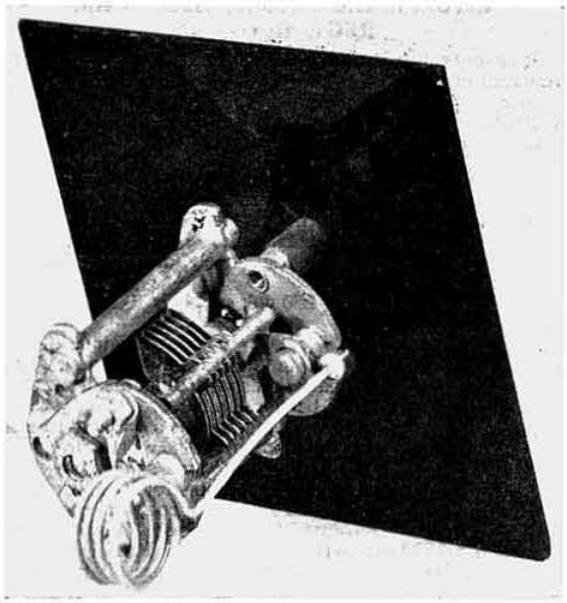


Fig. 4. This v.h.f. "sucking device," or simple absorption wavemeter, ensures that each multiplier stage is resonating at the correct frequency shown in Table I. The coil is place close to the inductor whose frequency is being checked and r.f. "sucked" from it by rotating the wavemeter capacitor. A microammeter connected in the grid return of a succeeding stage, or in the diode mixer output lead, will show a deflection when resonance occurs.

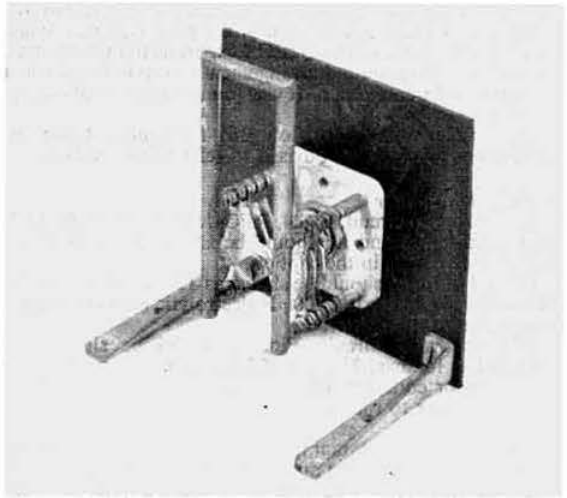


Fig. 5. A u.h.f. "sucker" is also required. This one consists of $\frac{3}{8}$ in. copper rod, with arms $2\frac{1}{2}$ in. long spaced 1 in. between centres and sweated to both stator lugs of the butterfly capacitor. This capacitor has three moving and two fixed plates with $\frac{1}{16}$ in. spacing. A dial should be fitted to the spindle to point to 12 o'clock with the vanes fully unmeshed. A frequency of 430 Mc/s occurs when the pointer is set at about 2 o'clock.

suck r.f. from each multiplier anode inductor in turn. If the needle shifts when the absorption wavemeter is set to 420 Mc/s, you are there!

Add an R.F. Stage

Operated without a preamplifier, the G2DD converter will produce encouraging results if it is off to a good start with a high gain aerial in front of it. But remembering that the input is fed straight into the mixer diode a moment's thought will show that a preamplifier offers the possibility of useful pre-selection, plus considerable extra gain. This amplifier need not be one of the beautiful, if elaborate designs that have appeared in print through the years, which cause much consternation to non-professional experimenters unable to undertake the precision mechanical work required; something quite simple will give more than adequate results —and the simplicity of its construction is such that members have been able to take down details of how to build it over the air!

The r.f. amplifier, utilizing the conventional grounded grid

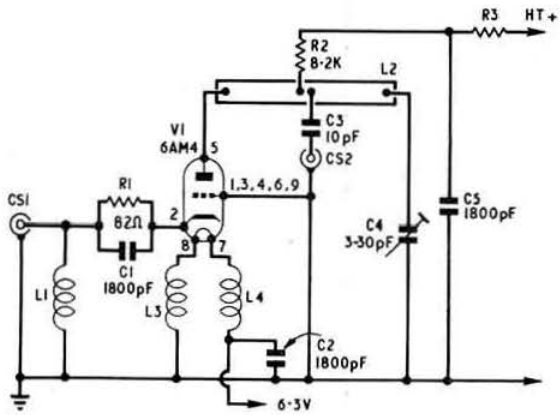


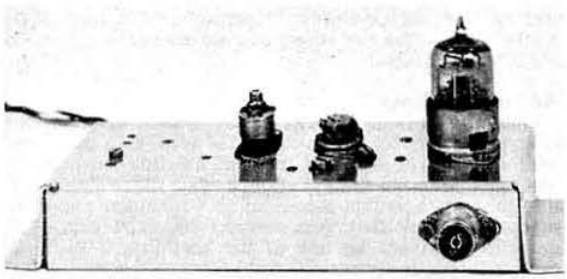
Fig. 6. Circuit of the 6AM4 head amplifier recommended by the writer. The decoupling resistor R3 should be selected so that the voltage at the junction of R2 with L2 is not greater than 180 volts. L1, 3, 4, quarter-wave r.f. chokes, 6 in. of 18 s.w.g. enamelled wound on $\frac{1}{4}$ in. dowel and then slipped off. L2, anode line, 20 in. of $\frac{1}{4}$ in. flat copper strip fitted with tag at each end. Connect pins 1, 3, 4, 6 and 9 of V1 together with copper braid and earth firmly to a tag under the valve-socket bolt.

circuit of Fig. 6, employs a 6AM4 valve, although an A2521 may be substituted if preferred.

The amplifier is constructed on a small aluminium chassis measuring 6 in. × $2\frac{1}{2}$ in., with the B9A p.t.f.e. valve socket mounted an inch from one end. A co-axial socket feeds the incoming signals straight into the cathode of the 6AM4, no input tuned circuit being necessary.

The output inductor consists of a strip of brass or copper $\frac{1}{4}$ in. wide by $2\frac{3}{8}$ in. long, secured at its mid-point to a midget stand-off insulator bolted to the underside of the chassis. Before fitting, the flat line should be drilled 6BA at each end to accommodate a solder tag. One of the tags serves as the connection to the 6AM4 anode pin, the other is soldered to a Philips concentric trimmer, 3-30pF, which will tune the line to resonance.

It is now necessary to connect the h.t. feed to the flat line at a null point for r.f. This point can only be found by experiment. Therefore, connect the h.t. feed "somewhere near," which can conveniently be the mid-point of the flat line. Later, when a signal has been identified, the exact point can be found by the time-honoured method of running a small screwdriver or pencil point along the flat line until no effect on the signal can be detected. Almost certainly, by



The r.f. amplifier for " Quickstarting on Seventy " is an extremely simple device which may be constructed on a 6 in. × 2½ in. chassis with the strip line inductor running down the centre. The concentric trimmer at the left is connected to its remote end. The other end of the line goes to Pin 5 of the 6AM4 valve on the right. Output is taken from the strip line through the co-axial socket in the centre on the chassis top. The co-axial socket in the foreground is for aerial input.

connecting the h.t. feed to the centre point you will be within ¼ in. of the right spot.

The signal amplified by this simplest of all u.h.f. front-ends must now be coupled into the G2DD converter. For this purpose a co-axial socket is provided on the top of the chassis (Fig. 7) to link the amplifier to the converter. This co-axial socket is tapped on to the strip line through a 10pF capacitor, C3 connected as near as possible to what looks like an 80 ohm impedance point on the flat line. Obviously this low impedance point will be at the cold end of the line—which is the middle! Experiment showed this to be within ⅛ in. of the h.t. feed point, and either side will do.

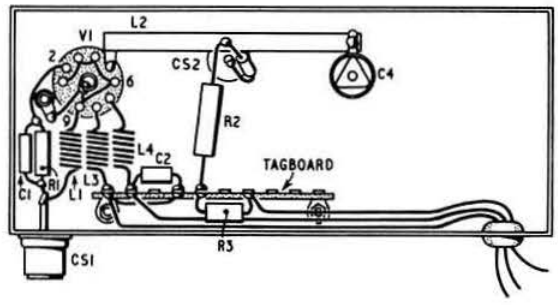


Fig. 7. The underside layout of the " Quickstarter " r.f. amplifier

Unless you live within range of a consistent 70cm signal, such as some known 70cm activity in your area, your quick-start on the band may be ill rewarded. Without these aids—or that *rara avis* to the ham shack, a u.h.f. signal generator—nothing will be available on which to align the signal frequency circuits of the converter. The trimmer on the r.f. amplifier has also be peaked up to produce that satisfying rise in the noise level accompanied by a big increase in signal that shows resonance has been achieved.

Yet if for the moment you *are* stumped for a signal, try the third harmonic from a 2m transmitter. This assuredly, by enabling you to get everything lined up, will give you the satisfaction of knowing that " all systems are go."

Errors in the October issue of the RSGB Bulletin

It is very much regretted that a number of serious errors occurred in the October issue of the RSGB Bulletin.

Members building the G3MVZ s.s.b. transmitter or the G2BCX and G3FEW Top Band transistor transmitters are asked to note the following corrections.

G3MVZ Transistorized S.S.B. Transmitter

Circuit diagram, page 639:

(i). The v.f.o. amplifier transistors TR10 and TR11 are shown incorrectly connected. The emitters should be connected to R43 and R46 respectively, and the collectors must be earthed.

(ii). The choke in the +250 volt supply is 10 Henries, not 10 mH.

(iii). The transmit-receive relay contacts feeding +12V to the audio amplifier are in the transmit position. The contacts near the power pack that short-circuit the driver cut-off bias, however, should be closed on transmit.

(iv). The value of R78, 1350 ohms, was calculated to suit the transformer used in the prototype. The more convenient valve of 1500 ohms could be used quite safely, however. Connections " X-X " of T1 are the supply for V1 and V2.

(v). Crystals X2-X6 are the same frequencies as employed in the Mk. 1 G2DAF transmitter. X2 (80 and 20m), 9 Mc/s; X3 (40m), 6·25 Mc/s; X4 (15m), 8 Mc/s; X5 (10m), 11·5 Mc/s; X6 (10m), 11·75 Mc/s. C52, 53 and 54 are 60pF Philips trimmer, and C80 is a 68 pF silver mica (see coil table, L6).

(vi). The 14, 21 and 28 Mc/s p.a. driver grid and anode coils L5 and L9 are wound on separate formers according to the coil table. The 3·5 and 7 Mc/s coils, however, are at either end of the same former, T2 and T3 are wound on standard Aladdin formers, the wire gauge being 28 s.w.g.

(vii). In the text on page 640, L6 should read L8 and L8 should read L6.

10 Watt Transistor Transmitters for 1·8-2 Mc/s

G2BCX Transmitter

(i). The emitter resistor of TR3 in Fig. 3 should be 47 ohms and the decoupling capacitor for T2 base winding is 0·01 μF.

(ii). Fig. 1 is the basic circuit of the prototype p.a., while Fig. 3 is the circuit of the G2BCX experimental transmitter, the different driver output arrangement shown in Fig. 3 using a series tuned transformer. It was found advisable to change C3 (Fig. 1) to 2200 pF.

For further information on this transmitter those intending construction are advised to refer to the author.

G3FEW Transmitter

(i). In the p.a. circuit, Fig. 4, RFC1, should be labelled L5, L5 should be L6 and L6 should be L7 to correspond with the winding details in the caption.

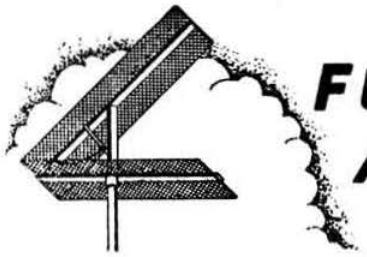
(ii). L7 in Fig. 6 should be shown as T2. The base-emitter decoupling capacitor is a 100 μF electrolytic with the positive connection to the emitter.

(iii). The v.f.o. circuit, Fig. 7, should be slightly re-arranged as follows: The top of L8 primary is connected to the oscillator collector, while the centre tap of the 560 pF capacitors goes to the OC170 emitter. RFC2 is a standard 2·5 mH choke.

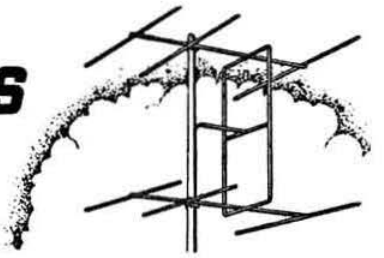
(iv). The second paragraph under the heading " Modulator " should read: The audio modulator is a single OC36 which develops some 4 watts of audio which is quite sufficient to fully modulate the AUY10s up to an r.f. *input* of 8 watts.

Mobile Column

On page 661, the caption to one photograph described a bubble car as belonging to G3RJI. Only the radio equipment was G3RJI's property, in fact, the car being owned by G3RWL.



FOUR METRES AND DOWN



GREAT OPENINGS AGAIN

By F. G. LAMBETH, G2AIW*

GREAT BRITAIN was in the centre of extensive v.h.f./u.h.f. activity when the bands opened during the weekend of September 18-19. Long distance signals were still much in evidence up to the following Thursday, with the peak of activity on Tuesday.

The prefixes heard on 2m by **G3LIM** in London should prove the magnitude of the opening.

Monday: EA, EI, F, HB; Tuesday: DJ/DL, EA, F, G, GW, HB, LX, ON, OZ, PA and SM; Wednesday: the above with the addition of a GM and GC. EA1AB was still very consistent. G5NF was heard working an OK station and SP1WY was being called by ON and PA stations. G6RH worked OK1EH/P, whilst GC2TR was heard working OZ9OR and SM6CYZ/7. Nearly all these QSOs were S9. Continental phone signals were usually very strong and there was a reasonable amount of c.w. Some of the carriers heard could have been distant phone stations—which would have been easily read on c.w.

Many DX stations were still evident on the Thursday evening, September 23; the path seemed to be lengthening, with a Spanish station working, among others, G6CW (Nottingham). EA1CP was heard but did not appear to come back to any G stations. It appears that the Spanish 2m band may be smaller than ours. The opening was, however, on the way out, and by Friday the band had closed. The opening on 70cm spread as far as Scandinavia. **G8ABP** (Birmingham) worked on September 21 DL9OL, OH4HN, PA0ULP, ON4ZK, DL9AR, G3PNI. On the 22nd, he worked ON4HN again and also F8MX/A. F8MX/A was a solid 59+ signal with no QSB, and was characterised as "fantastic." G8ABP, who has a QQV06/40A p.a. with 60 watts input, and receives on an AF186/3N70 into an AR88 with a 14 element Yagi, has worked 24 countries and five counties on 70cm in less than a year.

G3SSI (Acton, London) heard strong signals from eight countries on September 22, including seven ONs, six Fs, four PAs and DJs, three HBs and one OZ, LX and GC. An s.w.l., **A3646**, in London, also heard many of the above countries with only a dipole feeding a transistor converter into a command receiver. His log included G3IGV/M (Cornwall) working ON4UM.

This will give an idea of the opening from the listener's point of view. G3LIM says that it was remarkable that SM and EA stations (the latter off the back of the beam) could be heard only a few kc/s apart at the same time.

G3LTF (Galleywood) worked DJ, DL, DM, EA1AB, three HBs, OE5XXL, six OKs, five SPs and three SMs. All were on c.w. except the SM stations. Other DX heard included more OKs, HBs, DMs, OZs, SMs, EA1CP, DLs and GCs. On 70cm G3LTF worked several DJ/DLs and PAs, ON4HN and SM7BAE. There was also G-DX on the 20th with G8ABP (Birmingham), G8AEO (Bridgnorth), G2CIW (Birmingham), G6AAH/T (Gosport), G8ACI (Gosport), G6ABJ/T (Southampton), G3NBQ (Coventry), G8AGS (Birmingham), G6GN (Bristol) and G3MPS (Bridgwater) being worked. In spite of all this, G3LTF thinks that conditions were not as good on 70cm as on 2m.

On 23cm, G3LTF worked G2CIW, G3MPS, G3GWL and G3LQR. Stations heard were ON4ZK and PA0OS. The "worked" stations were cross band on 70cm or 2m. Signals were up on 70cm and 23cm for inland "G" working particularly on September 21. The transmitter was 5 watts output from a 2C39A tripler, with 32 element stack at 50 ft. The receiver was 1N23E crystal mixer with 51 Mc/s i.f.

G2PL (Wallington) using a "humble" 6 element Yagi, with 60 watts to a QQV06/40A, worked SM6CYS/7, SM6CTP, OK2BIT/P, OK1AZ, SP1AAY and EI2A, also G3BJD, G3JYP and G3CLW using either c.w. or phone. The following were logged: DJ/DLs, DM, F, PAs, GC, OZ, OK and an OE. It is interesting that G2PL could not hear EA1AB or HB9LN. One comment—surely when the band is wide open, calling CQ only tends to increase QRM as there are so many more Gs than there are continental prefixes.

G2JF (Wye) characterises the opening as being as good as anything experienced before and sends an extract of his log covering only the two days September 21 and 22.: SM7DSC (GQ74J), SM7DLK (GP16H), DM2AFB (FN58J), DM2ATA (FO69C), DM4YCO (GM48E), DM2CFO (GM48B), DJ4KH (FJ35F), DM3ZSB (FN58), SM6DMF (GR22A), F9RZ (ZE25F), DM2ARE (HM53J), SP2RO, SP2DX (JO54), SM7BYB (GQ39D), SM6CYZ/7 (GQ45G), OK1VDQ/P (HK16F), DM4ZID (GN75J), OE5XXL (HI52D), OK1VHF/SP5SM (KM66G), SP3GI (IM71A), OK1EH/P (GJ24J), DM2ACM (GL53G), OK1AJD/P (GK29J), OK1AHO/P.

G3XC (Indian Queens) says that the Cornish lads took advantage of the opening. Eight European countries were worked (SM, PA, ON, DL, OZ, F, LX, and HB). Strangely enough EA1AB got away, and no SP, OK or OE, etc. were heard. The known active stations' best QSOs were, G3XC (a.m.), (DM3ZS, North German border), G2BHW (a.m.) (SM6CTP), G3OCB with OZ9OR (s.s.b.) and G3IGV (a.m.) (F9NL, Pyrenees). A number of Gs worked by G3XC just before the opening included some unusual ones such as G4NT (Hughenden Valley, High Wycombe), G6LL (Buntingford), G3DY (Peterborough), G2CDX (Cambridge), G3JQI (Norwich), G3KXA (Solihull), G3IMV (Bletchley), and G5JU (Birmingham). G3IGV (St. Austell) raised G3EDD (Cambridge), G3IIR (London), G3NUB (Boston, Lincs.), and GB2GC, GC2FZC, GC2TR and GC3KAV.

G3OCB (Truro) says that Europeans and GB3VHF were audible from Tuesday morning until Wednesday evening, with the Beacon peaking to S9. The Europeans in general were weaker than on some openings, although the distances were great and from a remarkably wide area. EA1AB was heard on Tuesday evening, with OZ9OR and all the countries between except HB. Two new countries, OZ and ON were added to the score (total now 12). The best distances

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worked were OZ9OR (800m) and DL3SPA (about 750m). In all, 38 Europeans were heard, at distances of at least 400 miles. QSOs were made with two LX, two F, two PA, one ON, one OZ, and five DJ/DL stations. Ten countries were heard and the best signals were from PA0CML, PA0COB, ON4UM, OZ9OR, DL3YBA, DL3SPA, and F9NL.

The above two operators are looking for more skeds, and for the benefit of those interested, here are some particulars of the two stations.

G3XC: Frequency: 144.004 Mc/s c.w., with a.m. if conditions permit. Best times are 20.00-22.00 local time or 07.50 if evenings not convenient. Location: Indian Queens, 550 ft. a.s.l. with good take off 10° N of E, N to due S. Aerial: 16 element stack, 35 ft. a.g.l. Power: 150 watts.

G3OCB: Frequency: 144.080 Mc/s c.w. and s.s.b. Times: 21.00-23.00. Location: Stithiams, 420 ft. a.s.l., with good take off SE., N to NW. Aerial, 24 ft. long Yagi. Power: 600 watts p.e.p., 150 watts c.w.

Frequency: 432.024 Mc/s. Take off as above. Aerial: 6-over-6. C.w. or a.m. Power: 8 watts.

G6RH (Bexley) sends a welcome report after a long time; he was fortunate in being active on September 21 and 22. Concentrating on c.w., he worked LX1SI, OK1KAM/P, OK1EH/P, OK2TF/P, OK2KWS/P, OK1AZ, OK1KPU, SP1AAY, EA1AB, SM6CYZ/7, and a number of DL, DJ and DM stations. He also heard HB9LN, EA1CP and SP2DX.

All the above QSOs were worked on the 15 year old transmitter (QQV06/40A, 90 watts) and a 9 element home-built Yagi.

October Opening

Another opening began to show itself on October 8, and continued through to Sunday night, October 10 at least. The propagation was principally north/south, which meant that GB3LER (Lerwick) on 2m could be heard in the south of England. There have been many QSOs between G and GI/GM, with French stations heard in the background. PA, ON and DL/DJ were quite common. The east/west path was also in use, for EI2W worked 41 PAs, 11 DJ/DL/DMs, four ONs and one F, and heard an OK station on October 8.

" Lunch Club " Meetings on " Two "

G8LM, the Murphy Radio Club station at Welwyn Garden City, is now active on 145·1 Mc/s every weekday lunchtime from approximately 12.30 to 2 p.m. Another Greater London club station, G5FK, that of G.E.C. Wembley, is also on 2 metres several lunchtimes per week.

It is known that many other club stations with 2m facilities available would come on the band if there were someone else to work. A year or two ago it was possible to hear about half-a-dozen of them working with one another at lunch periods. This could happen again.

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

Call-sign	Location	Nominal Frequency	Emission	Aerial Direction
GB3CTC	Redruth, Cornwall	144·10 Mc/s	A1	North-East
GB3VHF	Wrotham, Kent	144·50 Mc/s	A1	North-West
GB3LER	Lerwick	145·996 Mc/s	A1	S
GB3LER	Lerwick	70·305 Mc/s	A1	N/S
GB3LER	Lerwick	29·005 Mc/s	A1	N/S

RSGB V.H.F. BEACON STATION GB3VHF

The frequency of the Society's v.h.f. beacon transmitter at Wrotham, Kent, when measured by the BBC Frequency Checking Station, was as follows (nominal frequency 144·50 Mc/s):

Date	Time	Error
September 14	09.59 GMT	50 c/s high
September 21	10.25 GMT	15 c/s low
September 28	12.42 GMT	70 c/s high
October 5	13.00 GMT	30 c/s high
October 12	16.00 GMT	90 c/s high

Check the band between 12.30 and 2 p.m. each day. There may be others waiting for you.

GM3RUF/P DXpedition

During a period in which good conditions were conspicuous by their general absence, over 600 QSOs were worked, 95 on phone and the rest on c.w. Great tribute is paid by G3KXA to the c.w. operators, whose response is described as magnificent. The 10 counties were visited in the promised order, but apart from a slight lift in conditions during the first evening (when most of the first stations were worked) band conditions generally were very poor. Even so, G3KXA thinks that they have proved the point that given a good site, high gain aerial, reasonable power and a low noise receiver, skeds can be kept up to 400 miles under any conditions. Sixty-six per cent of the skeds were made, and there were also many other QSOs. From some sites the sked success was 95 per cent. The Wrotham Beacon was always just audible and once (near Perth), GB3VHF came up to 20db over S9 for 10 minutes. The Beacon was always available for lining up the beam. The first GM/GC 2m QSO was made from Dumfries with GB2GC, S5 both ways (c.w.). GC2FZC was copied from several sites although never better than 239. The worst site was Dumbarton (47 QSOs) but this included DX like G3FAN (I-o-W), RST 559, G3EDD (Cambridge), 569, G5MA (Surrey), and G3XC who was RST 339/539. Perth was a " far north " challenge and from there G3BA was RST 599 on sked. The DX at 400 miles or over included G3XC 439 (Cornwall), G3IMV 439 (Bletchley), G3AOS 559 (Cheshire), G3EDD 449 (Cambridge), G5MA 539 (Surrey), G3PTM 569 (Solihull) and G5JU 539 (Birmingham). The most outstanding DX signals were G3BA (always Q5 on s.s.b.), G3EDD, G5MA, G3XC, G3PTM, G5JU, G3AOS and G6NB. Other very good DX signals from most sites were G3FAN, G3KEQ, G3IMV, G3LFF, G3LAS and GW3KYT.

During the contest G3KXA was on his own and worked for 11½ hours. He wishes to correct the QRA Locator, given as YP14F. It should be YP41F and G3KXA apologizes; it was due to tiredness after a long spell of operation.

There were 69 QSOs, 47 on excellent c.w., the claimed score being 21,030. Seven countries were worked and the best DX was at a distance of 660 km. The sites in Stirling, Kinross, Perth, Clackmannan and Renfrew could not have been reached without Landrovers. GM 2m stations (e.g., GM3EGW, GM3FYB and many others) are now armed with the frequencies of the sked stations and they are both looking for skeds and more frequencies; they actually heard many of the QSOs mentioned above. Thanks are extended to G3BA for his excellent help and to all those who used the key to make things so excellent and successful. Tom Withers loaned the 2m converter which made so many of the weak signal skeds successful. Thanks are also extended to GM6XW, GM3EGW, GM3FYB, GM6TF and GM3TFY for all their co-operation and help with the sites.

Two Metre News

G3PMJ (Manchester) now has equipment for 2m. The transmitter runs 50 watts input to a QQV06-40 and is the kind loan of G3PJK. The converter is a c.c. 6CW4 and the aerial a 6-over-6 slot beam at 35 ft.

EI6AS (Dunlaoghaire) worked GM3RUF/P from all nine counties and also GM3EGW and GM3FYB for Fife-shire, a bonus county for keeping the beam (13 element Yagi at 44 ft.) in the NE Direction. The power was 75 watts and the frequency 145·85 Mc/s.

Meteor Scatter in Greece

SV1AB (Athens), who is a member of the RSGB, has been keeping the v.h.f. flag flying in Greece. His m.s. activities have become widely known, and he has already had skeds

with OK2WCG (worked during the Perseids), HG2RD (also worked), UA1DZ (no final " R "), DM2BEL (pings and bursts only). SV1AB would like to have more skeds, especially for the Orionids and Leonids. They already exist with G5YV, DM2BEL, UA1DZ, F8DO, and ON4FG. There is room for more, however, including s.s.b. Apart from this, SV1AB transmits automatic c.w. everyday from 14.00 to 14.30 and 21.00 to 21.30 GMT, calling " DX de SV1AB " and beaming on the UK. Signal reports have been received from Israel, Tripoli (Libya) and from F3NB.

The frequency in general used by SV1AB is 144·700 Mc/s ± 1 kc/s. His address is George Vernadakis, Service Station " Mobil ", Peristeri, Athens, Greece.

The power used is 200 watts with a v.f.o. or c.c. c.w. and s.s.b. The aerial is an 11 element " long, long " Yagi, with 16 db gain.

Moonbounce

While in Scotland G3KXA and G3UAW had a personal QSO with GM3EGW and GM3FYB and noticed the fine quality of GM3FYB's home built v.h.f. gear, with special reference to the 70 cm moonbounce dish with a gain of 26db on which he logged KP4BPZ on July 24. This is shortly to be moved to a /A site, which creates a problem, as it is such a monster!

Moonbounce again but a very different one this time, although G3LTF is one end of it. The tests of WA6LET, Stanford University, California, led to a QSO with G3LTF, who gains another country and deserves our warmest congratulations for his sustained efforts thus crowned with success. The QSO took place on Saturday, September 25 at 15.30/15.33 GMT. G3LQR was present in the shack when they first detected 559 signals from WA6LET at 14.41 GMT. They fell off a little by QSO time (549/339) possibly because the moon was not very high, and there was interference from trees, houses, etc; WA6LET was heard working W3SDZ, W2CCY, W9HGE, W9GAB and K2MWA(?).

The gear was as follows: Aerial: 15 ft. diam. polar mounted dish with dipole and reflector, and a 15 ft. length of 50 ohm feeder to aerial change over relay. Receiver: parametric amplifier working into a new transistorized converter (built for V.H.F.-NFD). 1st i.f., 12 Mc/s, 2nd i.f., 5·5 Mc/s into R1475 with i.f. band-width of 500 c/s and 100 c/s. Audio filter. Transmitter: 432·031 Mc/s with transistor oscillator at 8 Mc/s and usual multipliers up to 2m of QQV03/20A tripler, QQV06/40A buffer amp, and a 4CX250B.

G3CCH (Scunthorpe) received WA6LET's signals for a short time. The peak report was 339, and signals appeared at their best around 15.30 GMT. There was, however, no QSO. G3CCH thinks all operators will now be looking for the next " big dish jamboree."

Twenty-three and Thirteen Centimetres

A letter from G3HWR points out that there are some axes which appear to need grinding, concerning frequencies to be used on the u.h.f. and s.h.f. bands. A discouraging number of stations on 23cm in the Home Counties are operating around 1298 Mc/s with some as high as 1299·5 Mc/s. As G3HWR has designed his converter to operate most efficiently within the IARU Region 1 recommendation (1296/1298 Mc/s), this snag becomes very obvious to him! Furthermore, a number of G8– – – operators do not seem to realise that there is a band plan for the range 432/434 Mc/s. We should like to have other opinions on these questions and would welcome a discussion through this column to dispel the ignorance of some and discourage the insularity of others.

G5FK is building for 13cm. The club has been much exercised about frequencies to be used and have examined the harmonic relationship of bands above 2300 Mc/s. They have now decided to base their s.h.f. programme on the following sub-bands, all of which can be generated by frequency multiplication from a common c.c. source of a few watts between 1150/1158·3 Mc/s = 8·3 Mc/s variation. This gives the following tuning ranges: ×2: 2300-2316·6 Mc/s = range 16·6 Mc/s; ×3: 3450-3475 Mc/s = range 25 Mc/s; ×5: 5750-5791·6 Mc/s = range 41·6 Mc/s; ×9: 10,350-10,425 Mc/s = range 75 Mc/s.

It is therefore suggested that these " sub bands " should be recommended for initial exploitation, much as the sub-band 432/438 Mc/s was originally experimented in the early days. It will doubtless take a long time before anything can be done, but it tends to show that G5FK's decision to operate at the low end of 13 cm is not an arbitrary one, but one which, it is hoped, will lead to developments later on the other s.h.f. bands. This is a matter which can also do with informed discussion and any other interested parties are invited to express their views. After all, 23cm started with about one station. Some of these (and others) are probably already working on the same lines, and some form of collaboration appears very necessary, even at this stage.

First Translator Balloon

British stations which were reported to have been heard on the first balloon by East German stations include (from DM2ASM): G3LTF, G2JF, G3EZ, G6AM, G6AG, G5YV, G3BA, and G3EMU, (from DM2BQN): G6AG, G3AHB, (from DM2CDN): G5AB? G3AHB, G6AG, (from DM2BML): G3AHB. (*VERON* V.H.F. News Letter).

Seventy Centimetres

The following are some operating frequencies reported by **GW4CG.** GW3MFY 432·29 Mc/s, GW3DFF 432·05 Mc/s, and GW4CG is on 432·27 Mc/s. EI6AS (Dun Laoghaire) now has 4 watts to a QQV02/6 plus a double 6-over-6 slots at 42 ft. The converter is A2521 trough line into an SX28. E12W and E14Q have already been worked.

During an opening on July 17, G3EKP and GW3KYT were worked crossband as the transmitter was not then ready. The frequency in use is 432·5 Mc/s.

G3OCB reports skeds with G2XV, starting on September 7, and heard him on the 14 and 15. The first contact was made on September 20 (559 out, 539 in). The distance is about 300 miles. There has been a QSO with G3EGV (579 out, 559 in), and also GB2GC and G5ZT.

Four Metres

G3PLX and G3OHH had a very successful DXpedition signing **GM3PLX/P** from Kirkcudbright, at a site 1200 ft. a.s.l. overlooking Wigtown Bay. Operation was on 70·175 Mc/s and many stations in the NW were QSOs on phone. The best DX included G3SKR, G3EHY and three stations in Bletchley, G3IMV, G2BKC and G2AUD. EI6AS was worked for Eire, GW3MDK and GW3LNZ for Wales. A very strong signal was put out by GD3FOC/M for the Isle of Man. 28 stations in 11 counties had been worked at the time of writing. The gear was home made, the transmitter input being 15 watts to a QQV03-10 and the aerial was a 4-over-4 beam. G3PMJ, who reports this, says that many thanks must go to G3PLX and G3OHH for putting up such a splendid show.

On September 14, **G3PMJ** (Manchester) had a very good QSO with G3SKR who, he says puts out the only strong signal from the south-east.

EI6AS says that the QSO with GM3PLX/P made his sixth county on 4m this year, but GB2GC was not heard at all. The gear gives 20 watts to a 4-element Yagi at 40 ft. Receiving in an RF26 converter plus a 6CW4 pre-amp. The frequency is 70·227 Mc/s.

NEWS . . .

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

ITU Centenary Medal. To commemorate the 100th anniversary, the International Telecommunication Union is issuing a Centenary Medal in gold, silver and bronze, symbolizing the advances in telecommunications and the ITU's membership in the United Nations. The medal, engraved on both sides, measures 6cm in diameter and is available from the Conferences and General Services Division, ITU, Place des Nations, Geneva. The bronze medal costs $3.50 or 15 Swiss Francs. Prices for the gold and silver medals will be announced later.

Canadian Licences as at March 31, 1965, totalled 11,280 with Toronto Region leading at 4149, followed by Montreal, 1935; Vancouver, 1549; Winnipeg, 1283; Moncton, 1273; Edmonton, 1091. There were also eight Maritime Mobile licences in force at the above date.

Silicon Transistors. At least three US manufacturers are offering silicon transistors at less than $1 apiece. Among the currently-available low-cost units are General Electric 2N2923, Motorola, MPS 706 and MPS 834 and Texas Instruments TI-416. These are all encapsulated *p-n-p* types featuring " in-line " terminals. Silicon transistors are used almost exclusively in military equipment and important industrial applications which may explain why manufacturers have been able to bring retail prices down to the low figure of $1.

Mullard Meetings arranged and managed by the Mullard Films & Lectures Organization are designed to keep the trade abreast of current technical developments in the radio, television and electronics industries. Society members who wish to attend local meetings should write to Mr. Ian Nicholson at Mullard House, Torrington Place, London, W.C.1, in advance for a ticket. Meetings will be held during November as follows: 2nd, Concert Hall, Co-operative Education Centre, Nottingham; 10th, Town Hall, Chester; 11th, Houldsworth Hall, Manchester; 16th, Glaxo Club Hall, Ulvaston; 22nd, Town Hall, Wandsworth; 23rd, Queen's Hall, Bradford; 29th, St. George's Hotel, Llandudno; 30th, University College of North Wales, Bangor. All meetings will commence at 7.45 p.m. The talk on each occasion will be about transistors followed by two films entitled *Thin-film Microcircuits* and *Electromagnetic Waves—Part II.*

US Federal Communications Commission has decided that the operator of an amateur station must use his own call unless the licensee is in actual control of the station. This means, presumably, that a US amateur on a DXpedition will not now be able to talk back to his home station and qualify for a QSL card from himself when at DX!

More BBC Experimental Stereo Sound from Wrotham. The number of experimental pilot-tone stereophonic transmissions from Wrotham on 91·3 Mc/s has been increased from two to three each week. The transmissions will be included in the Music Programme on Mondays and Fridays from 2.30 p.m. to 3 p.m. and on Thursdays from 11 a.m. to 11.30 a.m.

BREMA favour 625 lines only. British Radio and Electronic Manufacturers' Association, in a policy statement on the future of British Television, regret the suggestion that the 405-line system should be used for colour. BREMA advocate that the existing 405-line services should be switched to 625-line and a firm decision taken quickly. The Association consider it would be " disastrous " to perpetuate a dual-standard system longer than necessary. They argue that dual-standard receivers are more expensive, less reliable and less efficient than sets designed for a single standard.

SECAM DX. Pictures in colour have been transmitted successfully from Paris to Algiers using the French SECAM system. An existing 650-mile microwave system, which includes tropo-scatter over-the-horizon links, was used for the transmission.

BBC Experimental Colour TV Transmissions from Crystal Palace on Channel 33, using the PAL system, now take place on Mondays to Fridays from 2 pm. to 5 p.m. The transmissions consist of 15 minutes test card in black and white, 10 minutes of colour bars and 35 minutes of colour slides in each hour. There are also occasional colour films each week. Transmissions of live studio scenes and colour films follow the close-down of BBC-2 for 20 to 45 minutes on Monday, Wednesday and Friday evenings.

Racal Achievements. During the course of a three-day symposium and exhibition held in London, Racal announced that 12,000 of their famous RA-17 receiver and its various transistorized successors, such as the RA-217, had been produced. The new man-pack Racal s.s.b. " Squadcat " delivers an output of 5 watts p.e.p. and has facilities for 29-channel operation with no tuning other than aerial inductance. Cost is around £300.

Car Headlight Warning. A car radio receiver that sounds a reminder if a driver forgets to turn-off his headlights has been introduced by the Motorola Corporation. It works if the lights are left on after the ignition has been turned off and gives its signal even if the receiver is not turned on.

Inaugural Meeting of the newly-formed Institution of Electrical and Electronics Technician Engineers was held in the Lecture Theatre of the I.E.E., London, on October 19, 1965, when D. A. Barron, C.B.E., Engineer-in-Chief of the GPO, lectured on " The Future of Telecommunications." The Postmaster General (Rt. Hon. Anthony Wedgwood Benn, M.P.) also addressed the meeting. Full information about the Institution and a copy of the forthcoming lecture programme may be obtained from the Secretary, IEETE, 26 Bloomsbury Square, London, W.C.1.

President of Peru, the Honorable Fernando Belaúnde Terry, holds the amateur call OA4FO. The Peruvian Ambassador to Switzerland (Naton Sterental) is also a licensed amateur—OA4OS.

Japanese Amateur Licensing. There are at present 13,200 licensed radio amateurs among the 16,100 members of the Japan Amateur Radio League with a total of around 38,000 licensed radio amateurs in all Japan. The Japanese draw their frequency assignments from the ITU Region III allocations with the result that they may use 200 watts c.w. on Top Band and 500 watts c.w., a.m. and s.s.b. on 3500-3575, 7000-7100, 14,000-14,350 and 21,000-21,450 kc/s. There is a 50 watt limit for all normal modes on 28-29·7, 50-54 and 144-146 Mc/s. TV is also permitted on 430-440 Mc/s but above that frequency the limit is 1 watt for any mode. In the event of an emergency 500 watts may be used on 4·65 Mc/s, c.w. only.

BBC-2 U.H.F. TV Relay Stations. First of the new BBC-2 u.h.f. television relay stations for the London area began operation at Hertford on October 11, 1965, and at Tunbridge Wells on October 25, 1965. The Hertford station transmits on Channel 64 and the Tunbridge Wells station on Channel 44. Both use vertical polarization. Two further relay stations, one to serve the Reigate area and the other the Guildford area will be brought into service later. Channel 44 limits are—654-662 Mc/s; vision carrier 655·25 Mc/s. Channel 64 limits are—814-822 Mc/s; vision carrier 815·25 Mc/s.

ON8 Calls for Visitors to Belgium. Past President Leslie Cooper, G5LC is one of several UK amateurs to whom an ON8 call (ON8IZ) was issued during the past summer. Another was Edgar Wagner, G3BID/ON8IY.

Canadian Colour TV will be inaugurated on January 1, 1967—the first day of the Dominion's Centennial Year.

THE MONTH ON THE AIR

A CHRONICLE OF EVENTS ON THE HF AMATEUR BANDS

By M. E. BAZLEY, G3HDA*

AS *MOTA* deals with the h.f. bands one of its main topics is naturally DX. G3SGH in a letter suggests that DX achievements listed in their present form are meaningless owing to the operating conditions of each amateur being different. John goes on to say " that most amateur magazines which have a DX column cover their pages with the rare ones raised by G..... with scant attention to the little chaps who for a multitude of reasons bang away with much less power and only raise mediocre DX which would look pitiful alongside those KS, VR, etc." He is aware of the exception to the rule; DX has been worked on Top Band and wonders with what success this could be achieved on 20m using the same power. John is only entering a plea for those who do not possess the maximum in all things, that somehow a section of *MOTA* might be made available which would cater for the QRP boys.

There is no doubt that working a W6 with 20 watts and a dipole is comparable to working very rare DX with maximum power and a large array. If QRP readers intimate that there is demand and *they would support* a separate heading for QRP news then the writer would be only too happy to include it.

News from Overseas

W6FET, who operated from Montserrat recently with the call **VP2MN**, writes that he had 749 contacts in 62 hours actual operating time during his stay on the island. Herb took with him a Swan 350 transceiver with external v.f.o. together with a 75S3 receiver and for his aerial VP2MV kindly lent a TA33jr. Herb goes on to say " that operating conditions from VP2MN were quite different than from California and before leaving he had planned to listen at least 5 kc/s above and below the transmitting frequency but the very strong signals from South America made this impossible. European signals would start coming through from 19.00 until 24.00 and as a matter of interest out of the 749 QSOs made (450 s.s.b., 299 c.w.) 271 were with European stations and split as follows: CT1 (2), DJ/DL/DM (66), EA (2), F (5), G (29), GI (2), GM (1), HB (2), I (23), IS (1), LA (5), LZ (1), OE (9), UA (9), UR (2), UT (2) and YU (3). All these were made on 20m and of the five contacts made on 15m none were with Europe. One act of fate was that the last contact before tearing down the rig was with WA4END. One further note regarding s.w.l. reports, Herb said that he had received about 40 of which only five were for c.w. and many were a day or hours out on the times on their reports. One s.w.l. sent two cards and said he could not read his writing in his log but was sure that one of them was correct and to throw away the one that wasn't!

K1QHP/1 (FL8AK), one of the operators of ET3USA has now returned to the USA and hopes to be operative from his home call or K1KBO during the RSGB 7 Mc/s contests. Al used to oblige the European gang with countless QSOs on c.w. on all bands from 80m to 10m and always put ET3USA on the air for any RSGB contests he could participate in.

5N2AAF/G3JKO, Mike Dransfield, kindly forwards further news of local conditions and G stations heard in Thailand during the month of September. For the RSGB 21/28 Mc/s Contest he put up a 2 ele. beam on the UK and though no signals were heard on 10m, the following Gs were copied on 15m s.s.b. between 10.25/13.00 on the Saturday and 10.00/13.30 on the Sunday: G2BSA, JB, QT, G3BEG, CAZ, EGK, HDA, FMY, FPQ, JAF, JRL, KFT, LGW, MDK, OJG, PEU, PRP, RXC, TKK, G5FI, G6FM, G8NY, GM3SIG and GW3DZJ all between S3 and S6. Mike does say that there appeared to be one way skip conditions prevailing to Europe as quite a number of JA stations were calling Gs though they seemed to be making no contacts. All the G stations heard were either calling CQ or working into Africa. On the l.f. bands, Mike uses a 132 ft. long wire and has heard no stations at all on 160m and 80m. On 40m during 21.15/21.45 (October 2) G3FPQ and GI3OQR were the only UK stations heard though UAs, LZs, DMs etc., were plentiful.

G3NPI is now active for one year from Cape Town and has been issued with the call **ZS1GS.** Geoff will be looking for G contacts, particularly in the Essex area, around 14,275 kc/s most days. From **VK4SS** comes a further round up of Pacific activity for the benefit of *MOTA* readers. Stations active on **7 Mc/s s.s.b.:** KG6AAY, KX6BQ; **c.w.:** FU8AA, KG6AAY. **14 Mc/s s.s.b.:** FK8BG, KC6AA, KC6AQ; **c.w.:** FO8BI, FU8AA, KB6CY, VR1BZ, 4S7DA and 4S7NE.

Top Band News

6Y5FH sends details of his proposed activities for this year's Top Band " DX Season." A new transmitter has been built, capable of running 50 watts into a G5RV aerial and special attention has been paid to an extensive earthing system. 6Y5FH will be active every weekend looking especially for DX QSOs and any reports received or two way QSOs made will be QSLd 100 per cent. (Full address in *QTH Corner.*)

G2DHV, who operated recently on the continent with the calls **ON8IR** and **OE9ZUH,** mentions that his OE9 licence allowed him to operate on Top Band.

The only report on 160m activity this month has been received from BRS20317 who lists September 12 and 26 as good days for DX when K1PBW, VO1FB, W1BB/1, W1BHQ W1HGT, W2EQS and W2IU were all heard between 05.15 and 06.30. **ZL3RB** was being called by Gs on September 26 and it appears that he was heard in the UK but no two way contacts were made.

Band Activities

Since writing October *MOTA* three weeks ago, all bands, 80m to 15m have produced some wonderful DX and if one band has been in the doldrums then another has been provid-

* Please send all reports and news items to RSGB Headquarters to arrive not later than **November 11** for the **December** issue, and **December 3** for the **January** issue.

ing interest. The regular operators on 15m have been having a " field day," as this band on several occasions has lived up to past expectations with all continents coming in.

The writer wishes to thank the following for their help in compiling these reports: G2BOZ, G2LB, G2RO, G3BGL, G3FKM, G3HCT, G3SML, G8JM, GW3AX, BRS20317, BRS26444, A4038, A4552 and A4641.

3·5 Mc/s C.W.: ZL2BAF (06.20), ZL4GA (06.40), 7X2AH (23.10).

3·5 Mc/s S.S.B.: The following were worked/heard between 19.30 to 22.30 unless otherwise stated. OX3JV, VK3AHO, VK3ATN, VK3BM, VS6AJ, UW9AF, ZB2AO, ZD8HL, ZL2DCG (06.10), ZL4LM (06.25), 4X4BL, 5A2TR, 9M4LP.

7 Mc/s C.W.: CM2WS (21.25), CX3DN (22.20), FP8CP (20.00), K7LMU/HS (21.25), KV4CI (22.17), KZ5EX (23.00) KZ5TD (06.00), LU2AFG (22.00), MP4TBO (22.30), PJ2ME (22.05), TI2PZ (22.37), UA0SO (16.30), VK2/3s (06.15-08.30), VK3APN (20.45), VK5KO (20.45-22.15), VK0TO Macquarie Island (07.57), VP2GAW (07.23), VP5AR (06.00-08.00), VP6AW (21.20), VP7NQ (23.00), XZ2TZ (21.35), ZD7IP (22.30), ZL1AXB (07.30), ZL2AAG (06.45), 4U1SU (14.45), W9WNV/8F3 (21.28), 9Q5JR (22.45).

7 Mc/s S.S.B.: The following were worked/heard between 20.00 to 22.00 unless otherwise stated. EA6AR, HS1WL, JA2BTV, JA4BJO, OX3JV, PJ2AA, PJ2MI, UH8AE, VK2AVA, VK2KM, VK2NN, VK2SA, VK3ATN, VK3BM, VK4AK, VS6AJ, YA4A, YV5BPJ (23.45), YV5BTS (01.00), ZB2AO, ZC4MO (00.35), ZS1JA, ZS5JY, 4W2AA, 5A2TR (19.35), 5Z4AA (18.20), 7Q7PBD, 7X2AH (23.50), 9M2OV, 9M4LP.

14 Mc/s C.W.: BY4SK (14.56), CR4AE (07.47), CO6AH (22.00), FB8WW (16.10), FL8MC (20.20), FU8AG (09.40), HM0HQ (08.05), HP1AC (20.45), HS1S (14.00), KC6SZ (15.28), KG6SZ (11.27), K3SWW/KG6 (10.08), K1CZH/KM6 (08.45), KM6CE (08.50), KW6EK (11.50), LU1ZC South Shetlands (19.40), LU1ZX (19.20), MP4BFH (19.00), OY7U (16.32), PY2BZD/0 (18.45), TN8AF (15.15), VK8DR (15.10), VK9WE (11.40), VP2AZ (14.10), VP2SJ (22.10), VP5AR (21.30), VP8IB (20.20), VR1A (10.16), VR4CR (11.15), VS9MP (16.30), XZ2TZ (13.46), YN1SL (20.19), ZD7IP (07.03), 4S7DA (15.20), 5W1AZ (10.00), 9M6DH (14.47).

14 Mc/s S.S.B.: CT2GF (12.44), CR4AJ (07.58), CR8AE (16.30), CR9AI (15.38), DU1MR (15.43), ET3DR (15.54), FG7XX (22.30), FR7ZD (16.35), HI8JSM (21.37), K7LMU/HS (13.00-18.00), KC4USK (07.15), KG6IF (Marcus Island 09.48), KG6SP (15.00), WA7DYP/KH6 (Kure 07.28), KM6CE (08.18), KH6FIF/KS6 (07.56), PY2BZD/0 (18.30), TU2AA (07.17), TJ1AC (09.24), VK9AG (14.15), VK9XI (13.45), VP2KJ (21.48), VP2SJ (23.20), VP6KL (20.38), VS9MB (16.33), XW8AX (16.10), XZ2TZ (19.52), 4S7IW

Commonwealth Call Areas Table

	1·8	3·5	7	14	21	28 Mc/s	Total
G3KSH	—	26	24	81	26	—	157
5N2AAF	—	6	14	65	43	16	144
G3DYY	—	9	31	55	19	7	121
VO1FB	12	17	14	45	13	1	102
G8JM	4	—	—	76	16	1	97
G3AAE	—	—	7	51	24	1	83
G3LHJ	3	3	5	29	26	2	68
A2111	3	24	28	86	65	17	223
A4038	3	8	8	69	34	16	138
A2498	2	8	10	76	29	7	132
A4431	3	8	6	53	38	5	113
A4552	—	2	—	44	58	8	112
A2340	6	13	22	51	18	1	111
A4311	1	10	2	64	19	6	102
A4048	5	13	6	58	17	2	101
A3699	5	11	13	41	26	3	99
A3902	4	14	5	43	22	8	96
A4431	3	8	4	41	34	1	91
A3942	4	14	24	37	7	—	86
A4391	4	6	2	32	20	4	68

PROPAGATION PREDICTIONS

In November, as in October, the F2 m.u.f's are at their highest for the whole year in the Northern Hemisphere. Conditions will, therefore, be better than they were during the summer months. On the other hand the days are becoming shorter, so that the h.f. bands will close earlier in the evening, which means that most people will have fewer opportunities to work DX in the evenings on these bands. In spite of the increase in solar activity compared with last year, 28 Mc/s will still be of little value for DX working. Under favourable conditions on this band South America should come through between 10.30 and 15.00 GMT, Africa from about 08.30 to 15.00 GMT and South East Asia from about 08.00 to 10.30 GMT. On 21 Mc/s North America and Japan will not necessarily be heard, though the other continents should be workable. In general, the conditions for DX working will be more favourable in Southern Europe than further north. In contrast to 21 Mc/s all continents should be workable on 14 Mc/s. The approach of the midwinter season will provide more opportunities for DX contacts via the long path on this band, especially to South America and East Asia in the morning and Western North America in the afternoon. Between about 16.30 and 17.30 GMT when conditions are favourable on 14 Mc/s, KH6 should be workable via the short path. With the present early closing of 14 Mc/s, 7 Mc/s will become the main DX band after about 20.00 GMT.

The decrease in the atmospheric noise level during the winter months on 7 and 3·5 Mc/s favours DX traffic on these bands, which is basically possible when the greater part of the transmission path lies in darkness. This condition applies especially on 3·5 Mc/s. In the latter half of the night local traffic on 3·5 Mc/s will be frequently interrupted by the dead zone.

The provisional sunspot number for September was 16·3 showing a higher level of solar activity than previous months. The predicted smoothed sunspot numbers for January, February and March are 23, 25 and 26 respectively. Preliminary analysis of the magnetic and solar data covering 1964 shows that the sunspot minimum may have been in fact a double minimum during the months of July and September.

KIKSH, Gary Lunney operating the power station of W1BB/1.

(14.50), 4S7BR (15.00), 4W2AA (09.47), W9WNV/8F3 (16.03), 9M6BM (15.50), 9M8KZ (15.16).

14 Mc/s A.M.: CR7GR (17.32), EA8CR (10.50), EA9EO (13.50), HI3SVC (22.05), HI4XEC (21.20), HI8JBA (21.40), SU1IM (17.42), VK4JI, 5N2GWS (17.43).

21 Mc/s C.W.: FB8WW (11.20), FB8XX (11.30), FP8CA (16.35), HM2BV (12.55), HM5CO (11.00), JA6BXA (10.57), KC6SZ (11.08), KG6AAY (09.17), MP4BFI (16.35), PY2BZD/0 (11.56), TU2AN (17.12), VK9PL (10.22), VP8HJ (18.15), VQ9J (10.06), VS6FO (11.07), ZD5M (17.00), 4S7DA (15.28), 7G1A (17.08), 9M2OV (10.02).

21 Mc/s S.S.B.: CE3OX (21.20), CX8AAW (20.55), ET3USA (08.45), HC2LI (21.00), JA1GTS (12.35), JA6PY (08.50), KC6SZ (12.05), KV4CX (11.20-19.40), KZ5QC (21.45), LU1DTJ/M (20.35), OD5's (08.23-16.00), PY2BZD/0 (18.30), PZ1CN (20.55), VK9PF (11.00), VK9PL (10.05), VK9MT (11.10), VK9XI (15.15), VP3MV (21.20), YA4A (10.55), ZD8HL (11.30), ZD8WZ (15.52), ZD5D (16.45), 4W2AA (09.28-13.45), 5X5JK (07.50), 9M4LP (08.25), 9Q5QR (12.36).

21 Mc/s A.M.: CR6AN (17.53), CR7FR (08.00), EA9AX (15.50), EL2AK (18.05), ET3RB (13.40), JA6DPR (12.10), JA0BLU (09.27), TN8BK (18.52), VP1LJ (17.58), VP2SG (20.25), VP2SY (20.35), 5X5JK (08.44), 5X5KRL (11.50), 9K2AP (08.34), 9X5AV (18.21).

DXCC News

W1WPO, Bob White, of the DXCC awards section, was recently a guest speaker at a meeting of the Northern California DX Club, and the following items of interest are taken from *The DXer*. " The reason why **XW8AW/BY** credit had to be turned down was that for any American to operate in China he would need the permission of the USA and Chinese Governments. Other nationalities may operate from there and be accepted for credit (during the recent BY4SK operation the gear was supplied by W9WNV and the station operated by two non-Americans who had a legitimate licence for c.w. operation only). On the question of new countries the following could count as such under the present DXCC rules: Rockall, St. Peter and Paul Rocks (Brazil), Ebon Island (Ecuador), Comoran Island (Costa Rica), and the United Nations HQ in New York."

From the ARRL HQ comes the following official ruling on the status of Singapore. " Contacts made with stations located in Singapore before September 16, 1963 and after August 8, 1965 will be credited as Singapore. Contacts made with stations located in Singapore, September 16, 1963 to August 8, 1965 inclusive, will be credited as West Malaysia. This change will remove Singapore from the deleted countries. Honor Rolls totals will be adjusted in accordance with this change in the November issue. This change is neither an addition nor a deletion. Confirmations for Singapore credit may be submitted at any time."

Three rumours are at present circulating regarding the status of the **4X1DK** DXpedition to the Israel/Jordan Neutral zone in August last. (i) It will count as Palestine, (ii) as Israel, (iii) as an all time new one. No doubt W1WPO will advise which is correct in the near future.

DXpedition News

G3SBP and K4IIF will use the call **VP2VD** when they activate the British Virgin Islands for one week during October 23 to October 30 on 3510, 7010, 14,010 and 21,010 kc/s. The writer regrets that this information will only give readers three days notice in which to work this DXpedition, but details were not received until October 9.

Gus, W4BPD has been signing **OY2GHK** on all bands and was due to leave the Faeroe Islands on October 16. Gus told the writer that he was unable to obtain a licence to operate an " All time new one from Europe " and he did not know what his future plans were going to be. Frequencies: **14,035, 65** and **7003 kc/s c.w.** and **14,110, 140 kc/s s.s.b.**

The YASME DXpedition at the time of writing was signing **KC6SZ** from the Western Carolines and the next port of call is scheduled at the Eastern Carolines commencing October 23 for two weeks with the call **KG6SZ/KC6.** The DXpedition has been issued with the call YJ8YY and no doubt will be putting this on the air in the near future. Frequencies to watch are: **7002, 7011, 14,051** and **21,051 kc/s c.w.** and **7100, 14,235** and **21,400 kc/s s.s.b.** All QSLs to the address given under *QTH Corner*.

The writer hopes that the following may be of interest to readers who may wonder how a mammoth DXpedition is financed, particularly as these notes apply to the current K7LMU/W9WNV DXpedition.

Originally, before this DXpedition started an appeal was made for amounts of $25 or more and subscribers were promised that they would receive QSLs direct from the DXpeditions on the spot location. The writer does know that this promise has been fulfilled and with approximately 400 subscribers, the DXpedition set off with the backing of more than $10,000. As everyone knows they were successful in putting 5W1AD, YJ8WW, BY4SK, W9WNV/8F3, XZ2TZ and K7LMU/HS on the air and no doubt giving many stations all time new ones. On October 1 the following letter was sent to all subscribers by Ack, W4ECI on behalf of the DXpedition. " With the first phase of our DXpedition coming to a close, it brings up the second phase which consists of the North Pacific which includes the two new ones that everybody needs, the third phase which is the South Pacific including ZM7/Tokeleaus and the fourth phase which includes VK0, Heard Island. All of these spots have to be reached by charter boat at a cost of some $300.00 per day. As the next phase will be coming up within the next 14 days, it is most necessary that we seek additional support in the form of donations before they can be made. We realize in that a 'few of you have done so much for so many' but both Don, W9WNV and Chuck K7LMU are most determined to see the DXpedition completed. To complete the final three (3) phases, some additional $9,850.00 is required. We therefore seek your additional support. Remem-

QTH Corner

CT2GF	Via Radio Club Peruano, Box 538, Lima, Peru.
CR8AE	Jaime da Guia Pereira, Civil, Dili, Portuguese Timor.
CP1EA	Via W2CTN.
ex FL8AK	K1QHP/1, HQ. Company, USASATC & S, Fort Devens, Mass. 01433, U.S.A.
HS1S	1231 SukumvitRoad, Bangkok, Thailand.
K7LMU/HS	Via W4ECI.
KC6SZ	Via YASME.
KW6EJ	Via W2CTN.
PZ1BK	Box 160, Paramaribo, Surinam.
TI2WD/8	Via W2CTN.
VK9XI	Via VK6RU, 15 The Grove, Wembley, West Australia.
VK9WE	P.O. Box 56, Port Moresby, Papua Territory, Australia.
VP2GL	Via W5QMJ, 2215 East Chestnut Avenue, Enid, Okla, U.S.A.
VP3MU	Via W2FKQ, 17 Jarvis Street, Binghampton, New York, USA.
VP5AR	Via WA8GUA, 18243 Riverside Drive, Birmingham, Mich. 48009, USA.
XZ2TZ	Via W4ECI.
6Y5FH	1½ Duke Street, Kingston, Jamaica.
W9WNV/8F3	Via W4ECI.
9X5CE	Box 272, Kigale, Ruanda.

QSL MANAGERS

Hammarlund	Box 7388, GPO, New York, NY 10001 USA.
W2CTN	156 Ketcham Avenue, Amityville, New York, 11701, USA.
W4ECI	3101 Fourth Avenue South, Birmingham, Ala. 35233, USA.
YASME	YASME Foundation, Box 2025, Castro Valley, Calif. USA.

ber, for those who have contributed $25.00 or more or to those who in the future make this $25.00 donation, Don and Chuck will QSL direct from on the spot location. In the next three phases, they will pay special attention to our supporters."

For those who wish to support this DXpedition, contributions, however small are welcome, be they in Dollars, IRC's or mint US stamps. Whether stations contribute or not, all QSLs will be answered in due course, but if you think that you owe something for the new ones provided then it is up to each individual to send what they will. Frequencies: **c.w.: 7005/010, 14,045/55, 21,045/55 kc/s; s.s.b.: 7070/100, 14,100/110, 21,400/410 kc/s.** All QSLs via W4ECI at the address given in QTH Corner. (G3HDA is not a subscriber but does contribute a small amount for each all time new one worked.)

Contests

The results of the **Tops C.W. Club's 1964 80m activity contest** show that the first three places were filled by OK1MG, OK1BY and OZ1LO respectively, with the top G (G3HZL) in the 22nd spot. This year's contest will take place from 12.00, December 18 until 12.00, December 19 on 80m c.w. only. Scoring: Contacts with stations in your own country count one point, contacts with stations in the same continent count two points and contacts with stations in other continents three points. Total score is arrived by multiplying total points with total number of different prefixes worked. Logs (post-marked not later than January 12, 1966) to G3IRM, 22 Hervey Road, Bury St. Edmunds, Suffolk.

The results of the 1965 ARRL DX competition shows the following scores by UK stations.

PHONE SECTION

Single Operator		*Multi Operator*	
G6RJ	**56,336**	**GB2DX**	**235,104**
G8FC	55,116	G3LDI	8,160
G2QT	41,940	G3TWV	3,825
G3CAZ	35,640		
		Wales	
		GW3NWV	**147,441**

C.W. SECTION

Single Operator			
G4CP	**259,700**	*Wales*	
G2DC	148,824	**GW3JI**	**162,333**
G2QT	118,800	GW3FSP	131,868
G2RO	92,928	*Northern Ireland*	
G3APN	19,032	**GI3OQR**	**290,730**
Scotland		GI3OTV	37,530
GM3HCZ	**4,400**		
Multi Operator			
G6VC	**229,680**	*Wales*	
G3SSO	96,449	**GW3ITZ**	**69,444**

This year's contest dates are: Phone—February 12 and 13, March 12 and 13. C.W.—February 26 and 27, March 26 and 27. The starting time in each instance is 24.00 GMT Friday, ending at 24.00 GMT Sunday. Phone and c.w. are separate contests. Multipliers are the following call areas: W1-W0, KH6, KL7, VO and VE1-VE8 (a maximum of 21 per band). Each completed QSO counts three points. Logs must contain calls, dates, times, bands, exchanges (report and power) and points. The W/VE station will send report and state/province. Logs may be obtained from ARRL, 225 Main Street, Newington, Conn. 06111, USA and entries must be postmarked by April 23, 1966.

CQ Log sheets and entry forms for their two world wide DX contests may be obtained by sending a large s.a.e. to G3HDA.

Finally, a reminder that the *RSGB 7 Mc/s C.W. Contest* takes place on November 6 and 7. Complete rules will be found on page 474 July BULLETIN.

W6FET operating VP2MN. See page 743.

Awards

The WAHM Award is available to any DX station who makes contact with five different members of the Hamfesters Club on any band using any mode. Applicants to submit to Hamfesters Radio Club, 6000 South Tripp Street, Chicago, Illinois 60629, USA, five confirmation slips (which will be attached to members QSLs) listing dates, bands and stations worked. A current list of club members may be obtained by sending an s.a.e. to the above address.

Three awards are available from the Finnish Amateur League which are as follows: (i) *OHA Award* for contacting 15 OH stations in five call areas. (ii) *OHA 100 Award* for contacting 100 OH stations in 10 call areas on any two bands. (iii) *OHA 300 Award* for contacting 300 OH stations in 10 call areas on any three bands. Phone, c.w. and mixed awards are available and applicants should send a GCR list with stations in district and alphabetical order showing full log data together with five IRC's to: SARL Awards Manager, Box 306, Helsinki, Finland.

Of interest to s.w.l.'s is the new *HAVK Award* issued by the Wireless Institute of Australia and available only to short wave listeners. Briefly the requirements are the same as for the worked all VK call areas award which were given in the September BULLETIN page 595. All QSLs submitted for this award must show date, time, type of emission and band used and sent to S.W.L. Awards Manager, GPO Box 2611W, Melbourne, Australia, and accompanied by a check list and sufficient return postage. RSGB members may send their claim for this certificate to the RSGB Certificates Manager, but sufficient return postage (Inland) for the cards and postage to forward the certified list to Australia must be enclosed.

DX Briefs

VK9WE now active on 14,035/40 kc/s at 05.30 to 08.00 daily and 12.00 to 13.00 at weekends. The correct QTH for QSLs will be found in *QTH Corner*.

DXpedition by VP2BN: November 12, **VP2KI** (two days); November 14, **VP2DI** (two days); November 17, **VP2VI** (four days). C.W. and s.s.b.

K1IMP and W1BPW will be active from St. Vincent on c.w. and s.s.b. one week from November 25.

Correspondents are thanked for their co-operation and acknowledgement is made to the *West Gulf DX Club Bulletin* (W5IEJ), *The LIDXA Bulletin* (W2FGD/W2MES), *DX'press* (PA0FX) and *The DX'er* (N. Californian DX Club). Please send all items to RSGB Headquarters to arrive not later than **November 11** for the **December** issue and **December 3** for the **January** issue.

QUA Associates

conducted by "JIX"

AFTER a fast run up the M1 motorway from London, Nottingham came into view. Then Sherwood passed by and we soon arrived at the small mining town of Ollerton. GB3RH was on the air, and after a QSO with this, the official symposium station, we drove onto the campus where the modern Residential Centre stands; built by the Nottingham Education Authority for such ventures as this. Straightaway the enthusiasm and hospitality of the folk of Nottingham set the atmosphere for the weekend and we were soon joining in as the programme of talks and events commenced. Magnus Grammar School Radio Club had erected aerial masts and much hard work had gone into the setting up of the station. A fine receiver, using an HRO type dial was on show built by Richard, one of the Magnus lads.

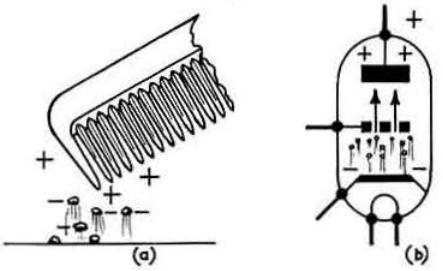

Fig 1. The electrostatic attraction that a rubbed comb will show, (a), is exactly the principle upon which a valve works, (b), or the motion of "holes" and electrons in transistors for that matter.

The purpose of this Symposium was to introduce Youth Leaders and others to amateur radio as an activity for young people and yours truly was delighted to represent "*QUA*. . . .", as it were, supported as I was, by the Roding Boys' Society. We have been talking about this kind of thing in these columns for a while now, and Newark Amateur Radio Society, affiliated as it is to the Youth Service, has our very best wishes and thanks for this pioneering effort. Obviously it will only be a matter of time before a conference is set up with similar aims in nearly every area.

In particular I accepted and enjoyed the keen enthusiasm, great friendliness and humour of the Mount School Radio Club members. These lads were so keen, it was a tonic for me, and I offer best wishes for the work at their Secondary Modern School in Newark. It looks as if I am going to have a busy time letter writing, with John, Smithy, Adrian, Tubby, Steve, Colin and Co. at the other end!

The whole programme was judged a success, including the inevitable junk sale at the end. So once again, cheers for Newark, and we look forward to GB3 Robin Hood on the air next year.

• • •

We now come to letter *E* in our series.

Electro, Electricity, Electron

Just like a dictionary of technical terms! But let us see if we can discuss these important *E* words, which are the names of the very bases of our subject, with a little more interest than the usual dictionary. There is one thing the dictionary usually states, however, and that is the fact that these words are derived from the Greek word *Elektron*, the word for Amber. Fashionable ladies in ancient Athens were apparently entertained by gentlemen briskly rubbing amber necklaces and showing the "power" they now possessed in that straw and hairs would jump up and cling to the amber. Boys do the same with their nylon combs and bits of paper. These are the first observations on electric charge and with the attraction and repulsion of charges, as with the amber, operate all our apparatus. Just consider the anode of a valve, or deflector plate in a c.r.t., they function just like the charged comb and scraps of paper. What is it that is attracted in these devices, not paper of course? It is the very particles of electricity itself, electrons. These are tiny negative charges, and when it was discovered that electricity was atomic in nature, then real progress in electronics began, right up to modern solid state linear r.f. amplifiers for s.s.b.

Energy

I have said so much about this inner "elementary physics" word, in other directions, that no more will be said here. (The trouble is, that you pour letters into my QTH with details all about your physics courses, exams, RAE courses, etc. . . . a lot of QRO stuff affecting my writing!) Anyway,

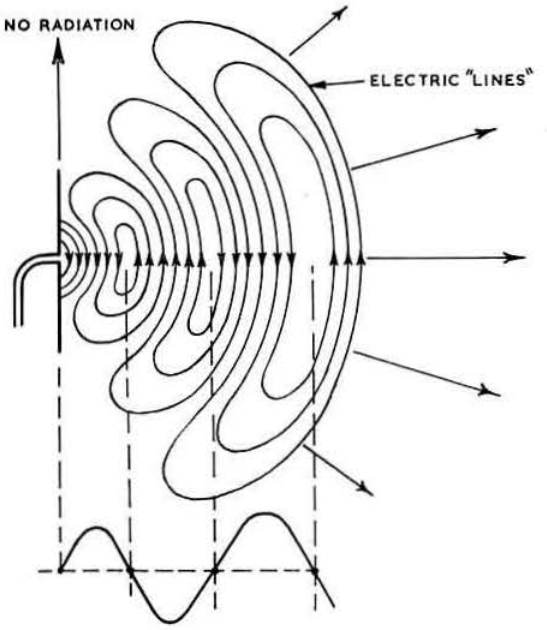

Fig. 2. Diagrammatic representation of the electric field radiated by a dipole aerial (one half). The accompanying magnetic field would be represented by circles going into the page, centred on the dipole. Notice the weaker and weaker field towards the ends; at the ends themselves no radiation occurs (in theory!).

* K. L. Smith, G3JIX, 82 Granville Road, Walthamstow, London, E.18.

I'll admit our hobby is an energetic one, and you would think that the amount of money we have to pay for this energy would create even more interest in it (and Joules to you).

Electromagnetic Waves

EM waves range from dozens of miles to a fraction of a millionth of an inch in length. That is, from long radio waves to gamma and cosmic rays. Whatever the wavelength, they all travel at exactly the same speed in empty space. This velocity is that of light, namely about 300,000,000 metres per second. EM waves are radiated by vibrating electric charge, such as electrons jumping inside atoms, or high frequency, alternating current in an aerial. If one vibration occurs in a second, the wave would be 300,000,000 metres long, if radiated (such a low frequency would hardly radiate a detectable wave, even if a long enough wire could be put up for an aerial). For a frequency of two cycles per second, two complete waves would " occupy " this length; that is, the wavelength would be 150,000,000 metres and so on. Thus 100,000 cycles per second (100 kc/s) would produce 100,000 waves in the length 300,000,000 metres. Each wave would be $\frac{3000}{1}$ = 3000 metres long. This enables us to work out the wavelength corresponding to any frequency. Wavelength = $\frac{300{,}000{,}000}{\text{frequency}}$, wavelength in metres, frequency in cycles per second.

Example: 1·9 Mc/s; $\frac{3000}{19}$ = 158 metres.

The waves progress as varying Electric Field Lines vibrating at right angles with a corresponding vibration of Magnetic Field Lines, and also to the direction of travel. Lines are the only way we can picture the invisible wave motion.

" A " Members' News

Peter Briggs, A4752, who lives at Southport Lancs., finds " *QUA* . . . " an interesting subject. It was good to hear from him for the first time, and let's hope the PCR receiver Pete uses carries on the good work. This PCR was modified to cover Top Band, and A4752 passes on the tip on how to do this simple mod. The oscillator trimmer for medium wave is unscrewed completely, then a piece of ferrite rod is inserted into the oscillator coil for this band, until 160m is obtained (no doubt by listening for Loran in the evening). While this is being carried out, the tuning capacitor should be nearly open.

Richard Hill, A4629, writes in to say that since joining the Society some five months ago, he has found membership offers many advantages. He uses a CR66 receiver with a preselector. Local activity seems pretty well developed in Stafford where Richard lives, and there are a few other " A " members who are friends.

Another first letter, this time from **John Steel, A4556,** of Appleby, Westmorland. John seems to be very busy with a number of constructional projects afoot. Also much school work apparently. John hopes to have a Club set up at school, and obviously wants a keen teacher to assist in this. You must know my views by now, and that is the desirability of trying to form a separate club, so widening the scope and increasing the challenge. Anyway, best of luck John.

Colin Pownall, A4827, was one of the boys I met at Ollerton. He writes about a component bridge that he hopes to build.

More " gen " from St. Helens, in the form of a communication from **Paul, A4034.** The first meeting of the St. Helens Club went off well, and Paul would particularly like to hear from any Associates around the area who are interested in joining the work with him and the local crowd. One new member is the son of a local amateur, whose aerial is less than 300 ft, from the school. Paul says, " At this range we can build a Top Band Xtal set and still be deafened! "

Thank you to the other " A " members who have written to me recently, I'll get round to dropping you a card (in my spare time, of course!). In the meantime, I can report a successful station was set up at the Hindleap Warren Camp under the call **GB3FED,** some overseas stations being worked. This London Federation of Boys' Clubs project went on the Pathe News circuit, and it was fun seeing the station on the cinema screen. Any more ideas from you about communal projects you would like to join in are welcome. Projects for next year (1966) ought to be discussed now.

So 73 to all readers, and good listening. JIX.

Bulletin Contributors and the Copyright Position

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Progressing through Amateur Radio

(Continued from page 733)

four has the holder for the neon stabilising unit. In each case the under side view is shown in Fig. 3. When the chassilets are placed in position on the side members, the feedthroughs mate up so that a simple link across completes the unit. The front panel contains the switches, indicator lamp and output sockets. Mains power is fed in via the terminal block on the rear support bar. Care must be taken to connect the correct polarity onto the tags of the electrolytic capacitor.

A pin connection plan has been adopted for the octal output sockets. Two 6·3 volts heater outputs are available, and by using the appropriate pins, 12·6 volts centre tapped is obtained. The unstabilised h.t. is taken to pin three and the 150 volts stabilised is available on pin 4.

Thus a whole range of supplies is available, and equipment can be plugged straight into the unit via plugs wired appropriately.

GB2RS SCHEDULE

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

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

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

CONTEST NEWS

— RESULTS — REPORTS — RULES —

Third 144 Mc/s Contest (Portable) 1965

The first 2m portable contest on May 2 produced another large entry of 52 portable stations and one mobile, supported by four check logs.

The overall winner was the Northampton Short Wave Radio Club, operating under the Club's own call G3GWB/P on a hilltop on the Isle of Wight; they receive a miniature cup for their efforts. A certificate of merit goes to the Midlands Contest Club operating as GW3RUF/P on the summit of Snowdon.

Equipment

By popular request this report deals with the equipment used rather than the vagaries of the weather and conditions. The last such report on a 144 Mc/s portable contest appeared in the November 1960 BULLETIN (page 239) and it is time the picture was brought up to date.

Within the 25 watt limit of the RSGB events the choice of transmitting valves is narrowing with the QQV03-20 dominating the field. Of the valve types used in 1960 the 6AK5 has dropped from four to nil, the QV04-7 from two to one, the 832 from 16 to three while the last 829B has gone. Conversely, of the more modern types, though the low power QQV02-6 stays at one on each occasion the QQV03-10 goes up from five to seven, the QQV03-20 from seven to 27 (if all varieties of this valve are lumped together) and the QQV06-40 goes up from three to six. There is also a general increase in power with a high proportion of stations running power near the 25 watt limit. This increase may be associated with more efficient transistorized power supplies and modulators allowing a higher proportion of the available battery power to be allocated to the r.f. equipment.

On the receiver side the following valves used in first r.f. stages in 1960 no longer appear in this critical position: 6BQ7, 6BZ7, 12AT7, ECC84, but the only 6AK5 is still with us. Valves now in use include E88CC, A2599, and A2521, all of which were coming into use in 1960 but the major changes are the introduction of the Nuvistors which appear in at

Position	Call-sign	Score	NGR	Ops.	Power (Watts)	P.A.	Rx R.F. stage	Aerial	Height (ft.)
1	G3GWB	14781	SZ-575876	M	25	3-20A		2 × 10 Yagis	
2	GW3RUF	14566	SH-609543	M	20	3-20A	E88CC	10 Yagi	22
3	G3KMT	14350	609768	M	10	3-20A	A2521	2 × 6 Yagis	
4	G3EGK	12895	SK-9864	M	24	6-40	Valve	4/4 Slot	
5	G4LU	12596	SJ-628081	M	23	3-10	A2599	5/5 Yagis	
6	G3PIA	12305	SU-338855	M	15	832		6/6 Yagis	45
7	G3OBD	11348	ST-815080	S	24	3-20	A2521	20 Stack	30
8	G3KMS	10649	SJ-03 60	S	20	3-20	6CW4	4/4 Slot	25
9	G3BJD	10646	NY-710322	M	20	3-20A	Nuvistor	6/6 Slot	
10	G3NJF	10448	TF-122944	S	24	6-40	6CW4	6/6 Slot	
11	GW3OXD	9303	SO-213637	M		3-20	6CW4	6/6 Slot	30
12	G5PI	8763	767058	M	22	3-20A		6 Yagi	
13	G3CGQ	8563	TL-960169	S	22	3-20	6CW4	6/6 Slot	
14	G3ORL	8442	TL-410045	M	25	3-20	GM0290	16 Stack	30
15	G3LEE	8228	301681	M	20	3-20		6/6 Slot	
16	G3FFV	8018	SE-821569	M	15	3-20A	Valve	4 Yagi	40
17	G3MDH	7886	930261	S	24	3-20	Transistor	5/5 Slot	
*	G3MAX	7593	SK-031689	S	25	3-20A	6AM4	8/8 Yagis	
18	G3OSC	7209	SP-848068	M	25	6-40	E88CC	6/6 Slot	
19	G2DJ	7049	SK-243554	M	18	3-10	6CW4	4/4 Slot	
20	G3FD	6968	51-017197	S	18	3-20	Transistor	5/5 Slot	
21	G3RXK	6842	SO-595868	M	15	3-10	6CW4	6/6 Slot	
22	G3NUE	6647	SP-329337	M	25	3-20	6DS4	10 Yagi	23
23	G3CHW	6629	773854	M	10	3-10	Transistor	8 Yagi	28
24	G3KUJ	6134		M	24	TT15	6CW4	6/6 Slot	35
25	G6UQ	5954	SJ-916594	M	24	3-20	AF102	5/5 Slot	
26	GW3ATZ	5891	253404	S	16	6-40	A2521	8/8 Slot	
27	G3JEQ	5562	892356	M	10	4-7	Transistor	5 Yagi	25
28	G2BLA	5386	SP-860973	M	10	3-10	Transistor	4/4 Slot	20
29	G3RAL	4798	SK-484104	S	25	832		8 Yagi	
30	G3JTW	4663	TL-782061	M	20	3-20	ECC85	4/4 Slot	
31	GM3FYB	4653	NO-486076	M	20	3-20	A2599	8/8 Slot	
32	G3FIJ	4407	TL-896312	M	25	3-20	6DS4	6/6 Slot	25
33	G5HZ	4350		M	12	5763		6/6 Slot	
*	G3GRS	3945		M	15			6/6 Slot	45
34	G3IAG	3928	52-463754	S	20	3-20		5 Yagi	30
35	G3EMU	3915	TR-197397	S	20	3-20	EC88	6/6 Slot	
36	G2CZM	3676	SP-933097	M	16	3-20A	Nuvistor	4/4 Slot	28
37	G3KPT	3639	SO-988760	S	0·2	2G110	2N1742	5 Yagi	
38	G3NEO	3580	SK-496846	S	25	6-40	6DS4	5/5 Yagis	
39	G2WS	3400	SP-4957	S	12	2-6	Transistor	5 Yagi	
40	G3GBU	3276	SK-400636	S	20			8 Yagi	
41	G2YU	3233	TG-914150	M	18	3-20	Transistor	16 Yagi	40
42	G3RHU	2974	372365	S	3	6J6	6CW4	5 Yagi	18
43	G3HQX	2906	490148	S	10	3-10	6CW4	4/4 Slot	
44	G3KQF/M	2004	617283	S	6	3B240M	6AK5	Halo	12
45	GM6XW	1718	NS-735810	S	25	6-40	Valve	8-8 Slot	
46	G3PUO	1682	34-638402	S	10	3-10		8 Yagi	
47	G3XC	1631	998576	M	25	3-20A	6CW4	13 Yagi	
48	GM3KYI	1399	NO-465455	S	25	3-20A	A2521	4/4 Slot	
49	G3JDM	1170	SJ-836026	S	15	832	6CW4	5 Yagi	
50	G2DHV	548	51-393563	S	15	3-20A	6CW4	7 Yagi	
51	G3SLJ	488	TL-555288	S	5	5763	6CW4	9 Yagi	12

* Late entries
M : Multi-operator. S: Single operator.
Transmitting valve numbers abbreviated: 4-7 is QV04-7, 2-6 is QQV02-6, 3-10 is QQV03-10, etc.
Heights are in feet a.g.l.
All entrants were portable except G3KQF/M.

least 18 receivers and transistors which are in use in at least 10 cases.

The new fashion in long Yagis is now becoming established: there are now 22 stations using Yagis of various kinds, and although it is not clear which of these are "long," a number of stations are using stacked Yagis as distinct from the slot fed pair. Even so, over half the entries use slot fed Yagis, mainly 6-over-6.

Operators

Finally, the number of operators has increased, in 1960 31 out of 40 entrants representing single operator stations. This year, over half of the entries were from multi-operator stations.

A rough check of the logs showed about 350 to 400 British stations on the band. G3KMT worked 118 of these compared with the score of 96 by G3ERD in 1960.

Check logs from G3EHR/M, G3SZS, GC2FZC and BRS26475 are acknowledged with gratitude.

Fourth 144 Mc/s Contest (Portable) 1965

The Fourth 144 Mc/s Contest which took place on July 4 will go down in history as a memorable occasion, when for a period of approximately two hours, contestants in the United Kingdom had the opportunity of contacting other national contestants in far away places via the mode of propagation known as sporadic *E*.

For the record, the following is an extract from entry logs received of contacts via this particular mode of propagation.

GW3BA/P: YU1EXY/P, YU3CW, YU2JH, YU1IOP.
G3NVJ/P: HG5KCC/P, HG6KVK, OE1XA/P/3, HG5KDQ/P, HG5KEB/P, OE3EC.
G3XC/P: OE1LHW, OE1HZ, HG5KEB/P, OE3EC, OE1XA/P/3, HG5KCC/P.
G3ENY/P: YU1NDL, YU3OV/P.
GW3RXK/P: YU3OV.
G3KMS/P: YU2JH.
GW3RUF/P: YU1NDL.
GM3LAV/P: IIAIM, IIDAN.

Congratulations to GW3BA/P, near Aberdovey, on attaining the leading position in the contest and likewise to the two West Country stations, G3NVJ/P Redruth and G3XC/P near Newquay in their positions as second and third respectively. There is no doubt that this short sporadic *E* opening had a considerable influence on the final placings and is a state of affairs which the Contests Committee feels is an opportunity for all stations to take advantage of in the same way as if there had been good extended tropo conditions. Apart from this diversion the general opinion is that fairly good normal propagation prevailed, and in this contest GW3BA/P worked G2JF near Ashford at 247 miles and G3TDR/P at 220 miles.

G3NVJ/P worked G3JZW/P at 228 miles, G3XC/P worked G5IG Leek at 226 miles, G3UHF/P near Buxton worked GM6XW/P near Stirling at 225 miles and GM3FYB/P Kinross at 230 miles and G3FRV/P worked G3KMS/P Bolton at 205 miles.

Posn.	Call-sign	Location	Input (watts)	Aerial	Contacts	Points
1	GW3BA/P	Nr. Aberdovey	23	10 ele	69	16,188
2	G3NVJ/P	Redruth	25	6/6	28	14,442
3	G3XC/P	Nr. Newquay	25	16 ele co-lin	25	13,872
4	GW3OXD/P	Nr. New Radnor	20	6/6	92	11,697
5	G3MDH/P	Nr. Shaftesbury	25	6/6	71	11,173
6	G3UHF/P	Nr. Buxton	25	4/4	86	10,576
7	G3ENY/P	Nr. Bridgnorth	24	16 ele co-lin	67	9,503
8	G2HIF/P	Nr. Wantage	15	—	92	9,259
9	G3FRV/P	Nr. Bognor Regis	25	6/6	86	9,197
10	G3ODB/P	Poole	24	20 ele co-lin	65	9,076
11	GW3RXK/P	Nr. Oswestry	15	6/6	62	8,373
12	G3KMS/P	Macclesfield	15	4/4	67	7,658
13	G3NJF/P	Claxby	24	6/6	52	7,191
14	GW3RUF/P	Nr. Corwen	25	10 ele	61	7.157
15	G3ERD/P	Nr. Derby	18	8 ele	64	6,540
16	G5IG/P	Nr. Matlock	20	5/5	54	6,111
17	G3GWB/P	Northampton	25	10 ele	61	5,963
18	G3TQZ	Nr. Evesham	25	6/6	60	5,912
19	G3NOH/P	Nr. Aylesbury	18	4/4	65	5,726
20	G3OSC/P	Nr. Aylesbury	20	6/6	57	5,446
21	G3PMH/P	Nr. Royston	25	5 ele	59	5,363
22	G3KMT/P	Nr. Ludlow	0.5	8 ele	47	4,656
23	G3CGQ/P	Nr. Tring	20	6/6		4,276
24	G2BLA/P	Nr. Hitchin	10	4/4	49	4,245
25	G3FD/P	Nr. Dunstable	16	8 ele	50	3,697
26	G2DSP/P	Nr. Worthing	5	5 ele	44	2,803
27	GM3LAV/P	Nr. Lauder, Berwick	18	4/4	13	2,756
28	G3PUO/P	Nr. Blackburn	10	8 ele	34	2,700
29	G3CZH/P	Nr. Banstead	10	8 ele	54	2,397
30	G3THH/P	Nr. Leek	10	4 ele	24	2.015
31	G3NPO/P	Nr. Leeds	12	5 ele	26	1,881
32	GM3FYB/P	Kinross	15	6/6	20	1,874
33	G3GKF/P	Kenley Common	20	6 ele	46	1,823
34	G3AZT/P	Nr. Chipping Norton	0·150	8 ele	21	1,747
35	GM6XW/P	Nr. Stirling	25	8/8	25	1,719
36	G3GBU/P	Stoke	20	4 ele	20	1,553
37	G3JDM/P	Nr. Gailey Staffs.	15	5 ele	17	1,292

Comments

G3MDH/P reports an enjoyable time operating single handed and G3OSC/P who had a late start comments adversely on stations operating more than one receiver during the contest.

G2BLA/P reports a visit from Hungarian amateurs to their site; they arrived at the time of the sporadic *E* opening! Comments and check logs are received with thanks from BRS15744, A3768, A3942, G4JJ/P, BRS24733, G2WS, GD2CZM/P, G8TR and G3SIV.

Second 70 Mc/s Contest (Open) 1965

This event, held on May 15/16 produced the record entry of 50. The winning station this year was GW3RUF/P, the well known call sign of the Midlands Contest Club, operated by G3KXA and G3UAW. Their score of 10,166 points was achieved by working 106 stations producing an average of about 100 points per contact; an excellent score indeed. GW3RUF/P will therefore receive the V.H.F. Manager's Trophy for 1965.

The second place this year was filled by G3PIA/P, the call-sign

Call-sign	Posn. (Sec A)	Posn. (Sec B)	Points	Contacts	Power input	Location
GW3RUF/P		1	10166	106	25	Monmouth
G3PIA/P		2	9317	126	15	Berks
G3FDW/P		3	8124	76	15	Cumberland
G3HM/A	1		6865	116	15	Sussex
GW3AHD/P		4	6320	84	15	Denbighshire
G3SKR	2		6306	140	50	Middlesex
G3MEH	3		6199	130	50	Surrey
GI3CDF/P		5	5899	78	20	Armagh
*G3OJE/P		6	4934	104	25	Bucks
GI3HXV/P		7	4532	57	30	Belfast
G3MHW	4		4415	124	45	Berks
G3IMV	5		4227	77	50	Bucks
GC3OBM	6		3484	25	40	Guernsey
G3NJF/P		8	3380	35	20	Lincs
G2AUD	7		3301	62	40	Bucks
G3NEO	8		3295	38	50	Yorks
G3RIK/P		9	3206	57	10	Lancs
G3KUJ/P		10	3138	40	20	Somerset
G2DSP/P		11	3009	70	8	Sussex
G3OWA	9		2961	73	15	Surrey
G3OHH	10		2655	48	50	Cheshire
G3TRY	11		2625	73	15	Bucks
G2AIH/P		12	2605	46	8	Glas.
G3EKP	12		2527	43	22	Lancs
G3RMN	13		2514	80	50	Surrey
G2BHW/P		13	2457	26	25	Cornwall
G3SUV	14		2391	47	20	Essex
G3RCV		14	2271	81	25	Kent
G3KCJ	15		2188	63	12	Beds
G2AXI	16		2005	43	20	Hants
G3TXB		15	1990	56	15	Middlesex
G2BJY	17		1964	35	30	Staffs
GM3EGW	18		1799	15	25	Fife
G3FIJ	19		1794	26	25	Essex
G3RDQ	20		1453	48	35	Surrey
G3JMY/P		16	1450	25	12	Glous
G2SPY/P		17	1447	29	15	Warwick
G3PGT	21		1421	48	5	Surrey
G3PUO/P		18	1419	31	10	Lancs
G3SLG	22		1396	29	25	Warwick
G3AYC		19	1345	41	35	London
GI3LLQ/P		20	1157	41	4	Co. Antrim
G3GGL	23		973	21	21	Worcs
G2BRR/P		21	865	18	10	Wilts
G3TOT	24		793	30	15	Herts
GI3RXV	25		740	23	5	Co. Londonderry
G3RWM/P		22	670	19	4	Lancs
G3LJW/P		23	445	14	10	Warks
G3JDM/P		24	406	14	15	Staffs
G2DHV	26		357	23	15W	Kent

* Member of the V.H.F. Contests Committee

of the AERE (Harwell) group with the score of 9317 points. The winning home station entrant was D. Hunter, G3JHM/A, who worked 116 stations for a total of 6865 points. The second home station was G2SKR of Wembley, Middx., who achieved the longest distance QSO of the contest with GI3HXV/P at 314 miles. Other long distance contacts include a QSO between GI3CDF/P and G3PIA/P at 276 miles. The latter station also worked GI3HXV/P 268 miles.

Comments

Most stations found conditions fair with a lift in conditions to the West and South West producing workable signal strengths in London from such stations as GC3OBM and GW3RUF/P. GI3CDF/P worked no less than 46 other GI stations to help build up his score, and also mentions the lack of c.w. stations on the band. GC3OBM was troubled with TVI which caused him to close down at 09.00; a fine score for only seven hours of operating.

70 Mc/s Listeners' Contest 1965

The Committee judged the winning listener's log to be that which was submitted by R. A. Ham, BRS15744, Storrington, Sussex, with the score of 1740 points, with a total entry of 84 stations in 18 counties. The certificate for second place goes to Michael Shaw, A3973 whose score was 1595 points.

The Committee thanks the following for very useful check logs: BRS15744, A3973, A4048, A4242, G2WS, G3PMJ, G6XA/P, GI3HCG, GI3HCG/M, and GI3ALT.

Third 70 Mc/s Contest (Portable) 1965

Although the first event of its kind on 4m it produced an encouraging number of entries totalling 36. Seven of the entries were from outside England; and from logs received it is known that there were at least 40 GI stations on the band during the contest, of these there were 10 signing portable.

The winning station, GW3OXD/P, was operated by G3PXZ, G3NZS, G3TGL, achieving 23 contacts at distances exceeding 100 miles, to help boost their score up to 7887 points. In second place is G3FDW/P operating from his excellent site in Cumberland, and logging 13 of his contacts to be over 100 miles with a final score of 7574 points.

Amongst the long distance contacts of the contest were the following three: G3EFX/P to G3SKR, Middlesex, at 230 miles. G3EFX/P to G3KMS/P at 213 miles and GM3FYB to G3LLE/P (212 miles).

Call-sign	Posn.	Points	Contacts	Power (Watts)	Location
GW3OXD/P	1	7887	61	25	Radnor
G3FDW/P	2	7574	56	16	Cumbs
GI3CDF/P	3	7014	53	25	Co. Armagh
G3AYT/P	*	6964	75	28	Staffs
G3EFX/P	4	6257	84	20	Sussex
G3PAI/P	*	6201	55	20	Berks
G3BXS/P	5	5942	78	12	Oxon
GW3RUF/P	6	5749	59	25	Merioneth
G3KMS/P	7	5378	65	15	Lancs
G3OJE/P	8	5363	74	20	Bucks
G2VB/P	9	5344	74	40	Surrey
G3JEQ/P	10	5253	90	10	Surrey
GW3RWM/P	11	5126	59	14	Denbigh
G3NJF/P	12	4920	32	20	Lincs
G3NKS/P	13	4896	66	50	Sussex
G3RIK/P	14	4756	49	10	Lancs
G3NUE/P	15	4736	41	25	Worcs
G3TLA/P	16	4499	48	11	Hants
G3PUO/P	17	4139	47	10	Lancs
G3FD/P	18	3522	50	16	Beds
G3RCV/P	19	3519	77	24	London
GW3UED/P	20	3475	43	13	Denbigh
G3RXJ/P	21	3248	48	12	Sussex
G3NJN/P	22	3209	42	7	Lancs
GM3FYB/P	23	3143	22	12	Kinross
G3MFB/P	24	2966	59	20	Surrey
G5UM/P	25	2656	52	10	Herts
G3GGL/P	26	2392	22	10	Shrops
G3ERO/P	27	2368	44	10	Herts
GI3ONZ/P	28	2332	30	5	Co. Londonderry
G2AVC/P	29	1856	16	10	Wilts
G2DSP/P	30	1771	38	8	Sussex
G3ABM/P	31	988	18		Cheshire
G3HJG/P	32	864	13	8	Lancs
G2WS/P	33	768	10	9	Worcs
G3JKY	34	442	11	10	Surrey

* Rule 8(a)

Equipment

The standard 4 element Yagi was once again put to good use by 90 per cent of the entrants, one of the exceptions to this was that which was used by G3JKY/P who described his aerial as a "dangling dipole."

A wide range of transmitter powers was used, but only one station used the maximum power permitted for the contest.

The Nuvistor type r.f. stage was once again the most popular "front end" with five entrants using fully transistorized receivers.

Comments

As mentioned above conditions for the contest were not good, with only eight contacts by contestants of over 200 miles. This the committee hope will be able to be improved on during V.H.F. NFD in September. G3EFX/P found few stations to work during the last three hours after working 50 in the first three hours this situation was also found by many other stations in the South of England. A number of stations comment on the lack of c.w. activity during the contest even though poor conditions prevailed. However, all stations enjoyed the contest and this, together with the number of entrants, made the results very encouraging.

The V.H.F. Contests Committee would like to express their thanks to the following for sending in useful check logs: G6XA/P G3TBS, BRS15744.

Fourth 70 Mc/s Contest (C.W.) 1965

An error occurred in Rule 5 on page 690 in the October BULLETIN. Rule 5 should have read "Contacts may be made on A1 only".

CONTESTS DIARY

October 30-31	- VU2/4S7 Contest (C.W.)
November 6-7	- 7 Mc/s DX Contest (C.W.) (see page 474, July 1965).
November 6-7	- VU2/4S7 Contest (Phone).
November 13-14	- Second 432 Mc/s Contest (see page 543, August 1965)
November 20-21	- Second 1·8 Mc/s Contest.
November 28-29	- CQ World Wide Contest (C.W.) (see page 650, October, 1965).
December 5	- Fourth 70 Mc/s Contest (C.W.). (see page 690, October, 1965).

1966

January 15-16	—Affiliated Societies' Contest (see page 679, October, 1965)
January 30	—First 144 Mc/s (C.W.) Contest
February 13	—First 70 Mc/s (Open) Contest
February 19-20	—First 1·8 Mc/s Contest
March 5-6	—Second 144 Mc/s (Open) and 144 Mc/s Listeners' Contests*
March 19-20	—BERU (see page 609)
April 3	—Low Power Contest
April 16-17	—Second 70 Mc/s (Open) and 70 Mc/s Listeners' Contests*
April 24	—D/F Qualifying Event
May 8	—Third 144 Mc/s (Portable) Contest*
May 22	—D/F Qualifying Event
May 28-29	—First 420 Mc/s (Open) Contests*
May 29	—1296 Mc/s Contest
June 4-5	—National Field Day
June 19	—D/F Qualifying Event
July 3	—Fourth 144 Mc/s (Portable) Contest*†
July 9-10	—1·8 Mc/s Summer Contest
July 17	—D/F Qualifying Event
July 24	—Third 70 Mc/s (Portable) Contest†
July 31	—D/F Qualifying Event
September 3-4	—V.H.F. NFD*†
September 11	—80 Metre Field Day
September 18	—D/F Final
September 24-25	—21-28 Mc/s Phone Contest
October 15-16	—Second 420 Mc/s Contest*†
October 29-30	—7Mc/s DX (Phone) Contest
November 12-13	—7 Mc/s DX (C.W.) Contest
November 19-20	—Second Top Band Contest
December 4	—Fourth 70 Mc/s (C.W.) Contest*†

* Qualifying contests for V.H.F./U.H.F. Listeners' Championship
† Dates subject to revision

CLUBROOM

A Monthly Survey of Group and Club Activities

For further information on membership or the activities of a particular club, application should be made to the person whose Call Sign is indicated at the end of the item. Full addresses may be obtained from a Call Book.

Basingstoke ARC will be holding its next meeting on November 13 when there will be a talk and practical demonstration of receiver alignment. Interested visitors will be very welcome. *G3CBU.*

Bristol ARC established a station at the local Trade Radio Exhibition which ran for a period of two weeks from October 5. At a previous meeting, when 42 members and visitors were present, Mr Green of Green Electronics lectured on his equipment.

Clifton ARS has now elected its new committee for 1965/66. A Club Net has been started on Top Band, and this takes place each Sunday at 10.00 Z. *G3JKY.*

Cornish ARC is holding future meetings of the v.h.f. group on the third Friday in each month. In the issue of *Cornish Link* under review, the Chairman, G3OCB, makes some sound comments on the layout of a transmitting station. *G3OCB.*

Coventry ARS recently paid a visit to the Coventry Telephone Exchange and members were able to see the complex STD equipment in operation. The society is particularly pleased that its President, G2LU has been awarded the ROTAB Trophy this year. *G3UOL.*

Crawley ARC has a number of members busily engaged in preparations for the Seymour Hall Exhibition. At the November meeting, G3LTF will be lecturing on "Moon-bounce." *G3FRV.*

G3NOO/A, the talk-in station at the Bristol RSGB Group's mobile rally at Longleat.

Cray Valley RS is holding a Dinner Dance at the Bulls Head, Chislehurst, on November 19. Latest date to apply for tickets (25s. each) is November 6. A really good time is promised for all—so—if you haven't got your ticket yet, and don't want to miss the fun, write off now to G3TCC.

Crystal Palace and District RC reports that they had a good time during the V.H.F. NFD. The 4m station ran 25 watts, but on 2m the station ran only 3 watts, but despite this very low power they worked into Gloucestershire. *G3FZL.*

Derby and District ARS is continuing to hold meetings weekly. Recently a "Components Quiz" was held, points being awarded for naming the item, and for specifying its use. This event aroused considerable interest and is to be repeated shortly. *G2CVV.*

Ealing and District ARS has moved to a permanent QTH. The club meets every Tuesday at 7.30 in the Northfields Community Centre, Northcroft Road, Ealing, W.13. The club will soon be active on all bands from 160m to 2m. Visitors and prospective members will be most welcome. *G3SGT.*

East Worcs ARS enjoys the support of the local paper which regularly publishes reports of its meetings. At the November meeting G2RO will be talking about Pacific DX. *G3HZG.*

Echelford ARS has come up with a smart idea. This is for members to bring their *outward* going QSL cards along to each meeting. Trojan G3SZG will collect, sort and despatch the cards collected to the RSGB QSL Bureau on the last day of each month. With such a system cards will flow more freely and not be kept hanging about. *G3RHF.*

First Class Operator's Club now has a membership of some 400 licencees throughout the world, but despite this, feels that there is room for a much higher level of activity. *G3JLB.*

Liverpool & District ARS has a very full programme for November, with meetings taking place on the 2nd, 9th, 16th, 23rd and 30th. Of especial interest to habitual collectors will be the Junk Sale on November 9—so don't miss this one. *G3PDC.*

Loughborough ARC is holding an equipment sale on November 19, and a film show on the 26th. Preceding meetings will be on November 5 and 12. *G3IPL.*

Magnus Grammar School RS says that the Ollerton Symposium on Amateur Radio was both instructive and enjoyable, and that their efforts in setting up a special station were well worthwhile. The station was operational throughout the symposium except for the period of the model aircraft display. *G3JNK.*

Manchester & District ARS ran a Jamboree Station under the call GB3SBS for the Salford Boy Scouts, and we think that they are to be congratulated for their efforts. November meetings will be on Wednesdays as usual.

Midland ARS has its November meetings planned for the 16th, but for those who haven't heard, the Society now meets at the Library in Margaret Street. To MARS goes this month's prize for reporting choice comments heard on the air—"Who said that inserted carrier gives a much better s.s.b. signal?" *G3JDL.*

NARC Challenge contains articles to its usual excellent standard, with one particularly enthralling and rib-tickling exposé on NFD. On a serious note, the well written Editorial

headed " Hobby or Obsession? " contains many truths and points for thought. *G3TLC.*

Northern Heights ARS is meeting on November 10 and 24. The former meeting will be devoted to tape recorders, and the latter to Electronic Logic. *G3MDW.*

Plymouth RC has six entrants for the last RAE all of whom passed. Tnree now have their calls while the others are almost ready for the Morse test. Starting on October 12, film shows are to be screened every second Tuesday throughout the Winter session. *G3UKI.*

RAEN report that as at August 25, 1965, registered members totalled 390, and that shortly a second edition of the Manual would be printed. *G3ION.*

Reigate ATS. Sixteen members spent the weekend under canvas on Willingdon Hill, Eastbourne during the V.H.F. NFD. On October 16 the club was addressed by Mr. S. W. Smith of the London Telecommunications Region. *G3NKT.*

Roding Boys Society is hard at it preparing for the forthcoming Exhibition for which they hope to have some items of interest. *G3TAJ.*

Saltash & District ARC will be holding its AGM on November 5, and is looking for a full house of members. On the 19th there is a Film and Supper Night to which XYLs and YLs are invited. One of the films to be shown is Mullards " Mirror in the Sky."

Scarborough ARS is busy improving the facilities in the clubroom, and for which a new operating console has been donated. Five members achieved success in the recent RAE, three of whom now hold G3 licences. A very full programme has been arranged for November. *G3RIX.*

Slade RS will be having a Film Show on November 12, while on November 26 the AGM will take place.

Spen Valley ARS will be holding two meetings in November, the first on the 11th will be a talk by Mr. C. Green of Green Electronics on Commercial Equipment, while on 25th, the Leeds Model Boat Club will be demonstrating Model Control.

Surrey Radio Contact Club. It seems we are in hot water over last month's paragraph. The plea in the *Newsletter* for more support apparently did not mean that attendance was declining; it was simply to try to encourage those members who are rarely seen at the Blacksmith's Arms, South Croydon.

Verulum ARC is venturing into the realms of a Grand Natter Nite on November 17, to satisfy those who say that the Club's programme is usually so full that they don't even get a chance to check up on who is sitting next to them! *G3PAO.*

West Kent ARS will be investigating the possibility of a club constructional project on November 5—which seems a better day than most to have the fireworks preceding the decision. On November 19, a Junk Sale is being held, while looking well ahead, a Film Snow has been arranged for December 3. *G6SSE/T.*

Worcestershire and District ARC cleared the hurdle of the AGM in September, and is now settling down to the winter programme. Visitors and prospective members are always welcome. *G8JC.*

HELP US TO HELP YOU

This feature can materially assist your membership, and when sending contributions the general rule should be to provide too much information rather than too little. In addition, due to pressure on space, as it is not possible to print the full name and address of club secretaries, will you please ensure that a call-sign is included to whom interested persons can apply. Without such a call-sign the club item can lose a great deal of its potential value.

Deadline for the **December** issue is **November 5.**
Deadline for the **January** issue will be **December 3.**

LONDON MEMBERS' LUNCHEON CLUB

CHRISTMAS DINNER

FRIDAY, DECEMBER 10

6 p.m. for 7 p.m.

KINGSLEY HOTEL

BOOK THIS DATE

Can You Help?

- D. Farman, G3TWZ, 6 Ash Grove, Bush Hill Park, Enfield, Middlesex, who wishes to buy or borrow a copy of the Handbook for the RCA AR77E, or alternatively just the circuit diagram?
- E. Haycock, BRS26377, who wishes to purchase or borrow manuals for Marconi R220 Receiver, Test Oscillator AN/PRM-10, and V.H.F. Transmitter Type T11-B?
- G. E. Beesley, A4574, 36 Beckett Road, Worcester, who wishes to purchase or borrow the manual for the Air Ministry receiver R1155A, Ref. No. 100/820, serial No. 9877?
- J. B. Armstrong, GW3EJR, 32 Hillford Place, Parcllyn, Cardigan, West Wales, who requires information on theAmerican Surplus receiver CRV46151, as he wishes to modify it for a disabled s.w.l.?
- R. W. Buckley, BRS26994, Highfield, Beech Hall Drive, Tytherington, Macclesfield, Cheshire who requires information on the Indicator Unit type 103 Ref No. 10Q/16208 which is part of the Monitoring Unit type 101?

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 cannot be accepted.

REGION 1

Ainsdale (ARS).—November 10 (Audio Oscillators), November 24 (Crystal Calibrators), 8 p.m., 77 Clifton Road, Southport.

Blackburn.—Fridays, 8 p.m., West View Hotel, Revidge Road.

Blackpool (B&FARS).—November 1 (Open Evening), November 8 ("Town Planning, etc. on Masts and Towers," by H. Fenton, G8GG), November 15 ("Multivibrators," by L. Lee, G3MCE), November 22 (Constructors' Competition), November 29 (Tape Lecture "Tape Recording," by F. C. Judd), 8 p.m., Pontins Holiday Camp, Squires Gate. Morse Tuition from 7.30 p.m.

Bury (B&RRS).—November 9 ("Commercial Measuring Instruments," by G3NXX of Solartron Instruments Ltd.), 8 p.m., Old Boars Head, Crompton Street (private room).

Chester.—Tuesdays, 8 p.m., YMCA, except first Tuesday in each month.

Crewe & District.—November 1, December 6, 8 p.m., Earl of Crewe Hotel, Nantwich Road.

Eccles (E&DAC).—Tuesdays, 8 p.m., Patricroft Congregational Schools, Shakespeare Crescent, Patricroft, Eccles. Every Thursday, Club Top Band net at 20.30 hours.

Liverpool (L&DARS).—Tuesdays, 8 p.m., Conservative Association Rooms, Church Road, Wavertree.

Macclesfield.—November 9, 23, December 7, The George Hotel, Jordongate.

Manchester (M&DARS).—Wednesdays, 7.30 p.m., 203 Droylsden Road, Newton Heath, Manchester 10.

(SMRC).—Fridays, 7.45 p.m., Rackhouse Community Centre, Daine Avenue, Northenden.

Morecambe.—November 3, December 1, 125 Regent Road.

Preston.—November 9 (Night on the Air), November 23, (All meetings start with a Morse practice at 7.30 p.m.), St. Paul's School, Pole Street.

Southport (SRS).—Wednesdays, 8.30 p.m., Sea Cadets Camp, The Esplanade.

Stockport.—November 3, 17, December 1, The Blossoms Hotel, Buxton Road, Stockport.

Wirral.—November 3, 17, December 1, Harding House, Park Road, West Claughton, Birkenhead.

REGION 2

Bradford.—November 10 (Mullard Film Show at Queen's Hall, Bradford), November 17 (Junk Sale).

Catterick.—Every Tuesday and Thursday, 7.30 p.m., Clubroom, Vimy Road.

Durham.—Alternate Thursdays, Vane Tempest Community Centre, Gilesgate.

Northern Heights.—November 10 ("Tape Recorders," by Mr. F. Thistlethwaite) November 16 (Mullard Film Show, Bradford), November 24 ("Electronic Logic," by Mr. G. E. Craven), 8 p.m., Sportsman Inn, Ogden.

Scarborough.—Thursdays, 7.30 p.m., rear of 3 Trinity Road.

Spen Valley.—November 4, 18 ("Transmitter Design"), November 11 ("Commercial Equipment," by Mr. Green), November 25 ("Model Control," by Leeds Model Boat Club), 7.30 p.m., Heckmondwike Grammar School.

REGION 3

Birmingham (Slade).—November 12 (Film Show), November 26 (AGM), 7.30 p.m., The Church House, Erdington.

(South).—November 18, 7.30 p.m., Friends Meeting House, Moseley Road, Birmingham.

Cannock (CCARS).—November 4, 18, 8 p.m., The Bridgtown Social Club, Walsall Road, Cannock.

Coventry (CARS).—Mondays, 8 p.m., TA Centre, Westfield Road, Coventry.

Dudley (DARS).—Fridays, 8 p.m., Art Gallery, Dudley.

Redditch (EWARG).—November 11, 8 p.m., Redditch Old People's Centre, Park Road, Redditch.

Mid Warwickshire (MWARS).—Fridays, 7.30 p.m., 7 Regent Grove, Leamington Spa.

Salop (SARS).—November 11, 7.30 p.m., Morris Hall, Bellstone, Shrewsbury.

Stratford-upon-Avon (S-u-AARS).—Fridays, 7.30 p.m., Masons Arms, Sanctus Road, Stratford-upon-Avon.

Stourbridge & District (S&DARS).—November 2 ("Home Constructed Electro-cardiographs," by Dr. Alan Parkes), 7.45 p.m., Foley College, Stourbridge.

Wolverhampton (WARS).—Mondays, 8 p.m., Neachells Cottage, Stockwell Road, Tettenhall.

REGION 4

Burton-on-Trent (B-o-TARS).—November 24 (Annual Dinner, Midland Hotel), Wednesdays, 7.30 p.m., Club Rooms, Stapenhill Institute, Burton-on-Trent.

Derby (D&ARS).—November 3 (Surplus sale), November 10 ("Technical Topics," by R. E. F. Street), November 17 (Film Show), November 24 (Open Evening), November 26 (Region 4 Lecture, "Colour Television," Technical College Lecture Theatre), December 1 (Surplus Sale), 7.30 p.m., Room 4, 119 Green Lane, Derby.

Heanor (H&DARS).—November 2 (Surplus Sale), November 9 ("A simple S.S.B. Transmitter," by R. Harrod, G3RWN), November 16 (Film Show), November 23 ("A Transistor Inverter," by B. Sandall, G3LGK), November 30 (Transmitting Evening), 7.30 p.m., Room 5, Heanor Technical College, Ilkeston Road, Heanor, Derbyshire.

Leicester (LRS).—Mondays, 7.30 p.m., Sundays, 10.30 a.m., Club Room, Old Hall Farm, Braunstone Lane, Leicester.

Loughborough (ARS).—November 5 (Open Evening), November 12 (Transmitting Evening), November 19 (Equipment Sale), November 26 (Film Night), 7.30 p.m., Club Room, Bleach Yard, Wards End, Loughborough.

Melton Mowbray (ARS).—November 18, 7.30 p.m., St. John Ambulance Hall, Asfordby Hill, Melton Mowbray.

Newark (Magnus GS).—3.50 p.m., Junior Physics Lab, Magnus Grammar School, Newark.

Peterborough (P&DARS).—Fridays, 8 p.m., The Old Windmill Clubhouse, London Road, Peterborough.

Nottingham (ARCN).—Tuesdays, Thursdays, Room 3, Sherwood Community Centre, Woodthorpe House, Mansfield Road, Nottingham.

Worksop (NNARS).—Tuesdays (RAE Class), Thursdays (Lecture Night), 7.30 p.m., Club Room, 13 Gateford Road, Worksop.

REGION 5

Bedford (B&DARC).—November 9 ("Two Metres," F. A. E. Porter, G2CDX), November 25, Westfield School, Queens Park, Bedford.

Cambridge (C&DARC).—November 5 (No meeting), November 12 ("Rx Consideration"), November 19 (Activity Evening), November 26 ("Youth to the Fore"—an evening for the younger members), 7.30 p.m., Club Headquarters, Corporation Yard, Victoria Road, Cambridge.

Cambridge University (CUWS).—Tuesdays, 8.15 p.m., Psychology Department, Downing Site, during University Term. Freshmen welcome.

Luton (L&DARS).—Tuesdays, 8 p.m., ATC Headquarters, Crescent Road, Luton, Bedfordshire.

Royston (R&DARC).—Wednesdays, 8 p.m., Manor House Social Club, Melbourn Street, Royston, Herts.

Shefford (S&DARS).—Thursdays, 8 p.m. (Morse Classes, 7.45 p.m.), Church Hall, High Street, Shefford, Beds.

REGION 6

Cheltenham.—First Thursday in each month, 8 p.m., Great Western Hotel, Clarence Street, Cheltenham.

REGION 7

Acton, Brentford & Chiswick (ABCRC).—November 16 ("The Individuals Approach to Radio," Discussion), 7.30 p.m., at AEU Club, 66 High Road, Chiswick.

Ashford (Middx.) Echelford ARS.—November 11, 25, 7.30 p.m., Links Hotel, Ashford.

Bexley Heath (NKRS).—November 11, 25, 7.30 p.m., Congregational Hall, Chapel Road, Bexley Heath.

Chingford (Group).—November 19, Telephone the Secretary, Loughton 2397.

(SRC).—Fridays (except first), 8 p.m., Friday Hill House, Simmons Lane.

Croydon (SRCC).—November 9, 7.30 p.m., Blacksmiths Arms, South End.

Dorking (D&DRS).—November 9 (Informal Meeting), Wheatsheaf, Dorking. November 23 ("Slow Scan Television," by A. Griffiths, G3MED), 8 p.m., Star & Garter, Dorking.

Ealing.—Every Tuesday, 7.30 p.m., Northfields Community Centre, Northcroft Road, Ealing, W.13.

East Ham.—Tuesdays fortnightly, 7.30 p.m., 12 Leigh High Road, East Ham. December 14 (Christmas Dinner).

East London Group.—November 21 ("Air Traffic Control and Navigation with slides and recordings," by J. C. Graham, G3TR), 3 p.m. Lambourne Rooms, Ilford.

East Molesey (TVARTS).—First Wednesday each month, Prince of Wales, Bridge Road, East Molesey.

Edgware & Hendon (EADRS).—November 8, 22, 8 p.m., John Keble Hall, Church Close, Deans Lane, Edgware.

Enfield.—November 16, 8 p.m., George Spicer School, Southbury Road.

Gravesend (GRS).—November 17, 7.30 p.m., RAFTA Club, 17 Overcliffe Road.

Guildford (G&DRS).—November 12, 26, 8 p.m., Guildford Model Engineering Society in Stoke Park.

Harlow (DRS).—Tuesdays and Thursdays, 7.30 p.m., Mark Hall Barn, First Avenue.

Harrow (RSH).—November 5 (Practical), November 12 (Film Show), November 19 (Practical Night), November 26 ("S.S.B. Transmitter"), 8 p.m., Roxeth Manor County School, Eastcote Lane, Harrow.

Holloway (GRS).—Mondays and Wednesdays (7 p.m., RAE and Morse), Fridays (7.30 p.m. Club), Montem School, London, N.7.

Hounslow (HADRS).—November 15, 29, Canteen, Mogden Main Drainage Department, Mogden Works, Isleworth.

Ilford.—Thursdays, 8 p.m., 579 High Road, Ilford (Nr. Seven Kings Station).

Kingston.—November 4 (Operation Club Station, G3KIN), November 18, 8 p.m., YMCA, Eden Street, Fridays (Morse classes), 2 Sunray Avenue, Tolworth.

Leyton & Walthamstow.—7.30 p.m., Leyton Senior Institute, Essex Road, London, E.10 (contact G3RYF; Ilford 3020, Ext. 247).

LOOKING AHEAD

October 27-30.—RSGB International Radio Communications Exhibition.

December 17.—RSGB Annual General Meeting.

LONDON MEMBERS' LUNCHEON CLUB

will meet at the White Hall Hotel, Bloomsbury Square, London, W.C.1.

at 12.30 p.m. on Friday, November 19, and 6 p.m., December 10, 1965

Telephone table reservations to HOL 7373 prior to day of luncheon. Visiting amateurs especially welcome.

London U.H.F. Group.—November 4 ("Research in U.H.F."), 7.30 p.m., Bull & Mouth, Bloomsbury Way, Holborn.
London Members' Luncheon Club.—12.30 p.m., third Friday in each month. See separate advertisement.
Loughton.—First Thursday in each month, 7.30 p.m., Loughton Hall (near Debden Station).
New Cross (CARS).—Wednesdays & Fridays, 8 p.m., 225 New Cross Road, London, S.E.14.
Norwood & South London (CP&DRS).—November 20 ("V.H.F. Expeditions," by Clive Penna, G3POI), CD Centre, Bromley Road, Catford, S.E.6.
Paddington (P&DARS).—Wednesday, 7.30 p.m., Beauchamp Lodge, 2a Warwick Crescent, W.2.
Purley (P&DRC).—November 5 (CW and Informal), November 19 ("Receiver Construction" by Terry Giles), 8 p.m., Railwaymen's Hall (Side Entrance), Whytecliffe Road.
Reigate (RATS).—November 20 ("Mixed Bag," by L. H. Thomas, G6QB), 7.30 p.m., George & Dragon, Cromwell Road, Redhill.
Romford (R&DRS).—Tuesdays, 8.15 p.m., RAFTA House, 18 Carlton Road.
Scout ARS.—November 18, 7.15 p.m., Baden Powell House, Queens Gate, South Kensington.
Science Museum.—November 16 (Informal Meeting), December 7 (Films on Amateur Radio & New C.S.S. Council Film), 6.30 p.m., Science Museum, South Kensington.
Sidcup (CVRS).—November 19 (Dinner Dance, Book Now), Bulls Head, Chislehurst.
Slough (SARS).—First Wednesday in each month, 8 p.m., United Service Club, Wellington Street.
Southgate & District.—November 11, 7.30 p.m., Parkwood Girls School (behind Wood Green Town Hall).
St. Albans (Verulam ARC).—November 17 ("Grand Natter Night"), 8 p.m., Marconi Service Works, Hedley Road.
Sutton & Cheam SCRS.—November 16, 8 p.m., The Harrow Inn, High Street, Cheam.
Uxbridge.—November 1, 15, 8 p.m., St. Andrews Scout Hut.
Welwyn Garden City.—November 11, ("S.S.B.," by S. T. Chrees, G3DZW), 8 p.m. The Blackhouse Room, Handside Lane.
Wimbledon (W&DRS).—November 12, 8 p.m., Community Centre, St. George's Road, Wimbledon, S.W.9.
Wembley GEC ARS.—November 12 (Visitors please telephone ARNold 1262 first).

REGION 8

Crawley (CARC).—November 10 (Informal), for details contact G3FRV. November 24 (lecture by P. K. Blair, G3LTF), 8 p.m., Trinity Congregational Church Hall, Ifield.
Worthing (W&DRS).—November 8 ("Business Radio Pt. II," by G3IWL), November 25 (Ragchew), Adult Education Centre, Union Place, Worthing.

REGION 9

Bath.—November 12, 7.30 p.m., RNR Training Centre, James Street West, Bath.
Bristol.—November 12, 7.15 p.m. (Film Show). November 26 (Talk by ZL2BBR "Amatuer Radio —Search and Rescue in New Zealand"), 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 (CRAC).—First Thursday in each month, Staff Recreation Hall, SWEB Headquarters, Pool, bear Camborne.
(CRAC V.H.F. Group).—Third Friday in each month, 7.30 p.m., The Coach and Horses, Rydar Street, Truro.
Exeter.—First Tuesday in each month, 7.30 p.m., George and Dragon Inn, Blackboy Road, Exeter.
Plymouth (PRC).—Tuesdays, 7.30 p.m., Virginia House, Bretonside, Plymouth.
Saltash (SADARC).—Alternate Fridays, 7.30 p.m., Burraton Toc H Hall, Warraton Road, Saltash.
South Dorset (SDRS).—First Friday in each month, 7.30 p.m., Labour Rooms, West Walks, Dorchester.
Torquay (TARS).—November 27 ("Transistor Techniques," demonstrated by the Torbay TR Society), Club HQ, Belgrave Road, Torquay.
Weston-super-Mare.—First Friday in each month, 7.15 p.m., Victoria Hotel, Weston-super-Mare.
Yeovil (YARC).—Wednesdays, 7.30 p.m., Park Lodge, The Park, Yeovil.

REGION 10

Cardjff.—November 8 (Film Show), 7.30 p.m., T.A. Centre, Park Street, Cardiff.

REGION 11

Bangor (UCNWARS).—November 4 ("BBC Communications," by B. J. Slamin, A.M.I.E.R.E.), 5.30 p.m., Dept. of Electronic Engineering, UCNW, Dean Street, Bangor, November 10 (Visit to GPO Network Switching Centre and Studios of Granada Television), November 18 (Film Evening). Further details from the Honorary Secretary, Peter Symes, GW3SWL, c/o Dept. of Electronic Engineering, UCNW, Dean Street, Bangor.
Llandudno (CVARC).—November 11 ("Triode Valves," by L. P. Jones, GW3GWX), 7.30 p.m., Cross Keys Hotel, Madoc Street, Llandudno.
Prestatyn (FRS).—November 24 (Film Evening), 8 p.m., Railway Hotel, Prestatyn.

REGION 13

Edinburgh (LRS).—November 11 (RSGB Tape), November 25 (Visitors night), 7.30 p.m., YMCA, South St. Andrews Street, Edinburgh.

REGION 14

Ayrshire.—Third Sunday in each month, 7.30 p.m., Conservative Club, Sturrock Street, Kilmarnock.
Glasgow.—First and Third Wednesdays in each month, Christian Institute, 70 Bothwell Street, Glasgow, C2.

REGION 16

Basildon (BDARS).—Details from G3IJB.
Chelmsford (CARS).—November 2, 7.30 p.m., Marconi College, Arbour Lane, Chelmsford. Details from G3LTF.
Great Yarmouth (GYRC).—Fridays, 7.30 p.m., the Manager's Office, the Old Power Station, South Quay, Swanston's Road, Great Yarmouth. Details from G3HPR.
Ipswich (IRC).—Last Wednesday in each month, 7.30 p.m., Civic College, Ipswich. Details from J. Rhind, tel. Ipswich 42504.
Norwich (NARC).—Mondays, 7.30 p.m., the Club Centre, 140 Oak Street, Norwich. Details from G3TLC.
Southend (SDARS).—Meetings in the Executive's Canteen, E. K. Cole Ltd., Priory Crescent, Southend-on-Sea. Details from G3NPF.

ECHO II (continued from page 734)

four years of its duration has been effective in increasing the serious amateur's awareness of space communication, of amateur radio's place in it, as well as his knowledge of specific techniques such as polarization, tracking, path-loss prediction, doppler, and other fields necessary to amateur space communication. Likewise, the *ECHO II* programme was instrumental in inspiring the development of sidelobe stacking for specific vertical radiation angles without the need of tilting rotors; of several commercial cross-Yagi arrays capable of switchable-sense circular radiation as well as conventional linear polarization; of new theoretical insights into satellite ionization phenomena, Faraday rotation theory, the nature of path losses, and human-operator reception of c.w.; and of new operating techniques such as aim-and-shoot. These and other achievements have already contributed to such amateur history as the Arecibo moon-bounce trials, the *OSCAR I* and *II* beacon satellite programmes, and the *OSCAR III* active repeater.

Perhaps the most significant contributions are those yet to be made, since, at the time of writing, *ECHO II* is still in orbit and due to orbital decay, is more and more accessible with each passing day. News of official two-way contact is still hoped for, either in North America or by the European group under Dr W. E. D. Parker, G6BY. Yet, after the satellite's first year, the results achieved are already enough to call amateur radio's part in the *ECHO II* programme a substantial success.

References

[1] Soifer, *System Analysis and Planning for Amateur Communication via ECHO II*, unpublished SB thesis, Massachusetts Institute of Technology, Cambridge, June, 1963. Preliminary reports of this analysis were published in the April and June, 1962 issues of *QST*.

[2] Soifer, "Satellite-Supported Communication at 21 Mc/s," *Proc. IRE*, September, 1961.

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H. A. BARTLETT, G5QA; J. C. FOSTER, G2JF; L. N. GOLDSBROUGH, B.Sc.(Oxon.), M.A., G3ERB; J. C. GRAHAM, G3TR; R. C. HILLS, B.Sc. (Eng.), A.M.I.E.E., A.M.I.E.R.E., G3HRH; E. G. INGRAM, GM6IZ; R. H. JAMES, A.M.I.E.E., A.M.I.E.R.E., GW3BFH; A. O. MILNE, G2MI; L. E. NEWNHAM, B.Sc., G6NZ; F. K. PARKER, G3FUR; A. D. PATTERSON, B.A.Sc., GI3KYP J. F. SHEPHERD, GM3EGW; J. W. SWINNERTON, T.D., B.Sc.(Econ.)(Hons.), A.I.L., G2YS; LOUIS VARNEY, A.M.I.E.E., A.I.L., G5RV

General Manager and Secretary:
JOHN A. ROUSE, G2AHL

Assistant Secretary
P. C. M. SMEE

Auditors:
EDWARD MOORE & SONS
Chartered Accountants

Bankers:
BARCLAYS BANK LTD.

REPORT OF THE HONORARY TREASURER

I HAVE pleasure in submitting to the Members the Balance Sheet of the Society at 30th June, 1965, and the Income and Expenditure Account for the year to the same date.

I am pleased to report that the Income and Expenditure Account shows a surplus of £1,397, a small increase of £3 over last year's surplus of £1,394.

At the Annual General Meeting I shall deal with the Balance Sheet and Income and Expenditure Account in detail, but I want to call attention in this report to some general items.

It is very gratifying that the receipts from Advertising in the BULLETIN show an increase of £546; I feel this increase must arise from the satisfactory response the advertisers are receiving from their advertisements—this in turn, I feel, is directly connected with Members writing or letting the advertisers know they are buying as a result of advertisements. Unfortunately, as I have warned on many occasions, the cost of printing is still rising and this fact, coupled with a larger BULLETIN, has caused the charge for the BULLETIN to rise over £2,000 in comparison with the previous year. However, the net increased cost is £1,574 which must be considered reasonable in the circumstances.

The work involved with the Exhibition, which is put in by so many Members, has had its own reward in the greatly increased income derived from sales. Our sincere thanks go to all those who have so ably and unselfishly contributed towards this result.

During the year under review, Council and Committee Members have kept in touch with all aspects of Amateur Radio, in particular in the International field. It is the considered policy of the Council to keep in personal contact as far as it is possible with the Societies in Europe and further afield—the safeguarding of frequencies for the amateur being the most important matter of common concern. A careful watch is kept on the cost of travelling and entertaining to make sure that all expenditure is justified and worthwhile, and that it is maintained at a reasonable level. It is considered that the expense of bringing members to Council meetings from all over the United Kingdom is well justified.

During the year under review the cost of postage has risen and whilst the full impact of the higher letter post has not yet been felt, the increase in the cost of the QSL Bureau is almost entirely due to the increase in parcel post charges.

During the year, new addressing and coding equipment has been purchased, the cards for which have now been completed. In accordance with the policy decided on last year, depreciation is being written off each year instead of writing off the whole of the cost in one year.

I would again like to extend our thanks to the staff at Headquarters for their excellent work on all matters, particularly for the continued assistance in the preparation of these Accounts.

NORMAN CAWS
Honorary Treasurer

RADIO SOCIETY OF GREAT BRITAIN

(COMPANY LIMITED BY GUARANTEE)

New Ruskin House, 28 Little Russell Street, London, W.C.1

INCOME AND EXPENDITURE ACCOUNT
for the year ended 30th June, 1965

1964 £	1964 £			1965 £	1965 £	
			INCOME			
	19,863		Subscriptions (including proportion of Life Members' Subscriptions)			21,693
	5,876		Profit on Sales of Publications, etc.			5,823
	5		Profit on Sale of Furniture			14
	802		Interest on Investments (Gross Amount before deduction of Income Tax)			1,085
	55		Deposit Interest			64
	26,601		**Total Income**			28,679
			EXPENDITURE			
	1,067		Rent, General and Water Rates, Cleaning, Lighting and Heating		1,187	
	6,511		Salaries, National Insurance and Staff Pension Premiums		6,357	
	120		Payments to Past Employees		226	
	156		Telephone		207	
	800		General Postages		774	
	1,094		Printing and Stationery (including Articles of Association and Publicity Leaflets)		1,180	
	202		Staff Luncheon Vouchers		254	
	94		Insurances		189	
	100		Bank Charges		100	
	74		Repairs and Maintenance		226	
	142		Legal Expenses		22	
	105		Audit Fee		131	
	242		Sundry Expenses		374	
	74		Depreciation of Furniture and Equipment		402	
	62		Membership Certificates and Badges		163	
	155		Awards, Trophies and Contests		131	
	10		Tape recorded Lectures		9	
	563		Cost of QSL Bureau		616	
	229		Contribution to I.A.R.U. Region I Division		243	
	17		Provision for Doubtful Debts		25	
	17		Bad Debts written off		7	
	193		General Meetings (Cost of Printing and Hire of Hall)		52	
	366		Net cost of Exhibition (Note 1)		436	
	305		*Golden Jubilee*		—	
	—		I.Q.S.Y. Newsletter		18	
	15		Equipment for Technical Development		8	
	75		Cost of Beacons		89	
			Bulletin distributed free to Members—			
	14,974		Printing, Postages, etc.	17,094		
	4,781		*Less* Receipts from Advertising	5,327		
		10,193			11,767	
			Travelling, Entertaining and Meetings—			
	345		Council and Committee Meetings	372		
	899		Council and Committee Members	994		
	299		Regional, Club, Overseas and Foreign Meetings less surplus on various rallies and conventions	271		
	79		R.A.E.N. Committee Meetings and Expenses	67		
	69		Representatives' Expenses	41		
	93		London Lectures	19		
	130		Sundries	325		
	312		*Regional Representatives' Conference*	—		
		2,226			2,089	
		25,207	**Total Expenditure**		27,282	
		£1,394	**SURPLUS OF INCOME OVER EXPENDITURE FOR YEAR ENDED 30th JUNE, 1965**			£1,397

BALANCE SHEET 30th June, 1965

1964 £	1964 £	1964 £		1965 £	1965 £	1965 £
			CURRENT ASSETS			
			Cash at Bank and in Hand			
2,923			On Current Account and in Hand	3,358		
500			On Deposit Account	1,500		
	3,423				4,858	
	2,140		Debtors, *less* Provision for Doubtful Debts		2,136	
	228		Payments in advance		611	
			Stock of Publications, etc. (as certified by the General Manager)		3,481	
	3,108					
		8,899				11,086
			FIXED ASSETS			
			Investments at Cost			
14,795			Quoted at Stock Exchange (Note 2)	14,795		
			Middle Value £12,410 (*1964* = £12,998)			
3,000			5 per cent. Defence Bonds	3,000		
8,000			Luton Corporation—Loan on Mortgage @ 5½ per cent.	8,000		
	25,795				25,795	
			Furniture and Equipment			
1			Net Book Value at 1st October, 1947 (written off against sale)	—		
1,293			Additions at Cost	3,079		
1,294				3,079		
877			*Less* Depreciation	1,242		
	417				1,837	
		26,212				27,632
		£35,111	**Total Assets**			£38,718
			BEVAN SWIFT MEMORIAL LECTURE FUND			
	80		Balance at 1st July, 1964		75	
	5		*Less* Prize Awarded		5	
		75				70
		256	**LIFE MEMBERS' SUBSCRIPTIONS RESERVE ACCOUNT**			301
			CURRENT LIABILITIES			
	3,484		Sundry Creditors and Accrued Expenses		5,909	
	11,393		Subscriptions in advance		12,053	
	583		Taxation		154	
		15,460				18,116
		15,791	**Total Liabilities**			18,487
			ACCUMULATED FUND			
	18,231		Balance at 1st July, 1964		19,320	
1,394			Surplus of Income over Expenditure for the year ended 30th June, 1965	1,397		
305			*Less* Income Tax in respect thereof	486		
	1,089				911	
		19,320				20,231
		£35,111				£38,718

E. W. YEOMANSON, *President*

NORMAN CAWS, *Honorary Treasurer*

JOHN A. ROUSE, *General Manager and Secretary*

REPORT OF THE AUDITORS TO THE MEMBERS OF RADIO SOCIETY OF GREAT BRITAIN

We have obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purposes of our audit. In our opinion proper Books of Account have been kept by the Society so far as appears from our examination of those Books. We have examined the above Balance Sheet and Income and Expenditure Account, which are in agreement with the Books of Account. In our opinion and to the best of our information and according to the explanations given us, the said Accounts in conjunction with the notes annexed hereto give the information required by the Companies Act, 1948, in the manner so required, and the Balance Sheet gives a true and fair view of the state of the Society's affairs as at 30th June, 1965, and the Income and Expenditure Account gives a true and fair view of the surplus of Income over Expenditure for the year ended on that date.

EDWARD MOORE & SONS
Chartered Accountants

Thames House, Queen Street Place, London, E.C.4.
15th October 1965

NOTES

(1) **International Radio Communications Exhibition**

Held in 1963 £		*Held in 1964* £
483	Profit on Sales of Publications, etc.	805
180	Subscriptions of New Members enrolled	236
£663		£1,041

(2) **Investments**

Middle Value at 1st July, 1964 £			Middle Value at 30th June, 1965 £	Cost Price £
3,930	£4,000 3 per cent. Savings Bonds 1955/65	(a)	4,000	4,021
3,975	£5,000 3 per cent. Savings Bonds 1965/75		3,650	5,219
3,482	£4,145 1s. 6d. British Transport 4 per cent. Guaranteed Stock 1972/77		3,192	4,055
1,611	£1,751 9s. 6d. 3½ per cent. Conversion Loan 1969 ..		1,568	1,500
£12,998			£12,410	£14,795

(a) *Redeemed at par in August, 1965.*

(3) **Capital Commitments**

There are no outstanding commitments for capital expenditure (*1964—£1,350*).

THE PILOT OFFICER NORMAN KEITH ADAMS PRIZE TRUST FUND

BALANCE SHEET 30th JUNE, 1965

	£ s. d.		£ s. d.
TRUST FUND	165 0 0	**INVESTMENT**	
Creditor:		£165 5 per cent. National Development Bonds	165 0 0
Prize to be awarded under the terms of the Trust Deed for year ended 30th June, 1965	5 5 0	**CASH AT BANK**	5 5 0
ACCUMULATED FUND			
Balance at 1st July, 1964—£10 10s. 0d plus Redemption Premium on £150 3% Defence Bonds £4 10s. 0d since invested.	—		
	£170 5 0		£170 5 0

INCOME AND EXPENDITURE ACCOUNT for the year ended 30th June, 1965

	£ s. d.		£ s. d.
Provision for prize for the year ended 30th June, 1965	5 5 0	Interest on Investment for the year ..	5 5 0
	£5 5 0		£5 5 0

NORMAN CAWS, *Honorary Treasurer*

JOHN A. ROUSE, *General Manager and Secretary*

REPORT OF THE AUDITORS

We have audited the Balance Sheet and Income and Expenditure Account as set forth above and have obtained all the information and explanations we have required. In our opinion such Balance Sheet and Income and Expenditure Account are properly drawn up so as to exhibit a true and correct view of the state of affairs of the Prize Trust Fund as at 30th June, 1965, according to the best of the information and explanations given to us.

Thames House, Queen Street Place, London, E.C.4.
15th October 1965

EDWARD MOORE & SONS
Chartered Accountant

HEADQUARTERS' FUND ACCOUNT AT 30th JUNE, 1965

	£ s. d.
BALANCE AT BANK:	
On Deposit Account	£2,131 17 0

NORMAN CAWS, *Honorary Treasurer*

REPORT OF THE AUDITORS

We have examined the above Statement of Contributions to the Headquarters' Fund and report that it is in accordance with the records of receipts.

Thames House, Queen Street Place, London, E.C.4.
15th October 1965

EDWARD MOORE & SONS
Chartered Accountants

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