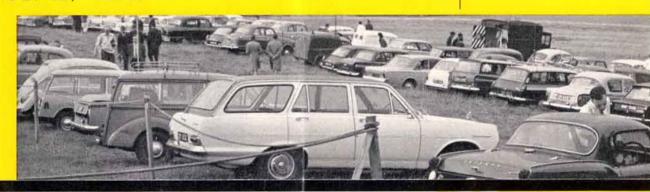




OCTOBER 1966

VOL. 42, No. 10



RSGB INTERNATIONAL RADIO COMMUNICATIONS EXHIBITION

to be opened by HRH The Prince Philip, Duke of Edinburgh, KG

Wednesday 26 October — Saturday 29 October



JOURNAL OF THE RADIO SOCIETY OF GREAT BRITAIN

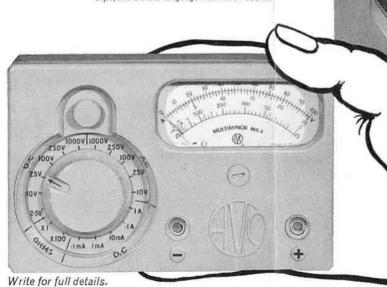


The Avo Multiminor Mk4 is the latest version of this well-proven multi-range measuring instrument. Designed and assembled to high standards of reliability, the Avo Multiminor offers simple yet instant range selection with a single rotary switch. There is only one pair of sockets for all measurements, and the scale plate is clearly marked for easy reading.

Accuracy is within the limits laid down in B.S.S. 89/1954 for up to $3\frac{1}{4}$ scale length industrial portable instruments.

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RSGB INTERNATIONAL Radio Communications Exhibition

- 1966

To be opened at 12 noon on Wednesday, 26th October, 1966, by the Society's Patron HRH The Prince Philip, Duke of Edinburgh, KG.

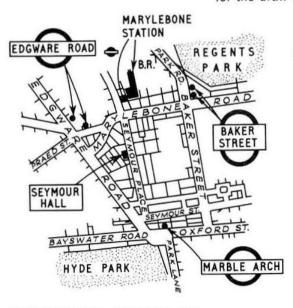
Two exhibition stations, GB3RS and GB2VHF, will be in operation on the h.f. and v.h.f. bands respectively, using a.m., c.w., s.s.b. and RTTY.

The Society's stand will be the largest to be seen at a Communications Exhibition. The stage will be occupied by the Royal Signals.

Awards for home-constructed equipment will be presented to winners of the competitions. Rules for the home-constructed classes have been changed this year; see page 540 August, 1966.

A special reception for foreign amateurs will be held on the evening of Friday, 28 October.

There will be a free draw for a communication receiver. A ticket for the draw is enclosed in this issue.



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26-29 OCTOBER

INCLUSIVE

Open 10 a.m. to 9 p.m. ADMISSION 3/-

RSGB BULLETIN OCTOBER, 1966

625



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FEEDER SPREADERS. 6" Ceramic type F.S., 10d. each. Postage 2/6 up to 12.

CERAMIC CENTRE PIECE for dipoles, Type AT, 1/6 each. P. & P. 1/-.

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TOUGH POLYTHENE LINE, type MLI (1001b), 2d. per yd. or 12/6 per 100 yds. Type MLI (2201b), 4d. per yd. or 25/- per 100 yds., ML4 (4001b), 6d. per yd. Ideal for Guys, L.W, Supports, Halyards, etc. Postage 1/6 on all line.

ABSORPTION WAVEMETERS. ABSORPTION WAVENELERS.
3.00 to 35.00 Mc/s in 3 Switched
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BANDCHECKER MONITOR. 3.00-35.00 Mc/s in 3 switched Bands. 0-1mA Indicator. Monitor Socket. Very sensitive, £3.13.6. P. & P. 3/6.

VARIABLE CONDENSERS. All brass with ceramic end plates and ball race bearings. 50pF, 5/9; 100, 6/6; 160, 7/6; 240, 8/6; and 300pF, 10/6. Extension for ganging. P. & P. 2/-.

SEALED RELAYS. 12v. 105 Ω Coil Type A. 4 Pole C.O. 15/-. Type B 2 Pole C.O. + 2 Pole, Norm. on. 12/6. P. & P. 1/6.

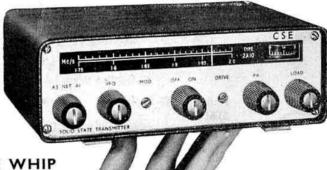
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KW

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RSGB BULLETIN OCTOBER, 1966

Volume 42 No. 10 October 1966 4/- Monthly

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We regret that owing to pressure on space, Single Sideband has been held over to the November issue.

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• 12 Valves Dual Conversion • Automatic Noise 100 ke/s xtal 35'-

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750mA	22/6	15V AC 22/6
	22 6	50V AC 22/6
1A DC	22 6	150V AC 22/6
2A DC	22/6	300V AC 22/6
5A DC	22/6	500V AC . 22/6
3V DC	22 6	"S" Meter
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50-0-50µA 29/6 100-0-100µA 27/6 POST EXTRA Larger sizes available—send to U.

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200 P.I.V. 200 mA		26
200 P.L.V. 6 amp	**	. 5/6
400 P.L.V. 3 amp (S.C.R.)	125	. 10 -
400v. P.I.V. 3 amp	0.0	7 6
1,000v, P.I.V, 650 mA	4.0	- 7/6
800y, P.I.V. 500 mA	32	5 6
400v. P.I.V. 500 mA	9.4	3 6
800v. P.I.V. 5 amp.	-	. 7/6
70v. P.I.V. 1 amp	2.0	. 36
150v. P.L.V. 165 mA	20	- 1/-
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7 valves + Rectifier, 4 Bands 550 kc/s-31 Mc/s, "S" Meter-BFO-ANL-Bandspread Tuning 260/250v, AC. Brand new, 24 GNS, carr, paid.





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only	224	333		***	444	75		0
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version						38	0	0
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RACAL RAITL 5-30				200		245		
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						35		
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KW 2000, 160-10 Mtr			vith h	.S.U.,	9000		3	- 2
P.E.P			***		***	205	0	0
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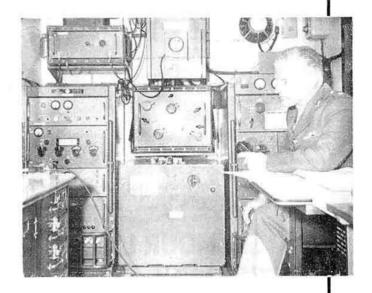
ROYAL SIGNALS

AT SEYMOUR HALL

Radio Amateurs serving in Royal Signals have collaborated to provide the display which you will find on the stage at the International Radio Communications Exhibition from the 26th to 29th October, 1966.

INTERNATIONAL RADIO COMMUNICATIONS EXHIBITION

26th-29th OCTOBER 1966



Many of the soldiers who provide the communications for the Army are also keen amateurs and our photograph shows Major Leslie Beaumont G3RUS (ex- VS9ALB, SV0AA, 5A5TZ) operating G3CIO, the Headquarters Station of Royal Signals Amateur Radio Society at Catterick Camp. This equipment, presented to the society by The Marconi Company, will be among the examples of modern radio stations shown on the Royal Signals stand.

Radio Amateurs with an interest in modern techniques will find the use of transistors in compact SSB equipment has not been forgotten whilst old-timers may recall their youth at the sight of the earlier examples of military "wireless sets" loaned by the Royal Signals Museum.

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Would you like to have details of career prospects in Royal Signals? We shall have all the information available and will be pleased to talk it over.



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RG-I Receiver



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Model RG-1. Frequency coverage from 600 kc/s to 1-5 Mc/s and 1.7 Mc/s to 32 Mc/s. Send for details. Kit £39.16.0 Kit £39.16.0 Assembled £53.0.0

OPTIONAL EXTRAS available for models RG-1 and RA-1.

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DX-100U Transmitter

RA-I Receiver

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signal rejection, Self powered.

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SB-300E Receiver

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Full details of model(s)	

NAME (Block capitals) ADDRESS	
	RB.10

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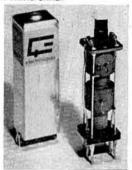
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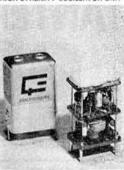
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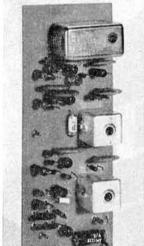


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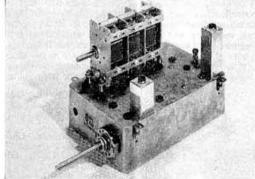
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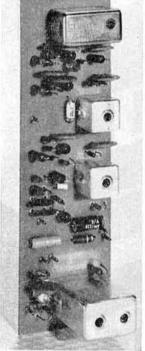




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Current Comment



discusses topics of the day

The IARU

ONE of the results of the current information explosion is the ever increasing difficulty of distinguishing the true from the false. In the words of a noted statistician there are lies, damned lies and expert opinions.

It is certain that some of the pronouncements recently made regarding the International Amateur Radio Union fall into one of these categories. One can only speculate as to the reasons why attempts have been made to muddy the waters surrounding the IARU. One thing is certain, such misguided efforts can have no beneficial effect upon the well-being and future of world wide Amateur Radio.

The International Telecommunications Union is a specialized agency of the United Nations and the IARU is recognized by the ITU as an organization able and competent to be represented at telecommunications conferences. At the present time there are 72 Member Societies of the IARU, of which 36 are in Region 1 embracing Europe and Africa. From the wealth of undisputed and published information it must surely be known to all but the disinterested that the National Society of the USSR is a member of the IARU and, indeed, in 1965 ranked third in the list of contributors to the finances of the Region 1 Division. Other countries of Eastern Europe which are IARU members include Poland (for many years), Yugoslavia (the host Society at the recent Region 1 Conference) and Czechoslovakia (whose representatives attended their first IARU Conference this year), whilst applications for membership from two other national societies in Eastern Europe are now in process.

Amongst the comments that have been made in relation to the IARU are that it has no real authority and that it is dominated by the stronger members. Both these statements are so vague that they can mean anything or precisely nothing. On the assumption that they have some relevance, however obscure, the point then arises just what type of authority can the IARU be reasonably expected to possess. UNESCO comes to mind as an example of an international body that has no statutory means of enforcing its decisions.

The smallest Member Society of the IARU can put forward a motion which, if adopted, can then become Union policy and subsequently be adopted by all its members. If one takes the wider concept and interprets the statement as meaning authority with the ITU, it must be pointed out that none of the major powers have this attribute. Their representatives must take their seat at the conference table together with their colleagues from the remaining 126 ITU member countries.

There is nothing further from the truth than to say that the IARU is dominated by its stronger members. In keeping with the practice followed at the United Nations, the ITU and other international meetings, each Member Society, large or small, has one vote only at a Regional Conference. If there is some sinister meaning to be attached to the allegation then this is entirely irrelevant in the context of the IARU.

To forestall any suggestion of complacency about the future of Amateur Radio let it be made clear that neither IARU Headquarters nor the Regional Divisions consider that the present organization cannot be improved. There is no doubt that it can be improved and equally no doubt that its strength will grow in the years ahead. The Region I Division and the Region 2 Division (the latter founded in 1964 with 17 members from North, Central and South America) are well established, but the cost of travel in the widespread Region 3 has so far prevented an organization from coming into being in that area. Strenuous efforts are now being made in Australia and New Zealand to remedy this omission.

In the circumstances of the present day the first duty of the IARU is to secure the maintenance of the amateur bands. Matters, however important, which are basically concerned with organization or development must, of necessity, take second place. This task is not an easy one and it demands a concentration of knowledge and effort at both national and international levels. Fortunately the amateur movement has within its ranks a large number of skilled and devoted members whose abilities are second to none, and whose efforts will continue in spite of the attempts to belittle them made by those without knowledge or responsibility.

The Society seeks by all means within its power to maintain and expand Amateur Radio, and it is firmly believed that this policy can only be successful when there exists a fully briefed, efficiently managed international organization. We believe that the IARU fulfils these requirements and we will support its work on behalf of world-wide Amateur Radio.

R. F. S.

PROFILE



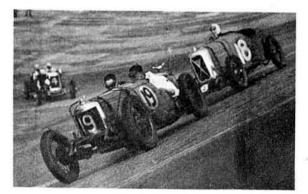
JOHN GRAHAM, G3TR

IN his own words, John Graham, G3TR, was born in Norfolk rather a long while ago, but he is not very interested in talking about his education or his working life: he maintains, however, that he was educated and he does work.

It is only when you get him to talk about his hobbies that John is more forthcoming and one soon discovers that he has led a very varied life, during which he has had a lot of fun in pursuing some extraordinarily varied hobbies. Indeed, if there is one quality he has above all others it is a real zest for getting fun out of life.

One of his very youthful loves was angling and he has fished all over England, Scotland and in Norway. He is not a purist: he enjoys all kinds of angling, but he does prefer going after trout and salmon with a fly. Perhaps his greatest regret is that he is unable to tell a real fisherman's tale because he has never caught or lost a really big one! This in itself sounds a pretty tall story.

Before he was 21 he was a keen motor cycle rider and took part in trials riding in the Midlands. From this he went on to motor racing, driving Brooklands Rileys at Brooklands and Donnington Park, and hill climbing, competing at Shelsey



G3TR in No. 19!

Walsh. [He has also taken part in the Monte Carlo Rally, starting from Stavanger, Norway. His first trip to Norway led him back there later and may have something to do with the fact that his wife Else is a Norwegian. He maintains his interest in rally driving with a Bond GT4S sports saloon.

Modern ballroom dancing was one of John's great hobbies and he only gave it up two years ago. His dancing with his wife as partner was of championship standard: he was Warwickshire County Blues Champion and South Birmingham Champion in the late '20s and more recently was a Semi-Finalist in the Sussex Amateur Championships, Potholing claimed his attention until he broke an ankle in one of his more foolhardy moments. This later led to the end of his dancing.

A very keen skier, mostly in Norway, he

claims to have fallen down more often than anyone else, but had to give it up after the pot-holing incident. At one time he played golf to handicap of 5 and dabbled in tennis tournaments.

To earn a living after a somewhat shaky start in electrical engineering in the '20s, John took up flying, went solo in a record short time, frightening himself and a lot of other people into the bargain. Some 30 years back it appeared to him that Air Traffic Control looked an interesting career and he became one of the earliest control officers—his Control Officer's licence is No. 13! At present he is Chief Officer and Air Traffic Control Officer-in-Charge at Gatwick Airport.

His interest in radio started in the early days before the BBC when he used to listen to 2MT Writtle and more than 40 years ago he held the AA call 2BQR, but it was not until 1938 that he obtained a full licence—GM3TR—while he was

(Continued on Page 645)



John in his DH60 Moth.

A Layman's Approach to a Simple Transistor Transmitter

By J. E. LARSON, B.Sc., Ph.D., G3NBL*

THE solid state world has been with us for a number of years. That semiconductors can replace thermionic valves to advantage in many electronic circuits is plainly manifest in the diversity and number of pieces of solid state equipment that have appeared on the market. For example, transistorized portable radio receivers abound and are accepted without question in modern life. Other technological advances are evidenced by the appearance of solid state TV sets, walkie-talkies, hi-fi stereo amplifiers, test gear, computer and data processing systems, parametric amplifiers, varactor multipliers and so on. Why all this swing away from thermionic valves? There exist, of course, perfectly valid reasons. Technically in this economic and competitive world solid state offers advantages and in some cases opens up completely new fields of technology. For example, the micro-miniaturization of circuitry for computers and satellite electronics. Semiconductors are small, robust, efficient and reliable with a long life expectancy. They require low operating voltages thus enabling compactness of asso-ciated components to be developed, and they are cheap to use for the job in hand.

What are we as amateurs doing about learning to use and exploit this comparatively new art? Well, first class communication receivers and converters have been designed and built and even commercial equipment is becoming available to us. We are all familiar with preamplifiers, modulators and diode power supplies, but what of transistor transmitters? Surely devices which can so revolutionize the reception side ought to be capable of doing likewise for transmission? This might well be so but little is being done about it. The "Technical Topics" feature in the BULLETIN has been hammering at the subject for long enough, but nevertheless, comparatively few practical circuits have been published on the application of transistors to transmission, or for that matter, on the choice and suitability of a particular device

for r.f. amplification purposes.

The writer has given some thought as to why this apparent lack of activity exists. Have you ever worked a station that has a transistor transmitter? Why not? Unlike valve circuitry, the use of transistors requires a completely different design treatment and philosophy, for transistors are current operated devices possessing involved parameters to define their working characteristics. More often than not, textbooks published on transistor action and design of circuitry exhibit the devices as complicated mathematical entities (which they are) beyond the ken of the majority of us amateurs. This situation just tends to fill us full of awe and only succeeds in making us reach out for the nearest 6AU6 or 6146. At best, we may slavishly copy someone's published design without understanding in the hope that it will work. Furthermore, tied by the purse we are still accustomed to access to surplus gear stuffed full of valves-it seems a pity to let them rot away (or can they?) and not make use of them. Transistors capable of any worthwhile power handling capacity are said to be very expensive and there always exists the risk of burning the things out by overloading them, overheating when soldering, or connecting them up the wrong way round. They require heat sinks and could one just imagine stuffing kilowatts into them! Thus there is built up in one's mind a kind of fear of the unknown, let us admit through ignorance, prejudice, cost, or even apathy.

It has always been said that necessity is the mother of invention. Well after trundling around a large bulky ZCI transmitter/receiver at G3NBL/M it became a necessity to build, own, and operate a small 10 watt high level modulated Top Band transistor transmitter which would operate directly from the 12 volt car supply with no fuss. This has now been carried out satisfactorily. However, one has to learn to crawl before walk and thus transistor operations began at G3NBL with a simple crystal oscillator receivingtype transistor, the OC44. A lot of low power r.f. energy has passed in and out of the aerial since that time and quite a lot has been learnt about transistors from scratch in the meantime. Hence the title of this article "A Layman's Approach to a Simple Transistor Transmitter." amateurs construct satisfactorily working circuits from a combination of rule of thumb, copying stage units, some calculation, trial and error fiddling, and luck. It is possible to do the same with transistor circuitry and forget the complicated maths.

Transistor Technique

It is not intended to repeat the basic details of the three methods of connecting a transistor except to point out that in, say, the common emitter connection, the requirement is that the input signal is fed in between base and emitter, and the output taken between emitter and collector. It is not necessary for the emitter to be earthed either to d.c. or signal, and in high power stages it is often convenient to solidly earth the collector to the chassis/heat sink, and "float" the emitter. This is rarely done with valves because of heater-cathode leakage and capacitance.

Temperature Stabilization

Temperature effects, always noticeable with transistors, become particularly important in transmitters where conversion efficiency sets a limit to the amount of power which one can waste in stabilizing the working point. For this reason no apology is made for treating biasing in detail:

Suppose we are constructing a low power stage using an n-p-n transistor running in class A and wish to draw a collector current of about 10mA from a + 12 volt rail (see Fig. 1). If we apply + 4 volts to the base of the transistor it would try to pass a very high current, but this current flowing in the emitter resistor would act in opposition to the 4 volts, so that equilibrium is reached when the emitter is a little less positive than the base: about 0.25 volt for a germanium transistor or 0.5 volt for a silicon. Taking silicon as an example, the emitter voltage must then be +4 - 0.5 =+ 3.5 volts. Then as the emitter resistor is 330 ohms, and 3.5 volts are dropped across it, the emitter current must be $3.5 \div 330$ ohms = 10.6mA. The collector current will be slightly less by the amount of base current. If the d.c. β is 50, a reasonable low limit for a small transistor, the base current will be 200μA which must be supplied by our 4 volt source, so that if this is a potential divider chain across the 12 volt supply, something like five times the current must be bled down the chain for good regulation, giving final resistor values as Fig. 1.

^{*86} Hartburn Lane, Stockton-on-Tees, Co. Durham.

Thus we have Rule of Thumb 1:

Divide the supply voltage by 3, and subtract 0.5 for silicon, 0.25 for germanium. Divide this by the desired collector current to get the emitter resistor (use nearest preferred value above). Divide collector current by 10, and calculate a 3: I divider chain to give the base voltage and pass this current down the chain.

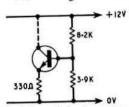


Fig. I. A small-signal amplifier, with base bias resistors selected to pass a standing current about five times that of the base current with a transistor having a d.c. β of 50. See "Temperature Stabilization."

The resulting circuit will have good temperature stability, which is essential for oscillators, but it has snags from the r.f. point of view. First, the potential divider is liable to shunt the signal source unless isolated from the base by an r.f. choke. Alternatively the bias can be fed to the "cold" end of a transformer. Secondly, in our example, in addition to the 90mW going into the transistor ([12 - 3.5] volts × 10.6 mA), of which perhaps 32mW might come out as r.f., an additional 49mW is being dissipated in resistors!

Clearly, this system is hopelessly inefficient for high power stages, which are generally run in class B or C anyway, but some protection against thermal runaway is desirable if this is not to become a very expensive hobby! A bypassed emitter resistor, calculated to drop 1 or 2 volts at the operating current is a valuable safeguard, at least in the early stages of experimentation, and is nearly essential to ensure proper current sharing when transistors are paralleled in order.

Frequency Response

The frequency response of transistors, although improving is still rather a stumbling block. The common emitter configuration is recommended wherever possible even though it falls off more rapidly with frequency than the common base. This is because its low frequency gain is so much greater that, notwithstanding the rate of fall off, the common emitter gain is still higher than common base at any frequency where the gain is high enough to be useful. Also, in contrast to common base, the collector base feedback is degenerative, i.e., it does not cause instability.

The most common way of expressing the frequency response in common emitter (CE) is by the f_T. This is the frequency at which the current gain would theoretically fall to one. At lower frequencies the current gain rises at 6db/ octave, i.e., at \frac{1}{2} f_T it is 2 x, at \frac{1}{2} f_T it is 4 x etc. until the low frequency value is reached. For a reasonable amount of power amplification, fr should be at least twice the working frequency, more if possible, whilst for a stable oscillator f_T should be several times the working frequency. This is because of internal phase shifts in the transistor, which

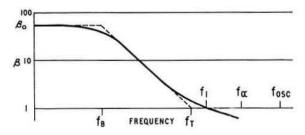


Fig. 2. A typical curve of the relationship between frequency and current gain.

increase as the frequency nears fr, and like all transistor parameters also change with temperature, resulting in changes of frequency with temperature.

Several other ways of expressing the frequency response may be met. f_1 is the frequency at which the β (or h_{fc}) actually falls to one, as opposed to f_T , which is the frequency at which it should if it fell off uniformly at 6db/octave. In practice f₁ is a little higher than f_T but the practical difference is negligible. Another parameter is fose, which is the highest frequency at which the device has a power gain of one, as shown by its ability to oscillate. As measurement of $f_{\rm osc}$ (sometimes called $f_{\rm max}$) obviously depends a little on the circuit losses, etc., it is tending to fall into disuse. As a rule of thumb, fose is approximately twice fr. fx is the frequency at which the current gain in common base falls 3db from its low frequency value. Its relationship to fr is dependent on the method of construction of the transistor, but lies somewhere between f_T and f_{OSC} . f_B is the frequency at which beta falls 3db on its low frequency value β_0 , and is given approximately by $f_{\alpha} \div \beta_0$. The relationship between these parameters can be seen from Fig. 2.

Generally these parameters are small signal values, i.e., they vary considerably with the d.c. working conditions. Certain transistors are deliberately constructed with this in mind to make them suitable for automatic gain control circuits but these are not suitable for transmitter applications. By contrast, switching transistors are designed for similar service to class C, and if the turn on and off times

are short enough they make excellent r.f. devices. The inexpensive 2N706A and 2N2368 are useful devices of this type.

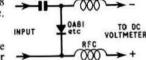


Fig. 3. A diode r.f. voltmeter which is useful for peaking up a stage for maximum output voltage.

R.F. Circuit Design

It is important to realize that impedances in transistor circuits are very much lower than in valve circuits. For exampleif a Top Bandp.a. runs 0.8 amp at 12 volts, applying

the rule of thumb $R = \frac{2V}{\pi I}$ results in 9.4 ohms, i.e., we have to step up to 75 ohms! Consequently very large capacitors

are needed to get a good working Q-and transistors are just as good at generating TVI as valves! Tapping the transistor down the tuned circuit is one way out of the difficulty, but particularly for high power/low voltage applications some compromise may be necessary. Owing to the low impedance levels lead inductances can have quite marked effects even at 7 Mc/s.

Another difference from valve techniques is that the drop in feed current as the output circuit is resonated is liable to be quite small. Consequently a useful device is the diode r.f. voltmeter shown in Fig. 3 which permits tuning a stage for maximum voltage out. It has an input capacitance of a few pF which is often negligible, but this can be allowed for by touching up the tuning when it has been removed to the next stage.

Modulation of Transistors

The difficulty of obtaining a good modulation characteristic may be made clear by remembering that the characteristic curves of a transistor are similar to those of a pentode, but one cannot modulate the screen grid! One way out of the difficulty with a pentode is to make the anode current proportional to anode voltage by applying sufficient drive to make the anode swing negative. This is seldom used because it results in very high screen grid dissipation and it is easier to modulate the screen. However this is one way of modulating a transistor. Unfortunately, letting the collector swing below the base voltage results in the collector-base junction being forward biased, and this (a) damps the output circuit and (b) stores charge resulting in a delay in response to the next quarter cycle. Both of these effects reduce the power gain and efficiency of the stage, so that only a slight excess of drive is desirable. To maintain this condition throughout the modulation cycle with constant base drive is clearly impossible, and so various tricks have been devised. These include modulating the collector and base simultaneously, partially modulating the previous stage, and modulating the previous stage with the positive half cycles only.

Another difficulty met is the voltage dependent output capacitance of transistors. This results in the tank circuit tuning varying in sympathy with the modulation, giving a phase and amplitude modulated output. This results in an unsymmetrical transmission as the two sets of sidebands tend to add on one side of the carrier and subtract on the other. The effect is reminiscent of a v.f.o. shifting with modulation, but the fault lies at the modulated stage. As this effect is most serious at high load resistance, low power stages are most likely to be affected. One side effect of the voltage variable capacitance is a tendency to improve the frequency multiplying efficiency of a transistor owing to an effect similar to a varactor multiplier.

Frequency Ranges of Typical Power Transistors

Turning to more practical aspects of the discussion on the effect of frequency on the operation of transistors, this can probably best be illustrated by reference to some published data contained in manufacturers' data sheets:

The Motorola 2N2947 epitaxial passivated silicon n-p-n transistor designed especially for h.f. power amplifier applications is rated at 25 watts total dissipation at a 25°C case temperature, when h_{fe} ($V_{ee} = 2.0$ volts d.c., $I_{e} = 400$ mA d.c., $f_{o} = 50$ Mc/s) = 2.0 minimum. Thus the f_{T} will be 100 Mc/s minimum. In Fig. 4 it is seen that with 3 watts input drive, the practical power output P_{out} at 50 Mc/s is 20 watts with a power gain G_{e} of 6·7 (8db) and 78 per cent collector efficiency. P_{out} falls to 3 watts, i.e., $G_{e} = 1$ when $f_{o} =$ about 200 Mc/s. At 100 Mc/s, the approximate f_{T} , $P_{out} = 12$ watts and $G_{e} = 4$. Fig. 5 shows a rise in collector efficiency with increase in collector current and power output. Fig. 6 shows how at a constant value of input drive power P_{out} increases with the applied V_{ee} . Fig. 7 shows that P_{out} is almost proportional to the drive power P_{in} .

By comparison, the Bendix 2N3018 rated at 25 watts dissipation at 100° C junction operating temperature gives an h_{fe} of 2·5 minimum at $f_{o}=100$ Mc/s ($I_{c}=250$ mA d.c., $V_{ce}=28$ volts d.c.). The f_{T} would therefore be about 250 Mc/s minimum. In a practical circuit when $f_{o}=50$ Mc/s, $V_{ce}=28$ volts d.c., $I_{c}=1\cdot1$ amps d.c., and $P_{in}=3$ watts, the measured power out was 25 watts giving a stage gain of 8 (9db).

Both the 2N2947 and the 2N3018 would be eminently suitable for construction of an all band 2-30 Mc/s transmitter delivering 20 watts, but unfortunately these devices are very expensive at the present time. Suffice it to say that they are available and that the price must fall eventually.

The RCA 2N1491 at about 34s is very much cheaper. It is a silicon n-p-n type with a rated dissipation of 3 watts with a 25°C case temperature or 0.5 watts in free 25°C air, $f_{\rm c}$ (Vee = 30 volt, $I_{\rm c}$ = 15 mA) = 250 Mc/s. The $h_{\rm fe}$ at 100 Mc/s = 1.8 . Thus the $f_{\rm T}$ would be about 180 Mc/s. Since $h_{\rm fe}$ at 1 kc/s = typically 50, the $f_{\rm fe}$ would be about 5 Mc/s. The manufacturers' data indicate that $f_{\rm a}$ (Vee = 20 volts) increases from 210 Mc/s at $I_{\rm c}$ = 10 mA to 275 Mc/s at $I_{\rm c}$ = 25 mA. The effect of frequency on power gain in the common emitter mode is shown in Fig. 8 where $G_{\rm e}$ falls off more or less linearly with $f_{\rm o}$ up to about 100 Mc/s and then more steeply. The gain at the $f_{\rm T}$ of 180 Mc/s = 12db and at the $f_{\rm a}$ of 250 Mc/s = 7db. By contrast, the power gain $G_{\rm b}$ in the common base mode is more constant but less than

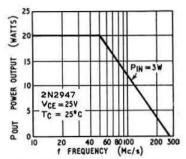


Fig. 4. Motorola 2N2947: Power Output/Frequency

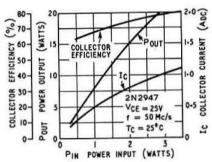


Fig. 5. Motorola 2N2947: Output Characteristics/Power Input.

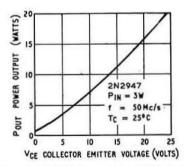


Fig. 6. Motorola 2N2947: Power Output/Collector Voltage.

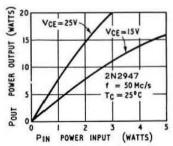


Fig. 7. Motorola 2N2947: Power Output/Power Input.

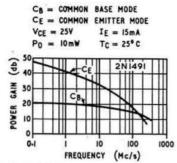


Fig. 8. RCA 2N1491: Power Gain/Frequency.

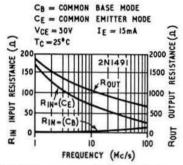


Fig. 9. RCA 2N1491: Input and Output Resistance/Frequency.

in the common emitter mode, though becomes greater above 150 Mc/s. In fact, 9db gain can still be theoretically realized at $f_0=400$ Mc/s. These figures reinforce the statement made earlier that below the f_T value common emitter mode is preferable for maximum gain but beyond the f_T value the last vestiges of gain can be wrung out of the device in the common base mode. Fig. 9 shows how common emitter input and output resistances decrease with increasing f_0 . Capacitance is also present which affects impedance matching. By contrast, common base mode input resistance is very much lower but tends to rise with increasing f_0 .

Power Ratings

One of the surest ways of burning out a transistor is to exceed its allowable dissipation rating which is linked to the maximum permissible junction operating temperature. The latter is generally 100°C or less for a germanium type or 150-200°C for a silicon type. Silicon devices are therefore to be preferred also on account of their very much lower reverse leakage currents which can give rise to thermal instability, and their higher reverse voltage ratings. The operating temperature of the junction will depend on the rate of heat generated from power dissipated as inefficiency in the device and the resistance to rate of heat dissipation from the junctions, to the protective metallic case and from the case to the surroundings. To improve heat dissipation from the junction the collector is often electrically and mechanically bonded to the case. For a TO3 type case which is used to house the 2N1905, the junction thermal resistance is about 1.5°C/watt dissipated but overall with the case in 25°C ambient air the value is only about 40°C/watt. If the case is clamped to a large heat sink the value is about 5°C/watt. Note, therefore, that the 50 watt dissipation rating for this device *only* applies to a *case* temperature of 25°C. In air at 25°C the allowable dissipation would fall to about 2 watts. For a TO5 case as houses the 2N3053, the thermal resistance values are 40°C/watt with a large heat sink or 175°C/watt in free air.

The allowable dissipation for any given ambient tempera-

ture can be calculated from the expression
$$P_{emax} = \frac{T_j - T_{amb}}{\theta}$$

where $P_{cmax} = maximum$ dissipation in watts $T_1 = maximum$ junction temp. °C allowable.

 T_{amb} = ambient or external working temp. °C. θ = Overall thermal resistance in °C/watt

 $\begin{array}{ll} = \theta_{\rm j} + \theta_{\rm i} + \theta_{\rm h} \\ \theta_{\rm i} & = \text{thermal resistance between junction and} \end{array}$

 θ_1 case thermal resistance between case and heat sink

 θ_h = thermal resistance between heat sink and surroundings

The chassis can very often be used as a heat sink especially if it is of the heavy die-cast type. For small transistors the use of terry clips, if necessary painted black, are quite useful It is desirable, but not essential, to design a circuit whereby the collector and case are in direct metallic contact with the chassis to reduce θ_1 to the minimum. It can be seen that in order to exploit the power handling capacity of a device to the maximum a large heat sink becomes necessary. To keep P_c to the minimum the d.c. to r.f. efficiency of the device should be as high as possible: 100 per cent efficiency would require no heat sink! Provided intelligence is used and that one is not too ambitious or greedy, heat sink problems are not likely to be a very severe problem.

There also exists a device restriction on the amount of drive power that can be applied but this is unlikely to be met with except perhaps in a very low gain inefficient stage.

Current Ratings

The most important current rating is the maximum collector current I_{em} . It is usually stated as I_{em} mean or d.c. continuous value. Sometimes I_{em} peak values are quoted for pulsed switching applications. For a class B amplifier with an idealized half sine wave form I_c peak = π × I_c mean. In practice, the peak currents may be higher due to transient keying responses. I_c is approximately equal to I_c , the emitter current. Often h_{te} falls off with a high I_c and this can lead to clipping of the pulsed waveform in a class B or C amplifier and to lowering of the efficiency. It is unlikely that the I_{bm} rating, maximum permissible base current, will be exceeded in practice.

Rule of Thumb 2: Maintain Ie below one third Iemax rating.

Voltage Ratings of Transistors

The maximum permissible collector voltage depends not only on the design of the device but also on its mode of use. Under conditions of sinusoidal operation with inductive loads such as tank circuits the peak collector voltage may rise to twice the supply voltage, $V_{\rm s.}$ In data sheets $V_{\rm cem}$ is often quoted as half the maximum peak voltage. It should be remembered too that modulation of a p.a. stage also leads to doubling of the collector voltage. The reverse emitter base voltage rating $V_{\rm chm}$ is usually quite small and this may be exceeded if the drive power is increased too much. Casualties to transistors often occur due to excessive voltage spikes so use well regulated power supplies. Rule of Thumb 3: Maintain $V_{\rm s}$ below one third $V_{\rm cemax}$ rating.

Choosing the Most Suitable Inexpensive Transistor

Expense usually goes hand in hand with frequency response and dissipation rating, but not always so. Bearing

in mind that power handling capacity can be multiplied by using, say, two transistors in parallel we should seek out a device possessing an f_T of at least twice the desired operating frequency but preferably more, and a dissipation rating that adequately suits our needs and purse. It is also desirable but not necessarily essential to select a type that is capable of giving a high collector current swing for 12-14 volts operation to obtain a satisfactory power output from mobile supplies. A silicon n-p-n device is likely to be more robust and stand up to more abuse from temperature rise than a germanium type. Furthermore, mass produced silicon devices for computer switching applications are now available at reasonable prices.

RCA's economy medium power device 2N3053 is a silicon n-p-n type rated at 5 watts dissipation with a 25°C case temperature or 1 watt in 25°C air, f_T = 100 Mc/s min. and $I_{emax} = 0.7$ amp, $V_{cemax} = 40$ volts, but costs only 7s. (trade price). This device should prove exceedingly attractive giving a very high gain at 2 Mc/s and at least 4 at 28 Mc/s. It could therefore be used as the basis of an all-band rig in the wattage class particularly for use in portable or mobile work. Another cheap device is the 2N706 silicon n-p-n type rated at 1 watt dissipation with a 25°C case, or derated to 0.3 watt in 25°C air. With an fr min. of 200 Mc/s it would be very suitable as a driver in a 28 Mc/s transmitter and even in a low power 144 Mc/s rig. The RCA 2N1905 costing 32s. 6d. is a germanium p-n-p type rated at 50 watts with a case temperature of 25°C, β = 90, f_{β} = 75 kc/s, f_{T} = 7·5 Mc/s, $I_{\rm cmax}$ = 10 amps., $V_{\rm cemax}$ = 40 volts. This should be a difficult one to burn out! Be careful though, for it can still happen. At 2 Mc/s a power gain of at least 4 should be attainable-this is a bit low but still useful. This device was employed by the author as the p.a. in a 10 watt high level modulated Top Band transmitter for mobile work and was in fact found to give a stage gain in unneutralized common emitter mode of five. It would be possible to use this at 3.5 Mc/s but the power gain would be less and carefully designed circuitry would be necessary. A more suitable device for 3.5 Mc/s and 7 Mc/s would be RCA's newer 2N3878 n-p-n silicon epitaxial power device rated at 35 watts (25°C case), $I_{\text{emax}} = 7$ amps, and $V_{\text{cemax}} = 50$ volts with an f_T of about 40 Mc/s and costing 37s. 6d. The Texas 2N1046 and 2N1907 germanium p-n-p are somewhat similar to the 2N1905 in ratings but possesses an fr of 20 Mc/s and cost 78s. The Mullard AUY10 germanium p-n-p and STC BUY10 silicon n-p-n types both rated at 10 watts with frs of 120 and 90 Mc/s respectively are also interesting types at moderate prices.

No doubt there exist other transistors in the low cost range which are suitable and it is just a question of studying the various manufacturers' catalogues and price lists to decide on the "best buy for the job." When writing to the manufacturers never expect to get any free samples, but they will be pleased to forward you their data sheets which can contain a wealth of useful information and circuit applications.

Now having read all the above and counted the thumbs let us proceed with the job of constructing something that works.

CONSTRUCTION OF A SIMPLE TWO STAGE TRANSMITTER FOR 2, 3.5 or 7 Mc/s

Let us select cheap 2N3053 transistors as general stock items with which to experiment. For simplicity a small two stage crystal oscillator p.a. c.w. transmitter with 2 or 3 watts input is to be constructed. Should this prove successful then one might convert it to v.f.o. control, add modulation facilities, or even add on a larger p.a. stage. The pertinent limiting values for the 2N3053 are again 5 watts maximum dissipation with a 25°C case temperature, or 1 watt in 25°C air, $V_{\rm cemax} = 40$ volt, $I_{\rm cmax} = 0.7$ amp, and $f_{\rm T} = 100$ Mc/s. Being a silicon n-p-n type the collector is connected to the

positive supply line. The value of supply voltage V_s is conveniently 12-14 volts from either three 4-5 volt bell batteries or a 12 volt car accumulator.

Crystal Oscillator Stage for 2 Mc/s Operation

It is not proposed to use a heat sink in this stage and therefore the collector current should be limited to $\frac{1000}{13.5} = 75 \text{ mA}$

maximum allowing for a safety margin of zero efficiency. The circuit adopted (Fig. 10) is based on a class A bias stabilized configuration. The design is dependent on the fact that with an inductive collector load and a certain value of emitter by-pass capacitance, a negative resistance appears between base and emitter. If a tuned circuit (the crystal) is placed across the negative resistance the stage will oscillate. The tuned circuit in the collector must resonate at a slightly higher frequency than the crystal to exhibit an inductive load to the transistor.

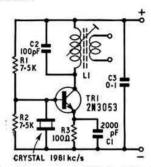


Fig. 10. A crystal oscillator stage for 2 Mc/s. L1 is a \(\frac{1}{2}\) in. diam. dustcored Aladdin former fully wound, \(\frac{1}{2}\) in. long, with 30 s.w.g. enamel wire. The link is 10 turns, 24 s.w.g. wire at earthy end of L1.

The d.c. conditions are set in the way described previously, but as this is a semi-power stage the efficiency is raised at the expense of temperature stability. The available h.t. is 13-5 volts of which we allow 3 volts across the emitter resistor; running at about 30 mA, this gives an input of $30 \times 10.5 = 315$ mW. The emitter resistor is $\frac{3 \times 1000}{30} = 100$ ohms and the base voltage is 3 + 0.5 = 3.5. The β_0 will be rather low for this transistor, say 35, so the base current is $\frac{30}{35} = 0.85$ mA. As the base supply resistors shunt the crystal and consume power we cannot allow a chain current of 3.5 mA, so that the resistance will be higher and the regulation lower. Making them equal gives an open circuit voltage of 6.75 volts which drops to 3.5 when 0.85 mA is drawn, i.e., the two in parallel come to $\frac{6.75}{0.85} = \frac{3.5}{0.85}$ K ohms = 3.82 K ohms. Since both are equal, each is 7.64 K ohms.

The oscillator stage can readily be constructed on a 2 in. × 2 in. square of Veroboard or similar drilled Formica laminate. The accent should not necessarily be placed on small physical size though but to use a transistor! The latter can be soldered in directly without trouble especially if the leads are held by a pair of pliers to act as a heat sink, but this should not really be necessary. It is always wise to check the completed circuit thoroughly, especially the connections to the transistor before applying power as reverse polarity will easily destroy the device.

At first apply 4.5 volts through an AVO and a 500 ohm potentiometer to limit the current should anything be amiss. With $V_s=4.5$ volts the stage should oscillate healthily when tuned up with the slug core. With the output link connected to a 75 ohm 2 watt carbon resistor and an applied V_s of 9 volts, I_0 should be about 25 mA giving some

80 mW r.f. output. With Vs 13.5 volts, Ie increases to 30 mA and the output power to about 150 mW. The actual transistor efficiency as distinct from the stage efficiency is nearly 50 per cent. Thus the device is operating well within its ratings. With a key in-serted in the battery supply, an a.t.u. and respectable long wire coupled to the link, we are now in business with a low power c.w. transmitter. In spite of the fractional wattage power output, the signal strength should only be about three S points down on the 10 watt input valve rig and a considerable coverage can be had at least on ground wave propa-gation. If you must talk to the other fellow just down the street then try inserting a carbon button microphone in series with the battery. A small percentage of modulation will result and the frequency is still rock bound.

A similar circuit constructed for 80m operation using a 3.518 Mc/s crystal (R1 = 3.3 K, R2 = 4.7 K, R3 = 190 ohms, C1 = 560 pF, C2 = 100 pF, L1 = 36 turns 30 s.w.g. close wound, with an 8 turns 24 s.w.g. link, on a \{\} in. Aladdin former) gave 70 mW r.f. into a 75 ohm load with $V_s = 13.5$ volts.

In a 7 Mc/s circuit, at least 50 mW was obtained.

A Simple 2-4 watt P.A. Stage using the 2N3053

The 2N3053 lends itself to a p.a. stage in the wattage class when used with an adequate heat sink and driven from the crystal oscillator stage above. The circuit (Fig. 11) employs common emitter mode in class B/C with a pi-tank output match. The transistor is mounted in an insulated twin Redpoint heat sink block (available from Henry's Radio) bolted to the chassis. With a quoted thermal resistance of 50°C/watt, 2 watts can be dissipated. Two transistors connected in parallel will offer dissipation advantage and give a slight improvement in performance. C3 is the d.c. blocking capacitor in the r.f. load line.

The performance of the transmitter has been measured

and the results are presented in Table 1.

It is seen that the efficiency of the p.a. stage is in the vicinity of 85 per cent falling to 70 per cent with the higher input of 4 watts. Two transistors seem beneficial at the higher output otherwise very little change in efficiency or output was observed. A satisfactory level to operate at would be 9 volts on the oscillator stage and 12-13 volts on the p.a. when at least 2 watts r.f. output can be obtained. Remember-

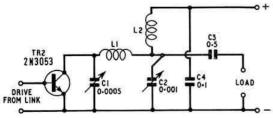


Fig. 11. A 2-4 watt p.a. stage using a pi-network. L1, Codar 31620, 2 in. long (6·85μH). L2, Codar 33224, 2 in. long (28·0μH).

TABLE I

		Λ	Measure	d perform	ance of	f two-st	age tran.	smitter		
Freq. Mc/s	No. of 2N3053s in P.A.	S	Osc. tage otal	P.A. Vs	P.A. Ie mA	P.A. Pin W	P.A. I _{out} 75 ohms	P.A. P _{out} W	P.A. D.C. to R.F. Efficiency	Total Efficiency %
		Pin	Vs			0.27	0.06	0.27	1.08+	00
1-98	1	0.03	4.5	4-5	60	0.27	0.06		100‡	90
	2	0.03	4.5	4.5	70	0.32	0.06	0.27	85	77
	1	0.12	9.0	8.7	155	1-36	0.122	1.12	83	76
	2	0-12	9.0	8-7	160	1.39	0.128	1.23	88	82
	1	0.12	9.0	12.8	215	2.75	0.168	2.11	77	74
	2	0.12	9.0	12-7	220	2.78	0.177	2.35	85	82
	ī	0.40	13.5	12.6	250	3-15	0.175	2.30	71	64
	2	0.40	13.5	12.0	380	4.56	0.208	3.25	71	66
	2	0.12	9.0	12.8	145	1.86	0.202*	1.53	82	77
	2	0.40	13.5	12-2	300	3.66	0.25+	2.35	64	58
3.58	2	0.18	9.0	12.5	270	3.38	0.162	1.98	59	56
	2	0.40	13.5	12-1	330	4.0	0.18	2.42	61	55
7.07	2	0.40	13.5	12.5	190	2.37	0.135	1.37	58	50

* into 37.5 ohm load

† into 37.5 ohm load but unable to dip p.a.

The efficiency was calculated directly from the results obtained. The resulting figures seem to be rather optimistic owing to various slight errors in measurement.

The drop in Vs of the P.A. with increased Ie indicates the internal resistance of the battery used to be about 4 ohms.

Compare the above overall efficiency with a simple valve counterpart, e.g., a triode oscillator and pentode output such as the ECL83, which would consume 3.8 watts alone in its heater. At 2 watts r.f. output the overall efficiency is likely to be around 30 per cent.

ing the law of S points-a three to four-fold increase in power results in only one S point increase in signal reportit is really not worthwhile caning the rig except for psychological reasons of satisfaction.

On 80 and 40m the value of L1 is reduced by suitably tapping down the air-wound coil. Although the author has not optimized by trial and error the circuitry for these bands, a few measurements indicate that reasonable efficiency and power output can be obtained quite easily. No doubt some fiddling would improve the performance.

The load impedance of the p.a. stage is given approximately by the expression:

Rule of Thumb 4:
$$R_{\ell} = \frac{V^2_s}{2P_o}$$

Thus with $V_s = 12.8$ volts and $P_o = 2$ watts, $R_t = 40$ ohms. This collector load impedance has to be matched to the 75 ohm load to the a.t.u. The Q of the pi-tank will therefore be very low and harmonic attenuation incomplete. However, with a tuned a.t.u. and the low power involved this should not present any problem. One of the greatest difficulties in constructing transistor p.a.s lies in the correct design and matching of the stage to both input drive and output power. Although in this case untried by the author, high level modulation could be applied by supplying 1-2 watts of audio from a transistor amplifier and modulation transformer possessing a low resistance secondary winding with an impedance of some 40 ohms in the p.a. collector supply.

Conclusions

It should be clear that there is really no serious impediment to anyone who is keen to try his hand at the development and construction of transistor transmitters.

The field is wide open for fruitful experimenting and original thinking, and hence opens up a new pioneering spirit in Amateur Radio—even if Telstar, Mariner IV and OSCAR still have the edge on us!

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The above list of references, although not intended to be allembracing, will give the reader much insight into the art.



G3TR-1966

Profile

(Continued from page 638)

living in the Orkney Islands. Since then, apart from the war years, he has been active in GM, GC and G.

John was for many years a keen DX operator and was the Leading G in the first WAE Phone Contest and in the VK/ZL Contest 1956. More recently he has been active on the v.h.f. bands. He has been Chairman of the Crawley Amateur Radio Club for the last four years and he takes an active part in club life.

He was elected to the Council in 1962 and is at present Chairman of the Membership and Representation Committee and the H.F. Contests Committee. He is also member of the Finance and Staff and Exhibition Committees.

In the face of all these activities it is somewhat surprising to find that John is a constructor of no mean ability: in an age in which factory-built equipment is commonplace, G3TR's station is almost completely home-built. Like everything he tackles, John Graham believes in getting the maximum amount of pleasure, satisfaction and fun from Amateur Radio.

Radio Facts and Fallacies

By B. PRIESTLEY, B.Sc., G3JGO *

AMATEUR Radio has accumulated a lore of its own over the years, and some of the knowledge has been shown to be a forerunner of professional developments. are, however, some fallacies and obscurities persisting and it is the aim of this article to clarify some of them.

Aerial Loading

Probably more head scratching and cussing has been provoked by aerials that don't load than any other problem in Amateur Radio. However, it is the writer's contention that any device capable of accepting power can be made to load correctly, with the provisos that (a) it may not usefully radiate the power consumed, and (b) an appreciable fraction of the transmitter output power may be lost in the coupling network.

The procedure is this:

Load the transmitter into a dummy load of 75 or 52 ohms to the desired level, and note the conditions (anode current, voltage, capacitor settings etc.). The aerial coupler must now reflect the same load resistance to the transmitter. Altering the pi-tank may give the same loading but almost certainly the loaded Q will be different. If it is too low, harmonics

will be radiated and if too high the tank circuit losses will rise. (If the unloaded Q is 200, a loaded Q of 12 will dissipate 6 per cent of the transmitter output.) Designing a coupler to transform the aerial impedance to the correct load resistance will be largely a matter of cut-and-try, aided by guestimation, remembering that two conditions are to be satisfied: correct loading, and maximum coupler efficiency. Note here the operative words "aerial impedance." It is not necessary to tune out the reactance before transforming, in fact sometimes it is undesirable as the design of the transforming network becomes difficult. Furthermore, obviously the fewer components the better, as they will all serve to waste some power.

As an example, suppose we are working on a mobile whip aerial for 1.9 Mc/s which, being much shorter than a quarter wavelength, looks like Fig. 1. Clearly, a series tuned circuit will tune out the reactance, and via a link coil we can transform to 75 ohms. However, not any tuned circuit which resonates will be any use if we want maximum efficiency and in difficult cases such as this the maximum coupling efficiency could be 10 per cent!

Suppose we use a coil of about 240µH, which has a reactance of about 3000 ohms at 1.9 Mc/s, and a small capacitor of about 40pF in series. This will certainly resonate, and if the link is correctly adjusted will present a good load to the transmitter, but what is the efficiency? If the coil has a Q of 200, then its series resistance will be $3000 \div 200 = 15$ ohms. With an aerial resistance of 2 ohms, 2/17 of the r.f. into the coupler actually goes into the aerial—about 12 per cent, or 9.3db loss! By reducing the L/C ratio as far as possible (while maintaining resonance) this loss can be minimized, even if the series capacitor becomes a bank of micas, switch selected, plus a 3 gang, 500pF variable. A similar system was used on the TA12 aircraft transmitter where the problems are similar. In the case of parallel tuning, highest efficiency will be obtained by maintaining a high L/C ratio.

Reactance and A.C. Resistance

Unfortunately there are still some radio text-books which explain reactance as a kind of resistance which applies only to a.c. circuits. This is a convenient story to persuade the student that he understands, and simply postpones the difficulty till a later stage (see "Negative Cycle Loading"). The essential difference is that resistance limits the current in a circuit by dissipating part of the applied energy; rather like income tax it is a one way process! Reactance only borrows it, and returns it in full later in the cycle, like saving money from earnings which reduces the apparent income. but is available to pay debts. Thus both earnings and debts (negative earnings) have a reduced effect due to saving. In exactly the same way the current produced by an alternating voltage is reduced on both positive and negative half cycles

by reactance in series with the load.

What then is a.c. resistance and how does it differ from d.c. resistance which can be measured with an ohmmeter? The answer to this is not at all! If one had an a.c. operated ohmmeter and could separate the resistance from the reactance it could be measured in exactly the same way. Suppose we had a r.f. coil wound with resistance wire (such things have been done!), then although we can measure the resistance at d.c. and at low frequencies, at higher frequencies the reactance, which is inexorably mixed up with the resistance. will make the readings increasingly inaccurate. This can be overcome by connecting in series a capacitor of such a value that it stores the same amount of energy as the inductance. As the two, fortunately, work out of phase with each other, the coil will be returning energy to the circuit at exactly the same rate as the capacitor is storing it, and vice versa. Thus once the two reactances have been started off with their ration of energy (rather like getting a heavy roller moving) they, as it were, throw it backwards and forwards, and from the point of view of our a.c. ohmmeter and the resistance, can be neglected, and so the resistance is easily measured. The above process is, of course, simply series resonance described in an unconventional way.

Having gone to all this trouble to measure the a.c. resistance, can we expect it to be the same as the d.c. resistance? If so this seems a waste of effort! The answer is probably not, as the resistance of the conductor is raised by skin-effect, i.e., the wire is only partly used at r.f. and also energy is lost due to radiation, induction in surrounding objects, and dielectric loss in insulation, which all extract energy, and this can be considered as resistance. Obviously if the coil is in fact a quad aerial, the loss due to radiation is highly desirable, but can nevertheless be expressed as a loss from the point of view

of power in this circuit.

Grid Drive

Now to another misconception among many amateurs, (and sotto voce, some professional engineers too)—grid drive. As valves are voltage driven devices, grid drive is properly measured in volts, quite irrespective of the class of operation, A, B or C. Grid current is an unfortunate side effect produced when the grid is driven positive, serving to dissipate power and create harmonics. The relationship between grid voltage and grid current is dependent upon the effective grid/ cathode resistance, which is necessarily high to prevent the grid stealing all the anode current and to keep the drive power requirement low, but varies from valve to valve. Hence, if your old faithful 807 passes out and is replaced by

^{* 43} Raymond Road, Langley, Slough, Bucks.

another, adjusting for the same d.c. grid current could result in a bad attack of TVI owing to the new valve having a higher grid/cathode resistance, and thus being grossly over driven to provide the desired current. A higher screen current would also result, possibly leading to poor quality modulation.

The cure for the above situation is to measure the peak grid volts, and not grid current. The essentials of the set-up are shown in Fig. 2. When a voltmeter (as high a resistance as possible) is connected across terminals + and — the device becomes a peak reading voltmeter. The product of C and R of the voltmeter must be large compared with the period of the r.f. drive (50,000 Kohms × pF will be adequate for all amateur bands from 1.8 Mc/s). If grid leak biasing is used it will be necessary to have a variable grid leak, and a certain amount of cut-and-try will be needed. This procedure is specified by at least one valve maker, while some others just indicate the bias and drive required and quote wide limits on the d.c. grid current resulting.

Other Applications of Peak Voltmeters

Having made a peak reading voltmeter, its usefulness is not simply confined to reading p.a. drive. Suppose we read the output of our new v.f.o. as 1.5V peak, and want to drive a TT11 p.a. with it. Inspection of the TT11 data gives peak grid volts 70, -50V bias, d.c. grid current 1.5-3mA, hence our grid resistor may be at its lowest, 50/3 = 17 K ohms. If this is bypassed it loads the buffer like an 8.5 K ohm resistor (8.5 and not 17 because the direct current dissipates power all the time, even when the r.f. is passing through zero. Equivalent r.f. loading is that of a resistor of approximately half value). We require 70V across this, i.e., an amplification of 70/1.5 which is about 47, and since the load is 8.5 K ohms, the necessary g_m is

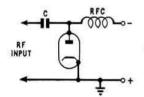


Fig. 2. A peak voltmeter circuit suitable for grid drive measurements. voltage

47/8.5 mA/V since gain = $g_m \times R_L = 5.5$ mA/V. So an EF91 with an average g_m of 7.6 mA/V will suffice and have a little in hand for old age. However, if the grid leak were not bypassed, the load resistance would be 17/3 K ohms and the necessary g_m 8·3 mA/V, in which case an EF91 could not be relied upon to drive a "greedy" TT11. The diode voltmeter is quicker than finding out the hard way that a 6CH6 would do a better job.

Modulation Metering

The peak diode voltmeter has several other applications. It is particularly useful in transistor circuits with the addition of a transistor d.c. amplifier when small voltages can be measured, or for aligning receivers. Another excellent use is in modulation depth monitoring, where most amateurs seem to think an oscilloscope is essential to comply with section 4.2. of the licence. While it is undeniable that an oscilloscope is the best method of modulation monitoring, the simple peak voltmeter illustrated in Fig. 3 is capable of useful results at much less cost. The circuit works by comparing the peak audio voltage applied to the p.a. with its h.t. Assuming a linear p.a., when these are equal 100 per cent modulation results, and the depth of modulation will decrease proportionately with the audio. The setting-up procedure is (a) with switch in the SET position adjust the

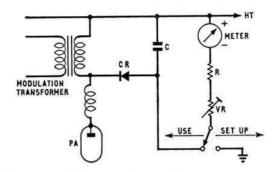


Fig. 3. A modulation meter circuit. C, $0.5-2\mu F$ paper, working voltage $1.5\times$ h.t. volts; CR, any thermionic or semiconductor diode with a p.i.v. rating of at least $2.5\times$ h.t. volts; meter, I mA f.s.d. or better; R and VR, to suit h.t. voltage and meter.

potentiometer until the meter reads a convenient value, say 800µA on a 1mA meter, (b) switch to USE. Now

 $800\mu A = 100$ per cent modulation

 $600\mu A = 75 \text{ per cent}$

 $400\mu A = 50$ per cent $200\mu A = 25$ per cent

and that is all there is to it.

Caution Owing to the transient nature of speech, a sluggish meter will fail to follow the rapid variations of speech, so that the monitor is liable to read slightly low. Thus it is not advisable to talk the meter above the 90 per cent mark. In any case the other chap's detector probably clips at about 75 per cent modulation so why risk splattering?

Neon Stabilizers

There seems to be a belief in some quarters that any old neon bulb is a stabilizer. Having been closely associated with the testing of stabilizers the writer can vouch for the falsehood of this! A stabilizer has a carefully prepared cathode so that the voltage across it is almost independent of the current, over a limited range. As only the cathode is so prepared it does not work if the connections are reversed. It glows, but that is all. A reference tube is similar, but it is primarily designed to maintain its voltage accurately for long periods when fed from a constant current source. Consequently its impedance is higher, and its working current range less than for a stabilizer, so that although it can be used as one, it is more suitable as a reference for an electronic regulator

Pre-selectors or Seek Not After Gain!

It does not seem to be fully realized by all amateurs that the amount of gain which can be usefully employed in a receiver is strictly limited. A quick calculation indicates that a gain of 167db will bring the thermal noise in a bandwidth of 5 kc/s up to 1W. Since on most bands the received noise is at least 10db above thermal noise, and a signal/noise ratio of at least 10db is desirable, the useful gain is reduced to 147db. This is a comparatively low figure when it is realised that one i.f. stage with $g_{\rm m}=3$ mA/V and a load impedance of 50Kohms will give a gain of 43db. Thus the addition of a pre-selector to a semi-satisfactory receiver, does no more than compensate for the gradual loss of gain owing to misalignment, or ageing of valves, possibly reducing image response and improving aerial matching, This could be better and more cheaply done by receiver re-alignment and an aerial matching unit. On the debit side the addition of a preselector will certainly degrade the cross modulation performance of the receiver. I suspect that in many cases the reason for adding pre-selectors or "souping up" receivers is to make the "S" meter readings even more optimistic. It

would seem simpler just to add 30db! Remember, the pattern of gain in a receiver is a careful compromise between the requirements of noise factor, cross modulation and a.g.c. performance. Think carefully before you upset it.

Negative Cycle Loading

This system claims to cure the defect of unequal loading of a push-pull modulator by a diode and resistor connected across the secondary of the modulation transformer so as to load on the negative cycle only. Unfortunately, as is liable to happen when someone will not tamely let the textbooks think for him, the reasoning, though superficially convincing, is wrong and the system actually creates the very state it tries to avoid.

The argument runs thus: In a push-pull modulated amplifier the negative cycles just reduce the p.a. anode voltage, and hence the current also, to zero at 100 per cent modulation. As a.c. volts are applied, and yet no current flows, no power is being drawn and hence the modulator valves must be unequally loaded, since the other valve delivers double

current at 100 per cent positive modulation.

Sounds convincing doesn't it? The explanation is that the "power" above is calculated by multiplying a.c. volts by a.c. plus d.c. currents, which naturally gives a silly answer! In fact alternating current is flowing but at the 100 per cent negative peak it is just cancelled by the direct current. However, there is still the awkward fact that throughout the negative half cycles more power is being supplied by the modulator and d.c. supply than is consumed by the p.a.! The reason for this is that the excess power is being stored as magnetic energy in the modulation transformer's core, and is used up in the positive half cycles when demand exceeds supply. If the idea of magnetic energy storage seems strange, the simple experiment of connecting a neon bulb across a coil of a few henries, and then making and breaking a current of a few milliamperes in the coil will demonstrate this. The neon bulb will flash at break although the source is of low voltage and quite incapable of igniting it directly.

Thus all that is accomplished by negative cycle loading is some rather inefficient controlled carrier plus distortion; a simple low-level speech clipper would be much more effective.

Reflectometer Directivity

It does not seem to be universally understood that a most important figure associated with a reflectometer (monimatch) is its directivity, or the extent to which it can distinguish between forward and reflected power. The ratio, which may typically be 30db, sets a limit to the amount of reflected power which can be detected, since it is obviously difficult to look for a reflected wave 30db down when there is also an equally strong indication from the forward wave. It would be possible to get an indication of zero reflected power if these two were equal in magnitude and out of phase, but the addition of an extra quarter wave of feeder, which would not affect the real s.w.r would apparently create a reflected wave 24db down on the forward, i.e., a true s.w.r. of 1.065 may be indicated as 1 or 1.135, or indeed any figure between these limits depending on the point of measurement! Admittedly, the region of uncertainty lies between a perfect s.w.r. and a highly creditable one, so that the practical implication is that there is no point in going to great lengths to improve the s.w.r. unless an equal amount of trouble has gone into adjusting the reflectometer, using a carefully constructed matched load, and setting up so that the addition of an extra quarter wave of cable does not change the indicated "s.w.r." which is then an indication of the directivity.

"S" Meters

The absurdity of many S meter readings has been previ-

ously commented upon, but perhaps the following example will highlight the situation. A certain receiver has an S meter calibrated to S9 plus 80db. If we assume that S1 is a genuinely "barely perceptible signal" of about $1\mu V$ and that one S point is 6db then the signal is 128db up on $1\mu V$, i.e., 2-5 volts! If this were received on a half wave dipole at 14 Mc/s then the received power of 88 mW would be approximately that received from a 1 kW transmitter 750 ft. away! Under these conditions it would seem simpler to take strength readings from the feeder ammeter, after all there is 35 mA of r.f. flowing into the receiver! Assuming that this signal is in fact produced by 1kW with highly efficient beam aerials, a reduction of power to $10\mu W$ would still yield an "exceptionally strong signal." This could easily be powered by two coins of dissimilar metals and a damp piece of blotting paper!

One further example. Having received a report of S9 plus 30db from a local station, and heedful of exhortations not to use excess power, the writer constructed a 20db 75 ohm attenuator, and inserted it in the transmitter output for the next over. The report?—S9 plus 10db—and unread-

able!

In view of the above a very simple code has been devised, with only two numerals, 1 and 2 for both readability and strength. These simply indicate unreadable/readable and inadequate/adequate field strength under conditions prevailing. One gentleman, when confronted with the above system and invited to think of a number if he didn't like 2 and 2 decided on 5 and 9 "because it would look odd in the log if it wasn't the same as all the others."!

Ode to a Mode

In days of Old when Hams were bold, and Sideband not invented, Words were passed by pounding Brass, and all were quite contented.

(with apologies to Wm. Shakespeare)

Purley and District Radio Club "Splatter," April 1966

RADIO AMATEURS' EXAMINATION

Wednesday, 7 December, 1966
MARY WARD HALL
5 TAVISTOCK PLACE
LONDON WCI

The examination will commence at 6.30 p.m.

Applications to sit the Examination at the above centre should be sent to the General Manager, Radio Society of Great Britain, 28 Little Russell Street, London, WCI, to arrive not later than Friday, 4 November 1966. 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 10s. As accommodation is limited, applications will be dealt with in the order received.



"NEXT BAND UP"

F^{1VE} years ago, give or take a little, "Twenty Three" was beginning to develop as "Seventy" had done a decade before. What had seemed daunting was becoming do-able; what had seemed esoteric was becoming everyday (well, nearly!).

There are signs that "Thirteen" will follow the same pattern, helped on its way by enthusiastic groups of members who are sufficiently close to one another geographically to enable contact to be made on this very "optical" band, and who between them dispose of a considerable amount of electronic know-how.

This last is a fair description of the people who make up the Radio Club at the GEC Research Centre at Wembley, where activity on the 2300 Mc/s band is now a very practical proposition. Heath Rees, G3HWR, in reporting current developments to "Four Metres and Down" writes:

"We have two series of equipments under construction locally, namely, crystal controlled narrow band gear similar in potential to current 1296 Mc/s practice; and modulated oscillator transmitters used in conjunction with broad band receivers for local 'natters.' In general, those with experience of 432 and 1296 Mc/s are going for the c.c. approach, while the 'new boys' are trying the s.e.o.s.

"The c.c. gear will be used at the low end of the band. G5FK is still on 2301.75 but newcomers to the band are encouraged to use 8 Mc/s crystals in their 144 Mc/s transmitters followed by four doublers to 2304 Mc/s. This will result in a compact cluster of stations. If small trimmers are added across crystals it will be possible to net or move off the frequency at will. G5FK will move to 2304 Mc/s in due course.

"The s.e.o. gear will operate above 2310 Mc/s using the c.c. transmissions as band edge markers.

"The following indicates our line of thought on the subject of receivers: bandwidth 1 Mc/s, preferred i.f. 36 Mc/s. Such receivers will function on A3 from c.c. gear, permit fairly heavy modulation of the s.e.os, since incidental f.m. up to 500 kc/s deviation can be tolerated, and are readily adaptable to pulse systems later on if these become fashionable!

"The specified i.f. will facilitate common oscillator duplex working, and TV parts or even complete secondhand television receivers can be used. We shall resist the use of super-regenerative receivers."

The GEC club members are using 70 Mc/s as an intercomband during the experimental stages of opening up 2300 Mc/s. Their members equipped for "Thirteen" are:

G5FK: c.c. transmitter at present on A1 and F3, to be modified for A3 later, and a c.c. converter to a BRT100 receiver. Aerial: 2½ ft. paraboloid.

* Bulls Green, Knebworth, Herts. Please send reports to arrive not later than 7 October for the November issue, and 18 November for the December issue.

G3RPE: c.c. converter to CR300 receiver. Aerial: 1½ ft. paraboloid. No transmitter yet.

G3HWR: s.e.o. type transmitter. Aerial: 2½ ft. paraboloid. No receiver yet.

G3SKR: s.e.o. type transmitter. Tunable converter into SX36. No aerial yet.

G3THQ: s.e.o. type transmitter building. Tunable receiver building.

Paths open are: G5FK to G3SKR (about 1 km), with only a short length of wire as an aerial at G3SKR; and G5FK to G3HWR (using G3RPE converter), which is 7.5 km, optical.

ILLUMINATING THE TARGET

Still apropos the "ultra highs," it is worth considering to what extent their use is likely to change the accepted patterns of amateur operation as we know them on "Two" and "Four."

For instance, the traditional "call and search" technique has little or no place on 1296 and 2300 Mc/s. Rather, it is a "time and bearing" operating procedure that prevails: you look for your contact at a specified time and on a precise aerial heading. To deviate from that heading by more than a degree or two with the sharply focused beams commonly used at u.h.f. is to risk missing your target altogether.

The thought obtrudes: Why not have a continuously rotating high gain parabola just as the radar people do, and lay down a circular field strength pattern around your station?

Nice work if you can engineer it, not the least difficult part of the job being to sustain a sufficiently constant signal level that will hold verbal sentences together when the scanner is not facing the receiving station. This postulates an alarmingly high rate of aerial rotation, or a ridiculously low rate of speaking, not to mention problems of a.g.c. characteristic in the receiver.

A variant of omni-coverage might be broad beam coverage where a parabola traversing rapidly back and forth over an arc of chosen size would provide a wider area of illumination than that given by the pencil-thin beam emitted from a stationary dish.

Flights of fancy, no doubt, but deserving of thought by those who feel that to be stuck with the "time and bearing" technique on 23 and 13 cm is not the best way to open up these bands.

... AND THE NEXT DOWN

From 2300 Mc/s the next band down is 1296 Mc/s, and here the past month has seen a level of activity probably not reached before. The sporadic spells of good conditions on "Four," "Two" and "Seventy Cems" during late August and early September appeared to assist propagation on "Twenty-three" to a considerable extent.

Even so, contacts over the hundred mile mark on 1296 Mc/s are still rare enough to be noteworthy, and the exchange of signals between G8ACE, indifferently sited at Hatfield,

and G3MPS at Bridgwater (QRB 120 miles) is a feat that should not go undocumented. Please let us have news of others like it.

"Twenty-three's" big moment was of course V.H.F. National Field Day—and if ever vindication were needed of the value of a contest to enhance the art of Amateur Radio communication, this was it. Many groups and clubs had in the months preceding the contest embarked on intensive design engineering work—with cost consciousness paramount—to produce 1296 Mc/s equipment that would make a really good showing on The Weekend. The result was contacts on "Twenty-three" that came to be numbered in dozens instead of the ones and twos of earlier Field Days. Most, according to custom, were generated from previous contacts on 70 cm, the favoured technique being to have 23 cm and 70 cm aerials on the same mast so that alignment for maximum signal on the lower band would give best promise of a contact on the higher one.

Which brings us to . . .

CONTEST NEWS . . .

... and, during that first weekend of September, to a V.H.F. National Field Day that will be long remembered not solely on account of successes on "Twenty-three" but on several other counts besides.

To begin with, there was the weather! After a promising start on Saturday it turned really sour overnight to make camping-out conditions rigorous to say the least. Typical were the Cornish Group's experiences from their 620 ft. site high up on St Agnes Beacon, as vividly described by G3OCB:

"The weather turned very bad, with gales, and on Sunday

LONDON U.H.F. GROUP

"Bull and Mouth", Bloomsbury Way, Holborn, London WCI

6 OCTOBER Lecture on the 432

Mc/s Parabeam by J-Beam Aerials Ltd.

3 NOVEMBER "Aerials for Satellite

Reception" by Peter Blair, G3LTF

I DECEMBER Technical Film Show

Further details from Phil Thorogood, G4KD, 35 Gibbs Green, Edgware, Middlesex morning the heavy rain was so driven by the wind that it stung like hail. The 32 element colinear aerial for 70 cm came down in the night, just missing G3OCB's car. The wind so bent the mast carrying the 6-over-6 aerial used for 2m that it had to be lowered for repair. While the aerial was being rehoisted the mast bent due to the wind pressure, and after it had been erected we just stood and watched the bent 4 ft. section of 1 in. conduit collapse like melting glass. The aerial was eventually erected 4 ft. lower, and minus the U-shaped section!

"However, all present (G3XC, G3OCB, G2BHW, G3LPB and SWL Len Richards) enjoyed the event and are planning for the next. The aurora was missed as we had all

turned in!

An ill wind for many: yet some interesting observations on 2m reception during the storm conditions by BRS15744 of Storrington in Sussex suggest that the intense fading experienced by many could have come from the storm centre. He noticed a distinct rise in the strengths of west country stations as the storm swept eastwards.

Something similar was experienced by a number of Home Counties operators listening to an OZ station during the earlier Scandinavian openings. A thunderstorm was on at the time. With three successive flashes of lightning the OZ

dropped from \$7 to \$4 to zero.

The aurora to which G3OCB refers above was, as well as the weather, the other major event that made V.H.F./NFD, 1966, so memorable. The background to the phenomenon has been provided by V.H.F. Manager Geoff Stone, G3FZL, who reports that a solar flare occurred at 0550Z on Friday, 2 September, which caused a complete fade-out of h.f. band ionospheric propagation (a Dellinger fade-out). The fade-out was very widespread, says Geoff, affecting communications circuits on frequencies from 4 to 19 Mc/s, including both European and more distant links such as Khartoum, Aden and Bahrein. As conditions were beginning to return a second Dellinger fade-out occurred at 0710Z and some circuits did not return to normal until about 0815Z.

At the same time as the release of intense ultra violet radiation which caused the fade-out, particles were discharged which arrived in the region of the earth during the evening of Saturday, 3 September. On 2 September the Indian Meteorological Office issued the following warning: "Moderate to severe magnetic and ionosphere disturbances expected between 2 and 6 September."

On Sunday, 4 September the following was issued:

On Sunday, 4 September the following was issued: "Great magnetic storm in progress since morning 3 September."

On Monday, 5 September the conclusion was reported as follows:

" Magnetic storm ended 03.00 GMT today."

From the European viewpoint h.f. conditions were severely disturbed from late Saturday night 3 September to Sunday morning and also to a lesser extent on Sunday afternoon.

G3FZL concludes by reminding us that as these auroral phenomena frequently repeat at 27 day intervals (one rotation of the Sun) the period around 30 September should have produced further manifestations.

That this particular aurora should have obligingly appeared over the weekend of V.H.F./NFD was a bonus indeed. From all quarters come reports of many unusual contacts having been made under the "spark note" conditions so characteristic of the phenomenon, and of European countries as far east as OH having been heard and/or worked.

One of the most active "auroral participants" was GM3TFY, who is believed to have made some 40 contacts by myriad multipath reflection. And in South Wales a report from GW3FSP shows how the presence of all those Welsh Mountains north of his QTH in Glamorgan have little if any effect on auroral reflected signals. Between 23.10 on the Saturday through to 02.35 GMT of V.H.F./NFD Sunday, Dewi worked the following at strengths averaging S8 out and

in, all with "A" notes: GM3TFY, GM3UM, G8SB/P, G2FO, GW3BA/P, GM3RUF/P, G3JRL/P and G3OZP, most of them many hundreds of miles to the north of him. Also heard at GW3FSP via aurora were GM4HR, GM3NG, GM2HLN, EI2A, GI3RXV, GI5AJ and GW2HIY. Beam direction was set at 20° west of north for optimum reception. Dewi's transmitter runs 150 watts and the aerial is a Skybeam 10 element at 35 ft.

We set out these results in some detail as being typical of the sort of thing that was occurring on that momentous weekend, and to give those who were not actually worked an idea of how their auroral-boosted signals were being

heard down south.

A useful cross-check on the GW3FSP results comes from G3PBV of Northampton, who heard or worked many of the same stations. And here is one of the oddities of auroral propagation: GC3SIT/P was heard on tropo off the back of the beam with aurora superimposed, while at the same time GB3VHF was coming in with a completely auroral note. A total of 12 countries was logged at G3PBV during the "A' opening, excluding an intriguing signal heard on 144.2 giving "IN75A," which put it in Poland. Could be: it would tie in with comments that USSR stations were in evidence on "Two" over V.H.F./NFD. Just how much in evidence is disclosed in a report from G3OZP of North Shields, whose contact with UR2CQ is a cause for congratulation. And so is the prompt receipt of the confirmatory QSL. The incoming UR signal was 59A, and G3OZP in turn received 55A. Seventeen European countries were heard at the North Shields OTH during the opening, and eight worked.

UR2CQ reports that other stations heard but not worked were G2FO, G3KHA, GM3TFY and GM4HR, all under auroral conditions. He goes on to say that his countries worked score is 22, including an A3 contact with HG2RD by meteor scatter. Input used is 120 watts to an 829B, and

the aerial is a 10-element long Yagi.

All UK operators should look for UR2CQ on 145-715. plus UR2CB at 145.652 Mc/s, during forthcoming 27-day

auroral cycles.

On the 4m band, also, the aurora exerted its effect, and among these who found the band open as never before was G3FDW at Retford in Notts, who made no less than 14 contacts on 70 Mc/s within the critical period of 2245 and 03.50 GMT. Mike remarks that the northern stations very quickly caught on to what was happening, and round went the beams to the north. In the course of a QSO with GI3HXV the ghostly auroral sound of G3FDW'S single sideband transmissions was taped by G3SKR down in London-a historical record worth preserving.

Apropos the V.H.F. National Field Day event in general, a less happy note is struck by a number of commentators on the subject of operating standards. Says G2WS, speaking for many: "On V.H.F. National Field Day when QRM reached a new high on the band, 144 to 144-1 Mc/s was literally packed with phone signals. Can we plead for a little more co-operation?

And G3BLP deplores the use of inadequate v.f.o's. "One heard during V.H.F./NFD had a signal at 350 kc/s intervals in and out of the band . . . the prize one when keyed swished through about 200 kc/s in a millisecond or so and finished with a mighty T7 chirp on the chosen frequency."

SLOW MORSE ON "SEVENTY"?

Following recent comment here about the use of Morse by the Class B licensees, G3KGU, who is Organizer of the RSGB Slow Morse Practice Transmissions, states that there is nothing to stop holders of Class A licences radiating Slow



G5ADM/DL7HR/M. See below: "The G-Scene through DL Eyes."

Morse Practice transmissions on 70 cm, once he has the details for publication. Such transmissions, says Mac, would greatly assist the G8-plus-three operators in overcoming the obstacle of the Morse qualification, and he adds: This would be a quicker solution than getting the terms of the Class B Licence amended, even assuming an amendment would be entertained. I would be very pleased to hear from anyone willing to make such transmissions on a regular basis. I already have one offer. Will others follow?"
They certainly should. Write Mac now if you are pre-

pared to join his most valuable service. His QTH: 25

Purlieu Way, Theydon Bois, Essex.

It seems to us that carrying this gesture a stage further it would be helpful if "Four Metres and Down" were to invite all Class B men who would like a slow Morse service to drop a postcard saying so. This way the who and where can be quickly established.

BEACONRY

The 70 cm Cornish beacon may be ready by the end of October, reports G3OCB. Alterations to accommodate it account for the temporary close-down of GB3CTC on 2m for a short time in September.

Another 70 cm beacon of great interest is DJ2LF, which has been on from Dortmund since May of this year. It is 140m above sea level, and the omni-directional aerial is 60m above ground—which all in all sounds like a pretty good site. Frequency is 432.005 Mc/s and the output 4 watts.

From Gibraltar comes the welcome news from ZB2AP that the 4m beacon signing ZB2VHF is now in commission, operating on 70.26 Mc/s with f.s.k. to 850 kc/s. Call-sign and carrier alternate every five seconds. Power: 17-5 watts. Aerial: 4-element Yagi donated by J-Beam Aerials Ltd.

"A lot of hard work has been put into this project by

G3JHM," remarks "Ossie."

Any reports of reception of ZB2VHF on "Four" can be sent to ZB2AP either on 14-1 Mc/s between 18.00 and 18.30 GMT daily, or via mail to J/T Osborne, Devils Tower, RAF North Front, Gibraltar.

THE G-SCENE THROUGH DL EYES

Making the most of the reciprocal licensing facility, many of our confreres from Germany have been prominent on the v.h.f. bands this last summer using the new G5-plus-threeand-suffix call-signs as they circumnavigated the British Isles as holiday tourists. Very nice it has been to have them among

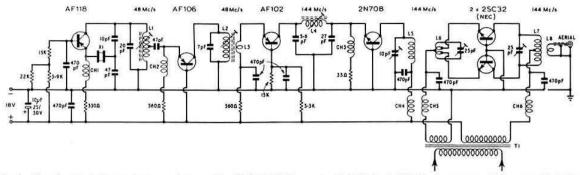


Fig. 1. Circuit of the half watt 2m transmitter used by G5ADU/DJ700, sent to the Bulletin via G6SN, who was one of the many Yorkshire area stations worked during the recent visit to England. Details not given on the circuit are: L1, 8 turns 6mm diam., tapped at 4th turn, with iron core. L2, 4½ turns 6mm diam., with iron core. L3, 3 turns of insulated wire wound over L2. L4, 6 turns 6mm diam., with iron core. L5, 4 turns of insulated wire in the centre of L6. L6, 2 by 2 turns 6mm diam., tapped at each turn. L7, 2 by 2 turns 70mm diam., centre tapped. L8, 2 turns 10mm diam., insulated wire in centre of L7. All coils wound with approximately 8to 20 s.w.g. tinned copper wire. L9 and L10, 60 in. thin (say 36 s.w.g.) cotton covered wire wound on a resistor. L11 to L14, 19 in. wire as L9. T1, modulation transformer accepting approximately 1 watt of audio from a transistor modulator. Sec.1, 15 turns, Sec.2, 800 turns, approximately 1 in. diameter. X, crystal for 48 Mc/s to desired channel frequency. Transistors are standard types except that the push pull final uses two of Japanese N.E.C. origin, type 2SC32.

us, with consequent enlivening of the 2m band on many occasions.

Way down south in Plymouth G5ZT had a fine contact with G5ADW/DL7MN/A (almost as difficult to type as to send!), and way up north as already reported G6SN and other Yorkshire members were much entertained by the transistor micro-squeak of DL7OO operating under his G5ADU call.

And how do we look and sound to our visitors? A letter received from DL7HR helps us see ourselves as others see us. This is what Berndt has to say:

"I spent a very nice holiday in G, GW and GM, though I had a little trouble with my car (puncture in the back wheel, therefore running into bushes and damaged the whole left side).

"I was glad to receive the British mobile licence with the terrible long call-sign G5ADM/DL7HR/Mobile. I only worked on 2m but I had a lot of contacts and it was always nice to meet the British OMs. Very often I got a personal invitation and the obligatory cup of tea.

"As an old v.h.f. man I was always looking for high spots and I think I found very good ones... Including the Fourth 2m Portable Contest I made about 60 contacts. During this contest I have been on top of the Green Lawther in Scotland. The only trouble was I had the wrong crystal for the north (144·1 Mc/s). I called the whole time but the result was only a few replies! The total score 5638 points. Nearly everybody moaned about my long call-sign, especially for a contest, as the call-sign was even too long for the small log columns!

"The activity in Great Britain is about the same as in DL. New for me was the use of n.b.f.m. but it sounds well and is a good aid against TVI and BCI . . . s.s.b. has to become more popular in the UK. At home (near Munich) I am on s.s.b. and c.w. using a 4X150 and a British made 10-element Skybeam. For s.s.b. calls listen to 145-415 and around . . ." (And in case you think this has been edited we will just confirm that it is virtually as DL7HR wrote it.)

TECH CORNER

Since the introduction of the revised British Isles Two Metre Bandplan on 1 August, with its sponsorship of spot frequency working, interest in variable frequency oscillators for v.h.f. transmitters has been accelerating. We are glad to be able to publish some more information about them here in "Tech Corner" while at the same time voicing the hope

that very soon one or more of the successful v.f.o. users will give the BULLETIN a full-dress constructional article about the particular design he uses, why he likes it, and—in detail—how he built it. The literature on the subject ought to be expanding from now on.

Meanwhile, to our immediacies:

From G3FDW:

The "V.H.F. Signal Shifter" at G3FDW consists of a very old s.s.b. exciter with output at 6-9 to 7-3 Mc/s, and home constructed, and is a phasing type exciter on 9 Mc/s. The v.f.o. is a Colpitts and covers 5-1 to 5-5 Mc/s. A 10-7 Mc/s crystal in this exciter produces the 6-9 to 7-3 Mc/s output: about half a watt is available, which goes to the v.h.f. mixer unit. This half watt can be s.s.b., a.m., f.m., m.c.w. or c.w. The last two are produced by feeding a 1000 c/s tone into the s.s.b. generator.

The v.h.f. mixer is as shown in Fig. 2.

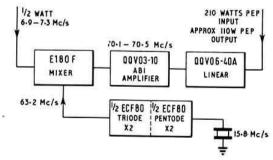


Fig. 2. The G3FDW "signal shifter" for 4m: block diagram.

All oscillators are run continuously.

All mixers are keyed by a -50 volt relay switched line, a contact on the VOX relay in the basic s.s.b. exciter. The aerial changeover relay is controlled via the VOX relay and this in turn controls the supply to converter, mixer and r.f. amplifier. The converter oscillator runs continuously and provides a sidetone facility on "transmit."

As the basic control is via the exciter VOX system one needs only to speak into the microphone or key the transistor

to give a 1000 c/s tone and everything goes to TRANSMIT, sidetone then being available to monitor all modes.

Netting is simply carried out by supplying a very small output from the s.s.b. exciter to the E180F mixer (not switched on). Enough output is there to be heard in the converter.

Frequencies have been selected with TVI considerations in mind.

From G3BA:

A skeleton diagram of the "Variverter" for 2m which was outlined in "Tech Corner" last month is shown herewith (Fig. 3). As will be recalled, the main transmitter is tuned up on 130 Mc/s and the output from a small v.f.o. mixed with the input to the final stage.

The "Variverter" has three stages: a v.f.o. covering

The "Variverter" has three stages: a v.f.o. covering 14-16 Mc/s; a balanced mixer using a miniature double

tetrode and operating at high level; and a variable gain amplifier to produce the amount of r.f. which the original multiplier gave to drive its amplifier.

All switching and operational functions are done as normal on the transmitter unit and the "Variverter" is left just as a black box but fitted with a dial to give the frequency of the transmitter output.

This type of device can be used just as easily on 4m although the v.f.o. range need only be 600 kc/s in this case. The "Variverter" can be

The "Variverter" can be heard in action on 145.3 Mc/s when G3BA reads the RSGB News Bulletin.

From G3PBV:

A v.x.o. has been built which covers the whole of the 2m and 70 cm c.w. zones. It consists of an HC6U 36 Mc/s crystal working on its fundamental of 12 Mc/s into the normal E180F crystal oscillator, using a Colpitts circuit. A 25 pF series capacitor gives 100 kc/s swing on 2m.

100 kc/s swing on 2m.
The cathode of the last doubler to 144 Mc/s is keyed, but there is some reaction back to

the c.o. It was found possible virtually to eliminate the chirp on 2m although there is a little at 70cm. This was done with capacitive looding (about 18 in. of co-ax connecting the v.x.o. box into the transmitter), and also by decreasing the grid leak to 12 K ohms.

The oscillator will eventually be transistorized when a suitable input amplifier has been developed.

From G8ARV:

The Bridgnorth Group, G3SVR, were using a rather interesting 23 cm converter for V.H.F./NFD. It was a modified valve converter in which the oscillator chain had been transistorized ("half the space and oodles less power," to quote G3OAD). The oscillator used a 53 Mc/s crystal followed by a doubler to 106 Mc/s, followed by a varactor step recovery diode multiplying by twelve to 1272 Mc/s.

From G3FZL:

I have been experimenting with a varacter (Mullard BAY96) tripler from 2m driven by a QQV03-20A running 20 watts input. The tripler was designed and constructed by George Jessop, G6JP. The interesting thing is that amplitude modulated drive gives perfectly adequate communications quality at the output frequency, whereas a frequency tripler could be expected to triple the sideband frequencies also, and thus multiply the audio frequency range by three.

The reason why this does not occur has been investigated, and it seems that the device is in fact a parametric up-

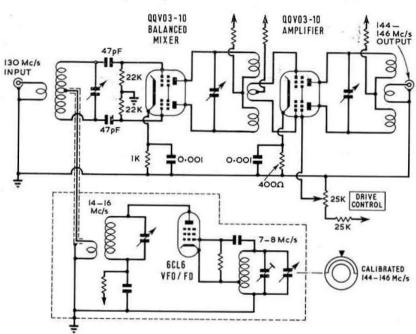


Fig. 3. Skeleton circuit of the G3BA " Variverter " for 2m.

From G6LL:

At G6LL the 2m v.f.o., which has been in use for a number of years, employs a cathode coupled oscillator at 18 Mc/s followed by a multiplier chain. To maintain stability the oscillator is kept running continuously even during reception periods, with the result that a heterodyne beat would be produced if co-channel working were attempted.

In order to achieve co-channel net operation a simple means of shifting the oscillator frequency during reception periods was devised, consisting of an SX761 varicap diode connected across the coil of the v.f.o. Rendered operative on RECEIVE by the application of a small voltage, the varicap moves the v.f.o. frequency by about 3 kc/s. At the operating frequency (times 8) this amounts to a shift of 25 kc/s or so.

The SX761 (latterly superseded by the SVC1 and SVC2) is a *p-n* junction diode, and the small d.c. voltage, derived from the l.t. line through a low voltage diode rectifier, is applied to it during listening periods to effect the change in frequency; the d.c. is kept out of the tuned circuit by a buffer capacitor.

The actual wiring arrangement is as follows:

Negative d.c. is applied through an r.f. choke to the varicap, which is connected to the hot end of the oscillator coil via a 0.01 μ F capacitor. The other end of the varicap is earthed. The d.c. voltage is applied to the varicap through a high value series resistor (say 3 Megohms).

No change has been observed in the capacitance of the varicap through temperature variation. converter and not a tripler in the valve sense. Hence the output power is proportional to drive, and thus a.m. drive

gives an output similarly modulated.

This device was used with success on V.H.F./NFD when G3FZL/P was operating from the North Downs. Several comments regarding the good quality of the modulation were passed. It is hoped that an article about the device will be completed shortly.

From G3FDW

The following tip may be of interest to the operator who uses a converter which having a low i.f. suffers from breakthrough.

A recent investigation proved that breakthrough was occurring only at the tunable i.f. strip (receiver) covering 9.65 to 10.25 Mc/s for the 4m band. It appeared to be due to mains lead pick up, but when a filter was made up to the accompanying diagram all i.f. signals dropped to a level below that of the converter noise output.

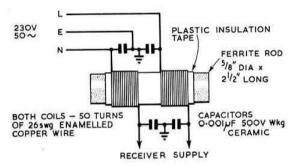


Fig. 4. The G3FDW "anti-breakthrough" filter. Values are as follows: each coil, 50 turns 26 s.w.g. enamelled copper wire. Former: ferrite rod $\frac{1}{4}$ in. diameter by $2\frac{1}{2}$ in. long. Capacitors: 0·001 μ F ceramic, 500 volt working.

This only works if the converter itself is free of i.f. breakthrough. This is easy to ascertain. Nearly always it is the station receiver that seems to be at fault.

The filter can be installed in the receiver cabinet if desired, but the lead length from the mains should be kept to a minimum.

From A4035:

I was very interested in the "communal" 4m transistor converter by A4388, published in "Tech Corner." A fact which struck me when examining his circuit was that injection can be further aided by arranging for L1 and L2 to be disposed in line, bottom coupling also existing along the common earth line. But I would be interested to know where A4388 obtained his 65 Mc/s overtone crystal!

From BRS27452:

Having passed my RAE in May, and now with the intention of taking my Morse test, I want to make a start on "Four" and to this end I have just purchased a B44 Mark 2. I wish to use a moving coil microphone with this device and understand that several operators have improved the audio sound of the B44 with the aid of transistor preamps. May we have information in "Tech Corner," please, from those who have used them?

Another modification I am anxious to make is to fit a key for c.w. I understand that many people simply feed in an audio signal at the microphone socket and so obtain m.c.w., but I feel that an interrupted carrier would give a distant station far more chance of resolving the signal. How is the best way to achieve the c.w. facility on the B44?



Seen at the Woburn Rally: the mini-halo for 2m on the mini-car belonging to G3PKT, described here last month. (G5UM print)

POINTS OF VIEW

"In the case of a 50 watt 70 cm transmitter interfering with a newly established BBC-2 receiver either (a) through cross modulation of a preamp or (b) through spurious responses of the u.h.f. tuner, would the amateur concerned be asked to close down?" (G8ARV).
"I still have some of those rather fancy ZB2 QSL cards

left, so I hope to get rid of a few when 4m opens! "(ZB2AP).

(See picture in the August issue.)

I vehemently agree with the G3LTF comments about s.s.b. sidebands and think the supposed 145.41 Mc/s sideband frequency a big laugh. It really means 145.41 plus or minus 25 kc/s for sideband spreading into Zone 7-and hard luck on any Zone 7 operators with crystals in this region. (G3BLP).

(Continued on next page)

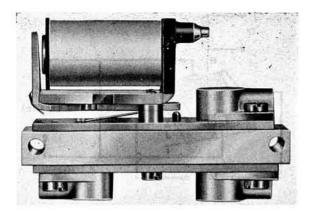
V.H.F./U.H.F. BEACON STATIONS

Call-sign	Location	Nominal Frequency	Emis-	Aerial Direction
GB3ANG	Craigowl Hill, Dundee	145-985 Mc/s		S
GB3CTC GB3GEC	Redruth, Cornwall Hammersmith,	144-10 Mc/s	AI	North-East
10000000	London	431.5 Mc/s	FI	
GB3GI	Strabane, N.I.	145-990 Mc/s	AI	
GB3LER	Lerwick	145-995 Mc/s	AI	S
GB3LER	Lerwick	70-305 Mc/s	AI	N/S
GB3LER	Lerwick	29.005 Mc/s	AI	N/S
GB3VHF	Wrotham, Kent	144.50 Mc/s	FI	North-West

RSGB V.H.F. BEACON STATION GB3VHF

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

Date					Time	Error
2 August	***	12.50			10.20 GMT	260 c/s low
9 August		955	9330		14.08 GMT	300 c/s low
	3000	***	2000	686	11.13 GMT	260 c/s low
23 August	****	1555	00000	***	16.30 GMT	250 c/s low
30 August	300	760			15.15 GMT	260 c/s low
6 September	600	212.5	2007		10.14 GMT	250 c/s low
13 September	555			***	12.50 GMT	240 c/s low
20 September	8.0			199	14.43 GMT	300 c/s low



Coaxial Relay Type 951

By G. R. JESSOP, G6JP*

Possibly one of the most attractive relays to become available to the amateur but which does not appear to have received the attention it deserves, is the coaxial aerial

changeover relay, type 951.

The illustration, which is reproduced approximately full size, and the outline drawing Fig. 1 give the salient dimensions of the complete unit. It is a small package that will easily fit into all kinds of equipment, especially for portable and mobile applications. Its small size makes it equally useful for valve and transistor transceivers or transmitters and can function as a normal aerial change-over for TRANS-MIT-RECEIVE, a switch for aerials or converters on 144 and 432 Mc/s, or any similar use where coaxial lines need to be changed from one circuit to another.

Unlike most co-axial relays, this type is not terminated in coaxial connectors, but instead its connections are made to small solder tags, which are enclosed by screening caps. These are designed to make full contact with the outer screen of the connecting cable, thus preserving the screening right up to the solder connection. Each of the three screening caps can be fixed in any one of three postions so that the most

convenient cable direction can be chosen.

*Member of RSGB Technical Committee. 32 North View, Eastcote, Pinner, Middlesex.

Four Metres and Down (Continued from previous page)

"The new bandplan for 144-144·1 is not working so well in the South West. A number of regular users of the band are continuing to use phone between 144 and 144·1 Mc/s and effectively blotting out the c.w. signals from distant parts. I can only hope these gentlemen have ordered crystals to bring them into the 144·1 to 144·25 Mc/s zone for their phone operating. Until they move the new plan is virtually useless." (G2WS). (Now at Weston-super-Mare).

LAST ROUND UP

From G2HHV, Dewsbury, comes a request that operators should keep clear of 145.5 Mc/s during the few minutes each week when the RSGB News Bulletin is read. He quotes an incident when two operators who should have known better carried on a QSO within cycles of this channel while he was putting out a Sunday morning newscast. There is no excuse

The contact rating for continuous service is quoted as 1 amp, or 30 watts, but it is considered that these figures can be increased to 2 amps (peak), or 50 watts.

The nominal maximum frequency is quoted as 450 Mc/s with a v.s.w.r. of 1-1 to 1. The design impedance is 50 ohms, which suits the current tendency to replace 75 ohm cable with that of 50 ohms nominal impedance. The cable for which the relay fittings are designed is UR 43.

The operating coil can be supplied for operation on any d.c. voltage up to 100 volts with a maximum power consumption of 1.5 watts. This rating provides a satisfying operating speed at 80 per cent of the normal working voltage. The sample tested which was intended for operation at 12 volts was found to function satisfactorily at only 8 volts and consumed only 0.44 watts. At this reduced voltage, the operating speed may have been reduced, but this was not apparent.

The speed of operation at normal voltage is quoted as

20 mS make, and 8 mS break.

Other features of this relay are isolation between all terminals and the frame (tested up to 1000V r.m.s.), temperature operating range from -40 to +100°C, the finish is silver plated and it weighs only 34 oz.

silver plated and it weighs only $3\frac{1}{2}$ oz.

The cost of this relay is 37s. 10d., but, if purchased in larger quantities of 20 or more, the cost is then reduced 31s. 6d. each. The manufacturers, Magnetic Devices Ltd., Newmarket, Suffolk, are prepared to supply individual purchasers on a one-off basis.

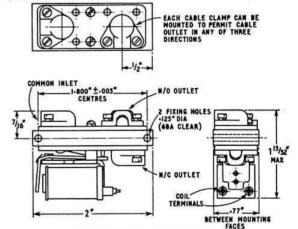


Fig. I. Dimensions of the 951 relay.

for this: the times of the broadcasts are known, and unintentional QRM to them can be avoided. "Either the news bulletins are wanted or they are not," declares John: "In fact it might be a good idea to get a referendum on this,"

New QTH at Cirencester for G8AOJ will help keep Gloucestershire on the 70 cm map. If you want to hear a varactor at work listen for his signal (still using his old London zone crystal at the moment, but a West Country zone "rock" is on the way).

If you get your BULLETIN in time you might just catch GM3GGK/P in Caithness and Sutherland, c.w. only in the proper Morse-zone, 1800 to 2000 GMT daily, October 3-6.

Over 50 stamped addressed envelopes have been deposited with G2AOX in readiness for "Oscar" news. They come from EI, F, ON and PA, as well as the UK, and even from the Faeroe Islands too. If you want early "Oscar"-info lodge an s.a.e. with Bill Browning at 47 Brampton Grove, London, NW4.

The Hall Effect

A New Approach to the Generation of Suppressed Carrier Signals

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

RECENT developments in the field of semiconductors have permitted an electro-magnetic phenomenon known as the "Hall Effect" to be usefully employed in applications where hitherto practical considerations have prevented its use. The effect was discovered about 20 years before this century, but until a few years ago it could only be produced at extremely low impedances which were totally impracticable for the circuitry where the property would be of any value. Fortunately, however, semiconductors have provided a solution to the earlier stumbling blocks, and there now seems to be a clear field for development.

There is one application which is of some importance to the amateur, that of the generation of suppressed carrier signals, but before this can be considered in any detail, an explanation of the nature of the Hall Effect is essential.

The Hall Effect

Basically, the theory of the effect is that when a current is passed longitudinally from end to end through a thin plate of semiconductor material while the plate is simultaneously subjected to a magnetic field in a direction perpendicular to the plane of the plate, a potential difference is developed between the two side edges. This potential difference is directly proportional to both the magnitude of the longi-tudinal current and the strength of the magnetic field, and is normally referred to as the "Hall voltage" (En), or the output voltage. It is given by the equation:

Open circuit output voltage $(E_{\rm H}) = \frac{R_{\rm H.} \ H. \ IC.}{d} \times 10^{-8}$ volts

where RH (given in cm3/coulomb) is a constant of the material known as the Hall coefficient. H is the magnetic field strength in Gauss.

Ie is the current passing longitudinally through the plate, known as the control current. d is the plate thickness in cm (a constant)

The Hall coefficient is a figure indicating the sensitivity of the material, i.e., the open circuit output voltage relative to the magnitudes of the magnetic field strength and control current, different materials giving different output voltages.

A general arrangement for what is known as the Hall multiplier is shown in Fig. 1. In this arrangement a load resistor is shown across the output terminals rather than the open-circuit output voltage condition referred to earlierthis being the condition most likely to be met in practice.

The magnetic field is produced by virtue of a current flowing through a coil and, being directly proportional to that current, we can represent the H term in the output voltage equation by the current producing the field, which we will

Hence
$$E_{\rm H}=\frac{R_{\rm H.}\ I_{\rm F.}\ I_{\rm C.}}{d}\times 10^{-8}\ \rm volts.$$

$$E_{\rm H} = \left(\frac{R_{\rm H.} \ 10^{-8}}{d}\right) \times (I_{\rm F.} \ I_{\rm C.})$$

Rearranging the constants: $E_{\rm H} = \left(\frac{R_{\rm H} \cdot 10^{-8}}{d}\right) \times (I_{\rm F}, I_{\rm C})$ or $E_{\rm H} = K(I_{\rm F}, I_{\rm C}) \text{ where } K \text{ denotes constant term.}$ The output voltage is now seen to be directly related to the

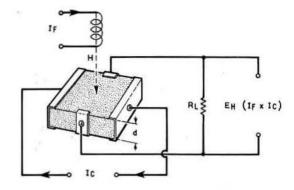


Fig. I. A representation of connections to a Hall plate.

product of the two electrical quantities I_F and I_C (field current × control current), the all important feature which makes it suitable for the generation of suppressed carrier signals.

This latter statement sounds rather glib but can be explained in a manner which can be readily understood by

even the non-mathematically minded.

In modulated radio frequency applications, the two currents I_F and I_C would be produced by two alternating voltages, one at audio frequency and one at radio frequency.

Any sinusoidal alternating signal can be represented by an expression such as $V \sin \omega t$ or $I \sin \omega t$, depending on whether voltage or current is being considered. As we are considering currents, we shall use $I\sin\omega t$, but before using such expressions, let us briefly consider what they mean.

I is the peak amplitude of the current, sin is a function determining the phase of the waveform, and ωt represents the frequency of the alternating current ($\omega = 2\pi f_1$ hence $\omega t = 2\pi f_1 = f(2\pi t)$). We could just as easily have used cos instead of sin in this expression, the only difference being the point at which your pencil starts when drawing an alternating curve, but from a practical standpoint we can ignore the sin component, and merely consider the expression I sin wt as being an alternating current of amplitude I (in

milliamps), and frequency of (in cycles per second).

In this "Hall multiplier" (given this title because the output voltage is related to the product of the two input signals) we are dealing with two alternating currents I_F and

These currents can at any instant of time be represented by $I_{\rm F} = i_{\rm F} \sin \omega_1 t$ and $I_{\rm C} = i_{\rm C} \sin \omega_2 t$ where $i_{\rm F}$ is the peak amplitude of the field-producing current, at a frequency of f_1 cycles per second $\left(f_1 = \frac{\omega_1}{2\pi}\right)$, and i_0 is the peak amplitude of the plate longitudinal control current, at a frequency of f_2 cycles per second $\left(f_2 = \frac{\omega_2}{2\pi}\right)$. Thus the product $I_F \times I_C$ becomes

 $i_F \sin \omega_1 t \times i_C \sin \omega_2 t$.

Now there is a trigonometrical identity which states that 2. $\sin A$. $\sin B = \cos(A - B) - \cos(A + B)$ or $\sin A$. $\sin B = \frac{1}{2}(\cos [A - B] - \cos [A + B])$.

Substituting the two current expressions $i_F \sin \omega_1 t$ and $i_C \sin \omega_2 t$ into this equation (for A read $\omega_1 t$ and for B read $\omega_2 t$) we derive

 $i_F \sin \omega_1 t \times i_C \sin \omega_2 t = \frac{1}{2} i_F$. i_C . $(\cos [\omega_1 t - \omega_2 t] - \cos [\omega_1 t - \omega_2 t]$

positioning, for looking at the result it can be seen that we

 $[\omega_1 t + \omega_2 t]$). Do not worry if you cannot follow this algebraical juxta-

^{* 52} Marlborough Avenue, Grange Park, Gosforth, Newcastle-upon-Tyne 3.

now have two different signal frequencies from the two which were multiplied together:

(1)
$$\frac{i_{\text{F. }}i_{\text{C.}}}{2}$$
 × cos $(\omega_1 t - \omega_2 t)$ and (2) $\frac{i_{\text{F. }}i_{\text{C.}}}{2}$ × cos $(\omega_1 t + \omega_2 t)$.

Translating these into practical terms we have two alternating current signals:

(1) a signal with an amplitude given by $\frac{i\mathbf{r} \cdot i\mathbf{c} \cdot}{2}$ milliamps, at a frequency which is the difference between the two input signal frequencies ($\omega_1 - \omega_2$)t c/s,

and (2) a signal with an amplitude of $\frac{i_P}{2}$. milliamps at a frequency which is the sum of the frequencies of the two

input signal frequencies, $(\omega_1 + \omega_2)t$.

Notice that the two original input frequencies $\omega_1 t$ and $\omega_2 t$ do not appear individually in the output equation, i.e., in terms of modulated r.f. output, the modulating frequency and the carrier frequency have been suppressed, and only the upper and lower sidebands $(\omega_1 + \omega_2)t$ and $(\omega_1 - \omega_2)t$ appear at the output terminals. This differs from the bridge modulator output in that none of the higher carrier harmonic sidebands are present in the output.

A semi-conductor material suitable for this purpose must

fulfil three main requirements:

 it must be of high carrier mobility, affording low resistivity, whereby power may be drawn from the plate;

(ii) the Hall co-efficient R_{II} should be high, to give outputs which can be amplified directly by valves or transistors. This is achieved by using a material of low carrier concentration;

these two factors must be reasonably independent of temperature to afford stability of operation.

Materials commonly used are indium arsenide (InAs), and indium arsenide-diphosphide (InAsP₂). Indium antimonide (InSb) is also useable but is very temperature conscious. At low temperature, it has the highest sensitivity, but the first two materials have sensitivities which remain sensibly constant over a wide temperature range. Fig. 2 illustrates this point.

Construction

The electrical system of the Hall modulator or multiplier consists of a thin strip of semi-conducting material (say Indium Arsenide)* with its metallic edge contacting electrodes and connecting leads. Plate dimensions might be of the order 20 \times 10 \times 0-1 mm. The longitudinal control current is fed in via the end electrodes, and the side electrodes

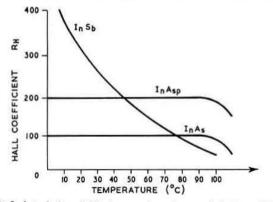


Fig. 2. A typical sensitivity/temperature characteristic for a Hall multiplier.

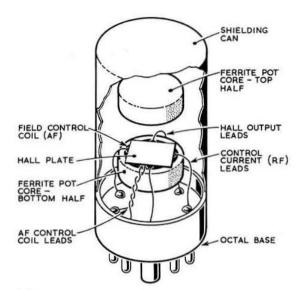


Fig. 3. A convenient holder for a Hall effect device is an Octal valveholder with an aluminium screening can.

present the Hall output voltage. The field coil is wound within a ferrite pot core, and the plate is mounted flat in the space between the upper and lower halves of the core so that it is directly within the magnetic field of the coil. This part of the assembly would normally be encapsulated in epoxy resin or similar material to safeguard the thin plate.

An external circuit comprising a few resistors completes the electrical system, the whole assembly being contained in a metal shielding can, about the size of an octal based receiving valve, with a similar base. Constructional details are given in Fig. 3.

Characteristics

The input currents I_F and I_C are fed into the coil and plate respectively, preferably from high impedance sources, the magnitudes of the currents being such that the plate does not overheat and the ferrite core does not magnetically saturate.

Linearity, defined as the width/height ratio of the hysteresis loop, is very good, being almost a straight line proportional to the control current I_c , and any deviation from the straight line is with respect to the field current I_F owing to hysteresis in the coil, but does not normally exceed I per cent.

Owing to thermal effects, a small residual voltage component, known as the resistive zero component (typically about 50 micro-volts), is usually superimposed on the Hall output voltage, but can be balanced out with the circuit shown in Fig. 4. Another small residual output voltage, the inductive zero component, again typically 50 micro-volts, can appear at the output owing to direct pick-up between the input and output circuits, but can be minimized by careful layout of the interconnecting leads. It is advisable to position a screen between the base and the socket to aid the reduction of this coupling.

The Hall coefficient $R_{\rm H}$ is slightly temperature conscious which means that the output voltage may decrease with a temperature increase by about $0.1\%/^{\circ}$ C, although this is not normally troublesome in practice.

A typical set of characteristics for a Hall multiplier

^{*} Hall effect devices are not too readily available at economical prices, but a suitable kit is available from Livingstone Laboratories, Greycaines Estate, Bushy Mill Lane, N. Watford, Herts, at £14. It is believed that Hall effect devices are also obtainable from Beckman Instrument Ind. Inc.. The Helipot Division, Fullerton, Calif., USA, and Glenrothes, Scotland.

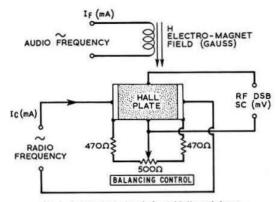


Fig. 4. A complete circuit for a Hall modulator.

designed for audio-frequencies in conjunction with transistor circuitry is given below:

ohms. R_{in} Rout 5 ohms. 300 mA r.m.s. max. $I_{\rm C}$ 200 mA r.m.s. max. IF Coil 300 turns. 10 K gauss. Field strength 10 ohms. Coil resistance Output voltage 80 mV r.m.s. Sensitivity 0.006 mV/mA/turn. Linearity 1 per cent.

Applications

The Hall effect lends itself to many useful applications. For example, by keeping the plate current $I_{\rm C}$ constant, and varying $I_{\rm F}$, the output voltage would give a measure of an external magnetic field. Ferrite cored assemblies could be used to convert magnetically recorded fluxes into electrical signals. Or, use of a d.c. plate current in conjunction with an alternating magnetic field current produces a d.c./a.c. inverter for use with magnetic amplifiers, etc.

The Hall Effect multiplier is used extensively in analogue computers, giving the products, quotients, and reciprocals

of two electrical quantities.

Analysis of a complex electrical waveform is possible by feeding the complex signal into the plate and using a variable frequency current to produce the magnetic field, thus giving an output voltage whenever the field frequency coincides with any of the frequencies contained in the complex plate input waveform.

But the application of most interest to the radio amateur is the possibility of generating a double sideband suppressed carrier signal. This can be effected by using a radio frequency control current I_c , with an audio frequency current producing the magnetic field via the coil, or possibly vice-versa by using the coil as part of the tuned circuit at r.f. Carrier suppression up to 60 to 70db can be achieved if reasonable care is taken to balance out the resistive and inductive zero components. Single-sideband signals can then be produced by any of the normal methods.

Even more interesting, but obviously much more difficult to achieve, is the generation of a single sideband suppressed carrier signal, with a choice of upper or lower sideband! Such a device has recently been demonstrated in this country.

In this device, a cube of semi-conductor material is subjected to a rotating magnetic field on four of its faces while a rotating electric field is impressed on the four corresponding edges. Using "vectorial" multiplication, the resultant Hall voltage appearing across the two end faces is a lower sideband suppressed carrier signal when fields are rotating in the same direction, and an upper sideband suppressed carrier signal when in contra-rotation.

For those not familiar with the terms rotating magnetic and electrical fields it should perhaps be explained that such fields are produced by the resultant of two separate fields having a phase difference of 90°—there is no mechanical movement involved.

No mechanical details have been published of the s.s.b. device, but the d.s.b. version is so simple that it surely

warrants further investigation.

The low input and output impedances of a Hall device make it eminently suitable for use with transistors. The driving power requirements are small—typically \(\frac{1}{2}\) to \(\frac{1}{2}\) watt—and the output voltages are quite useable.

There is, however, a snag. Commercially produced assemblies are rather expensive and are mainly for audio frequency work (although there are some available which will work up to a few megacycles), but there is no reason why any semi-conducting material could not be utilized to this end, possibly with reduced output.

The radio amateur has so often led the field of development

-why not this one?

RSGB International Radio Communications Exhibition

List of Exhibitors

Royal Signals	Stage
LST Components	1
General Post Office	2
Radio Society of Great Britain	3/4/5/6/7
Wireless World (Iliffe Electrical	
Publications Ltd.)	8
British Amateur Radio Teleprinter Group	9
British Amateur Television Club	10
Electroniques (Prop. STC Ltd.)	11/12
Peter Seymour Ltd.	13
Philadelphian Electronics Ltd.	13A
Green Electronic & Communication	
Equipment Ltd.	14
T. Withers (Electronics)	15
Alfred Imhof Ltd.	16
Enthoven Solders Ltd.	17
Salford Electrical Instruments Ltd.	18
Short Wave Magazine Ltd.	19
Multitone Electric Company Ltd.	20
KW Electronics Ltd.	21
Daystrom Ltd.	22/23
J-Beam Engineering Ltd.	24
Partridge Electronics Ltd.	25
Amateur Tape Recording Magazine	26
P.F. Ralfe Radio	27
Royal Navy	28
Amateur Radio Mobile Society	29
Contactor Switchgear (Electronics) Ltd.	30
Weller Electric Corporation	31
Ad Auriema Ltd. (National Radio of America)	32
Brian J. Ayres & Co.	33
Grampian Reproducers Ltd.	34
Baden-Powell House Scout Amateur Radio	01
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Further details can be found on pages 625 and 665.

THE MONTH ON THE AIR By JOHN ALLAWAY G3FKM

WO items concerning the ever-present problem of the OSL card have come to the writer's notice during the past month. The first is a duplicated letter currently being sent out by ET3AC to listeners who have sent him incomplete reports. He makes the point that he is pleased to QSL to listeners, but as most reports come from areas which he is actually contacting at the time he is being heard by the reporter he feels that in order to qualify for a reply more than one QSO should be logged. Only a quarter of reports received at present are complete and accurate, and these are all QSLd, direct if s.a.e. and IRCs are enclosed, or via the bureau otherwise. Blake quite rightly believes in encouraging listeners in every possible way, most of whom will ultimately become licensed as the best SWLs become the best amateurs. One of the encouraging features of the correspondence received by G3FKM has been the number of listeners who have become G3s during the year.

The second item concerns a note received from VE4OX. This makes the point that all QSLs received for stations for whom Ed acts as QSL manager via the bureau are destroyed and not answered. He considers that anyone really interested in receiving QSLs would send direct with s.a.e. and IRCs, and that the people who QSL via the bureau are merely

collecting wallpaper.

Readers will no doubt be interested to know that FCC has rejected a suggestion that the maximum power input permitted to W stations should be reduced gradually over a period of time to 125 watts. The Commission does not feel that such a power reduction would reduce mutual interference problems to any significant extent.

G3RZI (82 Evesham Road, Astwood Bank, Redditch, Worcs) is interested in making a camping DXpedition to Andorra next summer, and would be pleased to hear from anyone who would be interested in joining in, preferably the owner of a KW2000 (who can speak some French!)

News from Overseas

A letter from Maurice Caplan, 9V1MK, says that after everything was packed up and ready for the trip to Brunei which he had been planning, the military authorities decided that they could not find the necessary accommodation, so the whole thing had to be called off. He sends his sincere apologies to all those who searched the bands for him in vain.

News of G3SJ, who is now resident in Madeira, and who was signing G3SJ/CT3 for a while a few weeks ago, has been received via G2MI. It seems that due to some misunderstanding his permit only held good for operation from another licensed CT3 station's location, but matters have now been regularised and he now holds the call-sign CT3AS. Any prospective visitor from the UK who hopes to operate from Madeira is advised to allow plenty of time for his application to be dealt with. There are only three other CT3 stations active at present, CT3's AE, AO, and AV, and none of them appears to be very interested in DX working. CT3AS is looking for UK stations on 10, 15 and 20m, and promises 100 per cent QSL. His address is Rua No. 1, Bairro das Virtudes, Funchal, Madeira.

10 Knightlow Road, Birmingham 17. Please send all reports to arrive by
 5 October for the November issue, and 16 November for December.

What will probably be his last report from Jamaica before he leaves at the end of October has been received from 6Y5FH. He hopes to have a last try at working some Europeans on 160m if conditions and QRN permit. He is finding conditions on 20m so good that he rarely moves off that band, and is usually to be found on Tuesday and Friday at around 22.00 looking for G stations on 14075 (plus or minus 5) kc/s. On his return, Frank will be temporarily living in Stourbridge.

A circular received from our old friend Gus Browning, W4BPD, and holder of many other calls, describes a new weekly publication—the "DX'er's Magazine" which Gus is now producing. This is guaranteed to be issued at least 36 times a year, and will contain interesting information on current DX, DXpeditions, and much information of interest to DXers. The subscription rate for European stations (by air mail delivery) is \$19 per annum. Interested parties should contact Gus at The DX'er's Magazine, Route 1, Box 161A, Cordova, SC, USA.

DXCC News

It is announced in the September issue of QST that, in direct contradiction of the notice in the January issue of that publication, the telephony DXCC listing will be continued indefinitely. This will be received with mixed feelings by those who used to collect separate phone "countries" and gave up the practice after reading the first notice!

ORP News

G3TFX has been experimenting with 10 watts into a 120 ft. wire. He has had no difficulty in raising most of Europe on 7 Mc/s, and on 14 Mc/s he was rewarded by making contact with W3EPV, who gave him RST569. Richard's transmitter is crystal controlled at present but he hopes to have a v.f.o.

The only other contributor who admits to running less than the full legal power on all occasions is G3URX. He is now up to 52 countries worked with his 25 watts and vertical aerial. On 14 Mc/s he has had QSO's with JA, PY, UL7, UH8, UI8, UW0, VE and all W districts besides 6 and 7.

Further documentary evidence that there are transmitting



Iris and Lloyd Colvin with G2LB and G2LU during their recent stay in Jersey when they used the call GC5ACI/WB6QBP.

PROPAGATION PREDICTIONS

		X.		14 Mc/s						остов	ER 1966	
U.S.A EAST (W1-4)	S,	P.			CZZ	7	,,,,,,,,,,,,	annun i	11111		THIIII.	
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7				21 Mc/s					_		ER 1966	
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CARIBBEAN (6Y5/FM/TI)	S.	P.					7//	mmmn.	70	WIII/A		
BRAZIL (PY)	S.	P.			V-200		mmm	///		W///X)	
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				28 Mc/s	9					остов	ER 1966	
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				222.700			28 Mc/s						OCT	OBER	1966	
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S.E. ASIA (HS. 9M2)	S.	P.					viiiiii	annun .	VIIIIIII	manna.	221					
AUSTRALIA (VK)	S.	P.					YIIIIII	mm								
JAPAN (JA)	S.	P.														
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1-5 DAYS			277	111111	5-20 DAY	15		OP	NINGS	ON MOR	E THAN	20 DAYS	IN THE N	HONTH		

In the months of October and November in our latitudes, the day-time F2 m.u.f's reach their annual maximum. Solar activity has increased markedly compared with the same period last year, and this month, and probably also in the closing winter months, 28 Mc/s, will on favourable days (i.e. those with above average F2 m.u.f's) produce contacts with Central and South America, Africa, South East Asia, and parts of Canada. The east coast of North America will probably also come through occasionally on this band. Opportunities will be more frequent in Southern Europe than farther north. Short skip conditions in the winter months on 28 and 21 Mc/s will be quite rare, but on 21 Mc/s all continents should be workable. 21 Mc/s will be the main DX band during daylight, but this role will be taken by 14 Mc/s in the first part of night and by 7 Mc/s in the latter part. However, in the morning hours on 14 Mc/s there will be possibilities for DX with Central and South America and Africa and on the long path to Australia.

by traffic will therefore always be possible on 7 and also on 3.5 Mc/s when the greater part of the transmission path lies in darkness. This requirement applies particularly to 3.5 Mc/s. With the drop in the level of QRN during the winter, DX possibilities continue to improve on 7 and particularly on 3.5 Mc/s. There will continue to be interruptions to local contacts on 3.5 Mc/s in the latter half of the night caused by the dead zone.

The provisional sunspot number for August was 48.8 with the period of greatest solar activity occurring between the 23rd and 31st of the month. The predicted smoothed sunspot numbers for December, January and February are 66, 70 and 73 respectively.

Many will certainly make use of the latter possibility in the forthcoming VK/ZL contest. On 7 Mc/s in October, during daylight, contacts are possible over longer distances than during the summer months, as there is no dead zone during the day. This band is ideally suited to local and European contacts during the day, DX traffic will therefore always be possible on 7 and also on 3.5 Mc/s

amateurs running low power would be very much appreciated by your scribe. There must be some somewhere!

Contests

News of further State QSO Parties has been received from W1WY. The contest exchanges are the same in all cases and consist of report, plus serial number of contact and name of country, or in the case of the participants in the state concerned number, report, and county located in. In all cases one point is given per QSO, and the multiplier is the total number of counties worked. The California QSO Party will take place from 22.00 15 Cctober to 22.00 16 October, Frequencies used will be around 7075, 14075, 14300, 21075, 21125, 21300, 28075 and 28700 kc/s. Logs should be sent to: Tom Frenaye, 617 Purdue Drive, Claremont, Calif. 91711, no later than 10 November.

The Maryland QSO Party begins at 23.00 on 29 October

and ends at 01.00 31 October. Frequencies used 7075, 14,075, 14,275, 21,075, 21,352, and 21,110 kc/s. Logs should be sent before 21 November to Carl Anderson, 14,601 Claude Lane, Silver Springs, Maryland, 20904, USA. Lastly, the Delaware QSO Party is scheduled for the period 23.00 on 5 November to 05.00 7 November. Each contact counts five points and a Worked Delaware Certificate will be sent to anyone working all three Delaware counties (not by any means as easy as it sounds!). Favoured frequencies will be 7025, 14,025, 14,225, 14,345, 21,025, 21,325, 21,425, 28,025, 28,650, and 29,000 kc/s. Entries must be sent no later than 5 December to Delaware Amateur Radio Club, c/o J. E. McCarley, PO Box 201, Newark, Delaware.

This year's International OK DX Contest will take place from 00.00 to 24.00 on 13 November. This is a c.w. only contest, and covers all bands 1.8 to 28 Mc/s. Contest exchanges will consist of RST plus a figure indicating the

number of years the operator has been licensed. Three points are given for each contact with a Czech station, one for any other contact. Multipliers consist of prefixes, and entries may be single band (single operator), or all bands (single or multi-operator). The "100 OK" Award may be issued to those who contact 100 Czechoslovakian stations and the "S6S" Award to those who contact all six continents. These will be issued in response to a request sent in with the log, and no QSL's will be needed. Logs must be sent to the Central Radio Club, Post Box 69, Prague 1, Czechoslovakia, postmarked no later than 31 December. Leaflets giving full details of this contest are available from G3FKM.

A reminder that the RSGB 21/28 Mc/s Telephony Contest will be taking place on 15 and 16 October. Full details of the rules, etc, are given on page 330 of May BULLETIN, and log sheets may be obtained from Headquarters. This year's event should prove to be the best ever due to the increase in activity on the two bands concerned thanks to the rising sunspot count. There is a listener section, and all are invited to join in the fun and support this interesting contest. Another Society contest—the 7 Mc/s DX Contest (phone section) takes place on 29 and 30 October. For full details refer to page 413, June BULLETIN.

A further point concerning the CQ WW DX Contest (Telephony) on 22 and 23 October. Entrants are reminded that for multiplier purposes the WAE list is used for Europe—this means that IT1 (Sicily) and UN1 (Karelia) count as

multipliers.

Although not a contest, the Jamboree-on-the-Air takes place over the weekend of 22-23 October. A note received from G3RSS says "GB3RSS, who claims to be the Voice of the North in J.O.T.A., notes with regret that CQ WW Contest clashes with the Scout event, but will still be on 160, 10 and 4m hoping to find a hole for themselves! GB3RSS also m.c's "Desnet", which is a 160m net of scout stations started in 1964. It is believed that there will be greatly increased activity from the US during this year's Jamboree.

QTH Corner

CT2AN via W6LDA, 6158 W. 74th Street, Los Angeles, Calif. 90045. via W4NJF, 421 Saddle Rock Road, Norfolk 2, Va, USA. FLSAC FLBHM via W7WLL, 9216 S.W. Fir Grove Lane, Portland 25, Oregon. via WB2RSW, Lester Moskowitz, 43-10 Kissena Blvd, Flushing, NY. FP8DD (Europa Is) via W4VPD, 8254 S.W. 37th Street, Miami, Fla. CR7GF FR7E H. J. Chater, 10 Middlemarch Road, Radford, Coventry. GC2LU/P GC3POI/P via W2CTN. GC3SHZ/P WOWNV/HKO via W4ECI KIIMP/KC4 KS4CC via W4ECI. PO Box 1148, Miami, Fla, 33148, USA CBDX, PO Box 842, Recife, Pe, Brazil. via SMKVV, Olie Ekblom, PO Box 40, Sigtuna, Sweden. via K4AMC, 817 Neely Bend Road, Madison, Tenn, USA. via DJ2PJ, Hans Teichmann, Schulstr. 49, 6051 Dudenholen, PYTACO 0 TAIAV TA2FM VP5RB via W1EQ, George Caron, 62 Broad Street, Danielson, Conn. USA. via G3DHB, Signal Wing, School of Infantry, Hythe, Kent. VP8IK (Station in S. Shetlands.) VP8IV N. McLaren, c/o British Antarctic Survey, Port Stanley, Falkland Is. XPIAA XW8BS via K6MOL 920-B W. Ninth Street, Benicia, Calif. USAID/BPR. APO San Francisco, California 96352, USA. via KP4CL, Alicia Rodriguez, PO Box 73, Hato Rey, Puerto YAIDAN Rico. via W00MM, 10109 E. 71st Terrace, Raytown 33, Mo, USA. PO Box 1387, Kumasi, Ghana. 601PF 9G1FF 9L1TL via G3USF, M. Harrison, Dept. of Political Institutions, University of Keele, Keele, Staffs. via DL1ZK, Gustav Thiele, Alte Sandkaul, 5021 Widdersdorf/ 9X5MH Krs. Koeln, Germany. QSL Managers

156 Ketcham Avenue, Amityville, NY 11701, USA

RSGB QSL Bureau: G2MI, Bromley, Kent.

3103 4th Avenue South, Birmingham 5, Alabama, USA.

Awards

The tourist organization of the state of Rio de Janeiro is offering an award to licensed amateurs who can furnish evidence of having contacted at least 20 stations distributed throughout at least five different municipalities in the state since 22 November 1965. Applicants should send their QSL's for the stations worked, plus a log extract of the QSO's containing details of call-sign, date, time worked, band, mode, and municipality of station worked to: Diretoria Seccional da LABRE/RJ, Comissao de Concursos, Caixa Postal 274, Niteroi, RJ, Brazil. No mention is made of any charge, but presumably IRC's for the return postage of the C.E.R.J. (Certificado Estado Do Rio de Janeiro) would be appreciated.

Commemorating the first Transdanubian Radioamateur Conference, the Hungarian Radioclubs of Transdanubia are issuing the Pannonia Award. This may be obtained by sending proof of contacting three stations in each district HA/HG 1, 2, 3, and 4, since 1 January 1966 to: Radioclub of Gyor, HAIKSA, PO Box 79, Gyor, Hungary. Stations outside Europe need only two QSO's with each district. The award is also issued to SWL's, and may be endorsed for c.w., phone, or mixed modes. QSL's should be accompanied

by a list of QSO's and five IRC's.

The Trillium Award is issued by the Trillium Club of Niagara Falls, Canada, for contacting three of its members (or the club station VE3TOT and one other member). List of contacts showing club number and full log details, should be sent to VE3CLP, 2727 Russell Street, Niagara Falls, Ontario, Canada, from whom further details may be obtained.

The Swedish Railway Radio Club issues the "SvJF" Award to all licensed amateurs who have contacted three of their members since I January 1964. Applications should be sent (no QSL's needed) together with five IRC's to: SM3WB, Sven Granberg, Svangatan 4D, Stromsbro, Sweden. It is suggested that SM3WB is contacted for a list of members of the SRRC.

Top Band News

A special bulletin has been received from Stew, W1BB, concerning arrangements for next winter's Transatlantic DX Tests and First Timer's Tests. The regular tests will be held on Sunday mornings between 05,00 and 07,30 GMT, the dates of the Sundays when they will take place being 4 December, 18 December 1 and 15 January, and 5 and 19 February. During these test periods W/VE stations will call "CQ DX Test" for the first, third and alternating five minute periods of each hour, and will listen in the intervals. DX stations will call during the second, fourth, etc, five minutes and also listen in the intervals. Frequencies to be used will be: W/VE (East) 1800–1825 kc/s, (West) 1975–2000 kc/s. Europe 1825–1830 kc/s. ZL/VK 1800–1860 kc/s. JA's 1907·5–1912·5 kc/s. Africa 1800–1824 kc/s. Everyone is asked to be alert for unusual openings which may occur to any part over darkness paths at sunrise and sunset times.

The First Timer's tests are designed specially for those who have never had a transatlantic contact previously, and all others are asked to co-operate by staying off and leaving the band free for the weaker signals. Dates will be 18 December and 5 February for Europeans, and Africans, and 8 January and 5 March for the W/VE stations. Times and procedures will be as for the normal test mornings. It is suggested that 1823–1827 kc/s be used by European and African stations, and it should be noted that their mornings are those of regular tests. One final point made is that these are tests, not contests!

GM3SVK, who is located in the Northernmost part of the Shetland Islands has found conditions rather peculiar recently. He has been hearing W1BB/I, and has had con-

W4ECI

tacts with DL4SS, GD, DI, and G3SED and G5AQ who are both on the south coast. Fred's offer of skeds with anyone still needing a contact with Shetland still stands. Those interested should write to him at: F. L. Curtis, RAF Saxa

Vord, Haroldswick, Unst, Shetland.
In a contact with Bob Snyder, W0GTA/8F4, your scribe learned that Bob had managed a Top Band QSO with VK5KO. This is undoubtedly the first ever 160m contact between Indonesia and Australia. Congratulations to both parties. It was also learned that conditions in Sumatra appeared to be quite good, and DHJ was being heard well. Bob thought that QSO's with Europe were possible, but thought also that most of the regular 160m DX addicts were at present on other bands and not looking for him. His permit to operate from Sumatra extends until the end of the year, so the first 8F/UK contact should take place before he closes down.

DXpeditions

For those who collect US counties W8CXS will be visiting the following Michigan counties: Isabella (8 October), Midland (9 October), and Branch (15 October). On each day he will be on 14,075 kc/s between 21.00 and 22.30. Paul will be making many more trips of this nature next summer.

The announcement of the visit of PY7ACQ to Fernando de Noronha Island arrived just too late for last month's MOTA. He was scheduled to be PY7ACQ/0 from 6 to 12 September. QSL's plus IRC's should be sent to the address in QTH

Since 20 August Don Miller has been keeping the bands on edge with appearances from a number of extremely rare locations. The first was St. Peter and Paul Rocks, where he operated together with K1IMP as PY0XA. Conditions there were phenomenally good, and in spite of only using a trap vertical aerial they made about 3200 contacts in 28 hours of operating time. Following this the trail led to Navassa Island, where K1IMP/KC4 came on from on 31 August. Rumours of their imminent departure after landing proved to have been unfounded, and a further 2500 contacts were logged from this spot. Following this K1IMP returned home, and Don proceeded alone to Serrana Bank where he began operations on 5 September. He used the call-sign W9WNV/HK0 rather than /KS4 as this enabled him to transmit outside the American phone band; apparently the island is jointly owned by the US and Colombia and either prefix is legitimate. On this occasion Don's score was 2300 contacts in 17 hours on the air! From Serrana Bank to Bajo Nuevo was only a short distance and the next stop, this being so W9WNV/HK0 (Bajo Nuevo) came on the band around midnight on 7 September. It is believed that things went just as well from here, and after handing out a large number of reports he departed. At the time of writing he is in Caracas, making plans for possible trips to the third HK0 area, Malpelo Island, and/or Clipperton Island (FO8). Rumours also mention the possibility of TI9, Cocos Island, being visited.

OD5BZ and OD5EE should have operated from Qatar during the period 16 to 19 September. They had been allocated the call MP4QBB, but were hoping to obtain a second call so that they could use the second call on s.s.b. QSL's for c.w. QSO's should be sent via W7VRO, and for

s.s.b. via W8ZCQ.

5N2AAW nad 5N2AAX are reported to have obtained permission to operate from Dahomey (TY), and hope to be able to make a number of weekend visits. No definite information is available yet.

It is hoped that the Royal Signals projected expedition to Kuria Maria Island will be able to take place between 6 and 20 November. The call-sign of this one will be VS9HRV. and further details are awaited.

Smitty, 601AU, will be visiting Jordan again soon. This

time he will have a tri-band beam with him. 18 to 25 October is mentioned as the most likely time for this one to take place.

Band Reports

The last few weeks have been rather erratic with respect to radio propagation on the h.f. bands, and several quite severe electrical disturbances have occurred. It seems that some DX has been worked on 160m as a report has been received of an OK station being in contact with a VK. Further information concerning this is awaited with interest. Eighty is beginning to show signs of life, and the keen l.f. band s.s.b. enthusiasts at present established on 40 will soon be moving back on to the band. At this stage it may be worthwhile to ask stations attempting to work DX on the 1.f. bands to please keep their transmissions short in order that others may have the opportunity of a contact during the relatively short openings which occur.

During the last month a great deal of interesting activity has been taking place on 40m, and the Antipodean signals are once more in evidence in the early mornings. Twenty metres has been somewhat erratic, and the propagation into the Pacific area in the mornings has now apparently disappeared. The band is open all night still, but not as frequently as during August. Fifteen and 10m have seen a great deal of activity, and at least one good opening into the United States late in the evening on 10m has been reported. 9J2DT is reported to have had contacts with KX6 and 9M2 on this band, and W0GTA/8F4 (Sumatra) has been worked

on the band from the UK.

Once again your scribe would like to express his appreciation of the efforts made by the following contributors, without whose help it would not have been possible to write this section: G2BOZ, G2LB, GW3AX, G3HCT, G3HDA, GM3ITN, G3JVJ, G3KHA, G3KSH, G3LHJ, G3SML, GM3SVK, G3TDW, G3TMA, G3UML, G3URX, G3USF, G3VJG, G3VNC, G4MJ, G8API, G8JM, G8VG, BRS20317, A3942, A4038, A4048, A4431, A4568, A4713, A4886, A5105, A5141, and A5172.

1.8 Mc/s C.W.: OKITJ and other OK's (22.00), PAOPN

3·5 Me/s C.W.: F2CB/FC (20.05), Y04WH/OD5 (23.23), OY3H (21.05), UL7GW (23.00), 4U1ITU (05.58), 3·5 Me/s S.S.B.: F7IRC (19.45), PA9KZI/M (22.23),

PY7TP (23.00), W's (05.00-06.00), ZL4LM (05.47).

7 Mc/s C.W.: CO6WD (22.45), CR6HG (22.00), EP2BQ (18.55), H18RVD (22.40), JA1YL (20.17), UA0PY (19.25), U18KZA (00.40), VP2GLE (23.00), YV2AZ (23.00), ZB2AX (07.20), ZD8J (20.15), ZE1BF (20.30), ZL1HV (05.50).

9J2BC (21.02).

7 Mc/s S.S.B.: CR6HG (21.45), EL2A (21.00), JA2BAY 4BTO, 6YB (20.30), MP4BEU (20.30), MP4MAW (20.30), OD5EJ (22.00), PY1MIN (05.15), PY's 1-8 (22.00), UW9AF OD5EJ (22.00), PY1MIN (05.15), PY's 1-8 (22.00), UW9AF (21.43), VK's 2AVA, 2KM, 3ATN, 3BM, 3VJ, 4BQ (21.00–21.30), VP2GAI (22.00), VP3's AA, JR, YG (22.00), VP6KL (21.25), VP8CW (22.00), VS6AJ (21.00), VS9ARV (22.50), VS9OC (22.13), YV5BTS (23.15), ZB2AJ (20.30), ZD8ARP (20.30), ZL2BCG (06.25), ZP5KT (23.40), ZS1JA (21.26), ZS4PU (22.00), 5A2TR (20.15), W0GTA/8F4 (20.20), 7Q7BBD (21.30), 9J2DT (21.08), 9J2VX (21.30), 9M2DW (21.00), 9M2OV (22.00), 9Y4VT (22.15), VAME (20.20), CR4AB (23.30), EP2RV 14 Mc/s C.W.: CR3AD (12.00), CR4AB (23.30), EP2RV (19.28), FB8YY (07.50), FP8DR (10.34), W9WNV/HK0 (19.28), FB8YY (07.30), FP8DR (10.34), W9WNY/HR0 (Serrana Bank and Bajo Nuevo, 12.00–23.00), JX5CI (Jan Mayen, 12.30), K1IMP/KC4 (12.00–23.00), KG6AQA (18 37), KS4CC (22.10), KX6ER (10.45), IIAV/MI (18.40), OY9IM (21.50), PJ3AH (22.37), PY0XA (08.35), TA2FM (10.58), UA0YD (Zone 23, 07.00), VP8EG (20.30), VR2DK (07.20), VS6EN (15.51), YS2RC (06.50), ZA1BB (21.45), TD0.1 (20.01), 45TEA (15.20), SVIAT (09.41) ZD9A (09.01), 4S7EA (15.20), 5W1AZ (08.40).

14 Mc/s S.S.B.: CR5SP (16.48), CT2AN (19.03), FH8CD

(17.01), FO8AA (05.55), FP8DB (16.41), FY7YM (21.30), HM2BD (21.06), KB6CZ (08.50-10.50), KIIMP/KC4 (18.37), KC6BO (16.14), KC6CK (West Carolines, 13.45), KC6DW (10.50), KG6IC (Iwo Jima, 11.44), KH6BX (06.57), KJ6BZ (07.55), W6BGT/KJ6 (06.50), KM6CE (08.05), KS6's AW, BA, BV, CG, (06.30-07.30), KX6BQ (20.05), KX6BU (18.39), KX6BX (07.45), PY0XA (08.50), TA2AA (09.04), W6NMC/ TJ8 (20.30), TN8AA (18.20), VK8DI (15.15), VK9NT (07.00), VK9's DR, DS, GN, JK (12.00-15.00), VP2GR (06.49), VP8IK (19.40), VQ9EF (22.35), VR2DI (08.44), VR6TC (06.30), YK1AA (05.50), YV7AV (07.00), ZD9A (18.05), ZL4CH (06.05), ZL5AA (06.46), 5J4RCA (Radio Club of Colombia, 23.30), 5R8AK (17.21), W0GTA/8F4 (16.00), 9L1HX (18.35), 9M8DH (17.33), 9N1BG (18.10). 21 Mc/s C.W.: CM1AR (22.50), CT3AS (21.45), EA8FF (21.01), FL8AP (18.35), HC2FAE (22.40), HI8LC (20.56), HK5JS (17.20), HP1AC (22.35), KG6AAY (10.20), W8DGP/ KL7 (08.43), MP4BEU (11.32), TA2AC (07.30), VK9GN (11.10), VP2AK (21.25), VP8HJ (20.45), VR2EK (09.15), ZD5R (15.28), 5N2AAF (09.45), 8H3TX (Libya, 22.35), 9VINV (17.10), 9Y4LC (16.30). 21 Mc/s A.M.: EP3RO (16.34), FM7WN (16.02), FY7YC (20.20), HPIJC (22.00), OA4JR (20.21), TR8AD (08.28), VP2KD (20.26), XE2WI (22.23), YA5RG (12.43), ZS8G (15.00), 5X5JK (18.06), 9U5DL (17.36). 21 Mc/s S.S.B.: CE3LK (20.44), CPIEK (20.04), FL8MC (18.00), FP8CY (22.40), KB6CZ (12.27), KG4AM (13.10), KG6AAY (10.10), K1CAU/KG6 (14.02), OA7AX (20.55), T15RB (23.00), TN8AA (18.41), VK2NN (22.40), VK9's DJ, JK (14.15), VP3HAG (15.15), VP5RB (14.09), VQ9EF (17.39), VS6AJ (11.15), VS9OC (15.00), VU2JM (08.15), W6's (21.00), ZB2AX (21.05), 4UISU (18.45), 5N2AAX (15.09), 5R8AS (16.50), 9VIMY (17.45), 9X5MH (22.05). 28 Mc/s C.W.: CR7IZ (09.57), OY6FRA (16.43), PY5ASN (16.57), ZD7IP (21.30), 5H3JJ (18.14), 6W8DD (18.24), (16.37), ZDTP (21.30), 3H33 (16.14), 408D (17.47), W0GTA/8F4 (10.00), 9J2GJ (18.10), 9Q5LJ (17.47).

28 Mc/s A.M.: CR7DS (18.09), CX2CN (20.38), EA8BZ (15.39), LUIDAB (20.31), PY4AP (20.43), UG6AGI (10.01), XE1PY (21.58), ZE2JA (11.54). XEIFY (21.38), ZEZJA (11.34).

28 Mc/s S.S.B.: CE3PR (21.11), CR6HF (11.05), CX9CO (19.19), EA8AH (15.41), EL8B (18.30), HC1PE (22.03), HR1JMF (22.16), WIPZF/KV4 (22.28), TG9AQ (23.31), T12PTS (21.56), VP2KJ (22.29), W4HEW (22.39), XE1EH (22.36), ZP5KT (20.17), ZS6NM (10.12), ZS8L (09.17), 5Z4AA (09.05), 9J2MM (18.21), 9X5MH (18.25). On 22 August, between 22.50 and 23.45 many W's in the 1, 2, 3, 4, 8 and 0 district supers wards black trood strength. and 9 districts were workable at good strength.

DX Briefs

ET3AC hopes to visit French Somaliland again in late October or early November. The call will be FL8AC, and Blake will be on 14,235 kc/s listening 5 to 15 kc/s higher. All contributions received with QSL cards are being turned over to the Mrs Ted Thorpe Benefit Fund (the widow of ZL2AWJ, who was drowned while on a DXpedition).

VP81K is now active on s.s.b. from the South Shetlands. He has been worked at about 20.45 on 14 Mc/s. His QSL manager is G3DHB.

After 5 September the QSL Bureau for South Arabia will be managed by VS9ASP and not VS9ABL.

The RAF Seletar (Singapore) station is now on the air on 10, 15, 20 and 40 metres with the call-sign 9VINX.

ZAIBB has been heard and worked a number of times on 14 Mc/sc.w. He gives his name as Mehmed and promises to QSL in November. All that can be said is that he is consistent, and that QSL's via Radio Tirana will be eagerly awaited by many. It is rumoured that a letter from Radio Tirana has been received which says that there is at present no amateur activity from Albania, and that ZAIBB is unlicensed.

A sudden upsurge of activity from Turkey appears to be taking place, TA1AV, TA2AA, TA2AC and TA2FM being reported active in addition to TA2BK who has been on for some time.

8H3TX has been reported on 21 Mc/s; he said that he was in Libya and asked for QSL's via W2CTN. Further information is awaited on this one.

					able		222 0 12
	1.8	3.5	. 7	14	21	28	Total
Caroni	Mc/s	Mc/s	Mc/s	Mc/s	Mc/s	Mc/s	
G3IGW	19	43	46	58	55	1	222
G3HS	15	40	54	108	59	26	302
GM3KLA	. 3	38	45	44	70	15	215
G3JVJ	16	23	30	20	9		98
G3IAR	6	32	38	57	52	16	201
G3UML	3	32	50	171	82	70	408
G3KSH	8	20	36	63	38	11	176
G8VG	5	22	28	83	64	41	243
G3LHJ	5	20	20	81	33	4	163
G3PQF	-	24	58	18	6	21	127
5N2AAF	9	14	23	137	68	29	280
G3MWZ	7	13	1	42	8	-	71
9V1LP	6	12	20	27	23	14	102
GM3SVK	8	5	43	57	100	22	235
G3WZ	8 2 5	4	27	26	2	*****	61
G8JM	5	-	14	215	108	16	353
9J2BC	1	1	5	46	44	21	117
G3NMH	-	-	_	177	93	48	318
A4489	21	59	76	157	25	1	339
A4048	9	39	52	118	72	26	316
BRS25605	9	39	47	113	71	24	303
A3942	12	36	65	109	47	1	270
BRS26222	5	39	22	201	91	51	409
A4609	16	26	50	105	108	26	331
A4886	6	29	42	193	116	39	425
A4370	4	30	10	137	39	1	212
A4431	6	25	40	104	108	30	313
A3699	7	24	27	76	63	16	213
A4955	9	22	33	51	60	22	197
A5025	11	17	30	50	22	14	144
A4552		25	12	127	84	30	280
A4038	8	18	29	241	133	83	514
A4568	3	22	20	193	121	35	394
A4182	4	19	21	123	38	23	228
G8API	2 8 3 4 2 2	17	47	161	138	56	422
A5105	2	17	21	136	76	17	269
A4311	-	15	13	115	37	23	203
This month	h'e tah						-5 Mc
scores.	a tab	ic is gi	ven in	order	01 1.9	pius 2	J IVIC

Inis month stable is given in order of 1.8 plus 3.5 Mc/s scores.

All correspondents are thanked for their help, and particular thanks and acknowledgements are due to the West Gulf DX Bulletin (WS1GJ), the L.I.DX.A. Bulletin (WA2EFN), DX'press (PA0FX), The DX'er (W6HVN), Florida DX Report (W4MVB), DX News Sheet (Geoff Watts), The Ex-G Radio Club Bulletin (W3HQO), and On the Air (ON4AD). Please send all items for the November issue to arrive no later than 5 October, for the December issue no later than 16 November, and for the January issue by 9 December.

Remember . . .

Section 9(2) of the Amateur (Sound) Licence states:

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

...to identify

Transmitter Dummy Load

By R. F. STEVENS, G2BVN*

POLLOWING the Equipment Report† in the June issue of the RSGB BULLETIN, Electrosil Ltd.‡ report a considerable interest in their high dissipative resistors and to meet an obvious demand have made available the type HRL.250 for use in the Amateur Radio field. This resistor is slightly cheaper than the "H" type resistors reviewed in the earlier Report.

HRL.250 Resistor

This is a glass-tin-oxide type resistor having the stability and reliability necessary for wideband h.f. applications. The physical dimensions are 10·75 in. long and 1·1 in. diameter. The terminations on the resistor film are provided by bands

of a silver compound consisting of a mixture of fine glass particles and metallic silver fused on to the surface at a high temperature. The HRL.250 may therefore be mounted in the manner shown in Fig. 1 on page 397 of the June issue.

The rating at 40°C. ambient is 250 watts a.c. which approximates to a power dissipation of 4 watts per square inch. The maximum peak applied volts rating is 1 kV per linear inch of resistor length. Resistors of this type are designed to withstand overloads of up to 6·25 times their rated load for five seconds with practically no effect on their characteristics. Although the resistor is classed

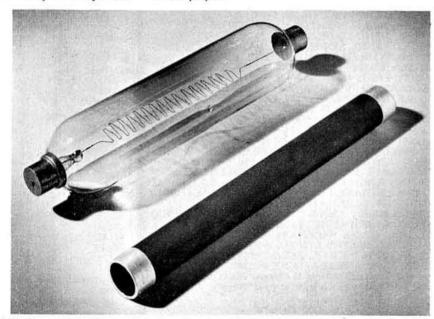
as a non-reactive component, below values of 300 ohms it does become slightly inductive in so far as frequencies up to 70 Mc/s are concerned.

The rating of the resistor may be increased to a limit of 100 watts per square inch by the employment of a liquid coolant such as distilled water or, preferably, a silicone oil, but operators of UK amateur stations will find little need for the power dissipation produced by such specialized cooling methods.

The HRL.250 resistor was tested at frequencies up to 70 Mc/s and the v.s.w.r. was found to be very low, being of the order of 1.2: I or less.

In view of the existing rating of the resistor liquid cooling was not employed but forced air cooling from a small fan kept the resistor well within the recommended temperature limit of 270°C, when r.f. power of 350 watts was applied.

Where a need exists for a reliable, frequency stable load resistor then the HRL.250 is considered to be most suitable for this purpose.



The Electrosil HRL.250 glass-tin-oxide resistor alongside a Robertson lamp formerly extensively used as a dummy load.

British Rail Amateur Radio Society

A meeting of the BRARS will be held at BRB Headquarters, 222 Marylebone Road, London, NW1, on 29 October, 1966, commencing at 2 p.m.

Further information about the society, which is open only to employees of British Railways and its associated companies, may be obtained from the Acting Honorary Secretary, Mr H. A. J. Gray, BRS23279, "Eleven," Swanton Drive, East Dereham, Norfolk,

Cigarette Lighter Lost at Woburn Abbey

Mr J. J. Hollington, G4GA, lost a gas cigarette lighter at the RSGB National Mobile Rally at Woburn Abbey on 11 September 1966. If the lighter, which is of great sentimental value, was found Mr Hollington would be grateful if it could be returned to him.

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^{*} Chairman, Technical Committee.

^{†&}quot;Transmitter Dummy Loads," B. D. A. Armstrong, G3EDD, and R. F. Stevens, G2BVN, RSGB BULLETIN, June 1966, page 397.

[‡] Electrosil Ltd., Pallion, Sunderand, Co. Durham,

RSGB International Radio Communications Exhibition

For the 1966 Exhibition, the RSGB will have the biggest stand ever, and it is a commentary on the expanding activities of the Society that it is still impossible to find enough space to do everything which the RSGB would like to do. The Society's Exhibition Committee hopes, once again, for a record attendance.

RSGB BOOKSHOP

A large staff, under Stand Manager Fred Ruth, G2BRH, will have available stocks of all RSGB Publications in print, together with many from the USA, and other publishers. New publications available will include the 1966/67 issue of the RSGB Callbook.

RECEPTION AREA

The reception area, introduced at the 1965 exhibition, proved to be a most popular innovation, and the scheme will therefore be adopted again this year. As before, this area will be in the charge of Council Member John Graham, G3TR, assisted by Mrs Elleen Vaughan, BRS26612, Council and Committee members, and Headquarters Staff. Reception will attempt to answer all members' enquiries, take orders for badges, subscriptions to overseas periodicals, and accept new or renewed subscriptions for the RSGB. A most important part of the stand staff's duties will be to welcome, and assist in any way possible, the very many overseas visitors to the exhibition.

RECEPTION FOR FOREIGN AMATEURS

The Society is organizing an informal Reception for foreign amateurs, on the lines of that held in previous years, for Friday, 28 October at 7.30 p.m. Between 7.30 and 8.30 p.m. entry will be restricted to foreign amateurs and invited guests, and after 8.30 p.m. the doors will be opened to all comers. The Society hopes that all visiting overseas amateurs will make themselves known at the reception area, when arrangements will be made for them to attend the reception.

EXHIBITION STATION

Ron Vaughan, G3FRV, and his group of operators, have recovered their voices after the 1965 exhibition and will again be operating the Society's stations, GB3RS and GB2VHF, from the stand.

GB3RS will be operating on the 160 and 80m bands during exhibition hours, using c.w., a.m., and s.s.b. In line with experience gained in previous years, it has been decided not to operate on a fixed schedule owing to the difficulty of forecasting activity and conditions.

Generally, c.w. transmission will be on 160m during evening periods, and a.m./s.s.b. will be used at other times. The a.m. transmissions will be A3H (compatible sideband, i.e., one sideband and carrier) as last year.

Subject to the equipment available and activity, GB3RS will be pleased to make RTTY schedules, and stations wishing to make arrangements should call the exhibition station on telephony. RTTY transmissions will use 850 c/s shift at a speed of 50 bauds. GB3RS will also arrange 2m and 4m schedules for GB2VHF upon request.

Please note that the station will not answer "breakers," nor take part in multi-way or net QSOs.

GB2VHF will operate on the 2m or 4m bands, depending upon activity, using A3. The exhibition operators would like to explain, in advance, that the extremely high noise level at the exhibition makes the weaker signals difficult to read; don't blame the operator, he is doing his best!

GB2VHF will also be pleased to make RTTY schedules, subject to equipment availability, and transmissions will be on a.f.s.k./850 c/s shift at 50 bauds.

A special QSL card will be despatched automatically via the RSGB QSL Bureau for each contact with either station. Alternatively, visitors to the exhibition may claim their QSLs at the Headquarters station stand. Your own QSL should be sent via the Bureau clearly marked GB2VHF/ GB3RS via G3FRV.

Visiting mobiles are asked not to operate for lengthy periods in the vicinity of the exhibition. Several cases of severe interference to GB3RS/GB2VHF occurred last year for this reason.

RADIO AMATEUR EMERGENCY NETWORK

Members of the Surrey RAEN Group will be showing a typical base station of the sort installed in many Police, Red Cross, and St. John's Ambulance Brigade establishments. The base station will actually be in operation during the exhibition on 70:365 Mc/s to communicate with other RAEN stations: the call-sign in use will be G3NAT/A. John Kingston, G3VK, and his helpers will be pleased to give information on all aspects of RAEN to interested members. Supplies of RAEN literature, badges, etc., will also be available.

EDUCATION COMMITTEE EXHIBIT

A special feature of this display, to be organized by L. E. Newnham, G6NZ, and Tim Hughes, G3GVV, will be equipment that can be easily reproduced by the beginner. Full information will be available on a 160/80m transmitter, companion receiver and 2m transmitter.

HOME CONSTRUCTED EQUIPMENT

This year, owing to shortage of space, the Society's Exhibition Committee has decided to restrict the number of items displayed and to exhibit only items of a high technical or constructional standard. To this end, the following are the arrangements for this exhibit:

- All items submitted for exhibition will be subject to acceptance by the Exhibition Committee.
- (ii) Entries will be accepted as items which have been the subject of published articles in the RSGB BULLETIN during the period January 1965 to date. It should be made clear that only the member writing the original article will be allowed to enter.

In addition, entries will be accepted from members who are prepared, if required, to write a constructional article for publication in the RSGB BULLETIN featuring their entry, this article to be paid for at the normal rates.

- (iii) Entrants will be required to certify that their entries were constructed entirely by themselves from commonly available materials and components.
- (iv) RSGB members only will be eligible.
- (v) The Horace Freeman trophy will be awarded for the most original piece of equipment on show.
- (vi) Additional prizes may be awarded at the discretion of the judging Committee.
- (vii) Members wishing to enter should have already sent a brief description of their proposed entry to G3IWA, who is organizing this section of the Society's exhibit. (See page 570, September 1966).

COUNCIL MEMBERS AND COMMITTEES

A number of Members of Council and of the Society's various Committees will be available to receive members' enquiries. Please ask at Reception.

Mobile Column

By E. ARNOLD MATTHEWS, G3FZW*

RSGB National Mobile Rally at Woburn Abbey

N spite of a none-too-hopeful weather forecast the record attendance on 11 September again proved the popularity of the Woburn Rally, which is now an established item on the Amateur Radio and the Woburn Abbey calendars. The car park overflowed the large roped-off area of parkland and the count was lost at over 400, the majority of which were equipped for mobile operation. The count of visitors was lost at 2,000 and the visitors' book on the reception stand was completely filled. There is no doubt whatever that the well organised informality of this rally makes it the major social event of the amateur year.

As can be imagined, the marquee housing the trade show was packed solid at times! The attractions here were the RSGB Bookstall, manned by G3FZL and G3SGN who sold out their stock, Brian J. Ayres, Les Taylor, G3JMU, Daystrom Ltd., Contactor Switchgear (Electronics) Ltd., who had on display the prototype solid state receiver type 2AR, (which is intended to be a companion to the 2A10 transmitter), a headband mounted microphone MM2 and their 160m aerial type 2 ATMA. Green Electronic and Communication Equipment Ltd. had a display of their well known V.H.F. equipment. Out in the open, J-Beam Aerials Ltd., showed a range of V.H.F. aerials. We are indebted to this company for kindly providing the 2m talk-in station.

During the afternoon various competitions were held, including novelty races for the children. A pedestrian D/F hunt was won by G3JFH (Cheltenham) who located both stations in 16 minutes. A well deserved consolation prize was awarded to G3RXA, who spent a very uncomfortable time on duty as one of the hidden station operators tucked in a laundry basket by the side of the St. John Ambulance Brigade vehicle. This was the site of the first aid post manned by members of the Brigade's Stotfold Combined

. 1 Shortbutts Lane, Lichfield, Staffs.



G3RXA/P as revealed by G3JFH who won the "Pedestrian D/F Hunt" at the Woburn Rally. After 45 minutes hidden in the basket G3RXA (better known as GW3RXA) found that he was so cramped that he was unable to walk when released. The aerial was a single turn loop inside the lid of the basket.



The lengths to which visitors will go to attend rallies are exemplified by amateurs from Ealing and Marlow who hired this coach to attend the Woburn event, equipped it with v.h.f. gear and obtained the appropriate call-sign GB3BUS/M.

(Photo by BRS21814)

Division. Close by was the tent housing the 80m s.s.b. talk-in station operated by members of Verulam Amateur Radio Club, who also provided stations on 160 and 4m.

Cornish Mobile Rally

GB3CRC was on the air promptly at 09.00 BST on 24 July on 80, 160 and 2m, talking in visiting mobiles and welcoming them to the Cornish Radio Amateur Club Mobile Rally held at Pentire Headland, Newquay.

Twenty-five mobiles and some 95 licensed amateurs visited the site, and spent a most enjoyable day "Rag chewing with stations not seen for many a long day. The judges selected three visiting mobiles as winners of the concours d'elegance: First prize to E. Roland, G3TFN/M, of Manchester, second C. Spreyer, G3OCC/M, of Chislehurst, and third R. M. Davis, G3RUK/M, of Birmingham. A special prize was presented to a party of 12 from Yeovil who made the longest round trip to be present.

A special feature was a police radio car, which was on view by courtesy of Chief Inspector A. J. Lobb of the Newquay police. Constable Gilbert was in attendance to answer the many and varied questions on his "mobile rig." He was keenly interested in the local RAEN organization as several members present had mobile rigs on the local RAEN frequency. Some very interesting mobile rigs were to be seen

in the car park, ranging from transistor transceivers to rigs which filled the back of a van, and the collection of aerials was almost as unbelievable.

When even the keenest had to call it a day, there were plenty of volunteers to clear the site, and many mobile QSOs on the way home for that "final final."

"Barefoot on Skye"

Scots may be forgiven for thinking of Flora MacDonald, but this title covers a few notes on the writer's summer holiday. During the week we spent in this delightful island we found 160 and 80m to be of little use, a situation shared with G2AFR/M the only other amateur met there. Some useful weather reports, however, were received from GM3SFH and other members of the IQSY net, one of whom made the comment that we should listen to satellite TIROS for reports because "it goes over the Sky to see".

Activities were quickly transferred to 20m which was a

Activities were quickly transferred to 20m which was a much more rewarding band and a number of interesting DX stations were worked. Driving conditions are probably as arduous as one could find anywhere in the country, and on-the-move operation is not to be recommended. A great deal of road widening is being undertaken in the island but many roads are still single track, and passing is only possible at marked passing-places, which are generally frequent. Petrol stations are few and far between. Although the island is 50 miles long no part of it is more than 5 miles from the sea, but to get to a beach you may have to go 20 or 30 miles. There is much to see, the food is good and QRM is nearly non-existent. TVI didn't seem any problem, probably because there is a transmitter on the island.



Talk-in stations at the Cornish Rally manned by Clive Bowden, G3OCB, Chairman of Club, using his homebuilt 2m station (nearest the camera), Edna Cooper, G3UGO, Vice-President, using Codar AT5 on Top Band and Bill Locke, G3NKE, Public Relations Officer, using an NCX3 on 80m. Standing at the end of the table is Joe Johnson, G3THT a committee member.



G3UNP and G3NBO (Verulam ARC) operating the I60m talk-in Station at the Woburn Rally.

(Photo by BRS21814)



G3RXA with G3LXP and G3GJX discussing final arrangements for the "Pedestrian D/F Hunt" at Woburn. (Photo by BRS21814)



Bill Colclough, G3XC selling one more "winning" ticket to Bill Gilbert at the Cornish Rally.

Region 12 ORM

The programme of events arranged in connection with the Official Region 12 Meeting held on Saturday 20 August, 1966, began with a Civic Reception in the Town Hall, Elgin where the Lord Provost of Elgin, Mr George A. Smith, J.P. welcomed members and their wives. In reply, the Regional Representative Mr J. MacIntosh, GM3IAA, thanked the Lord Provost, the Town Clerk, Bailies and Town Councillors for their hospitality. The party then adjourned to the "Two Red Shoes" restaurant for lunch.

Radio Exhibition

Under the convener, Don Noble, GM3NCS, an Exhibition was staged in the ballroom of the restaurant with an Amateur Radio station operating on 3-5 and 14 Mc/s under the callsign GM3TKV/A. The Royal Navy, the Royal Air Force and the Civil Defence Corps provided interesting displays, while amateur equipment was displayed by L. Hardie, GM2FHH. Messrs. Bayley's Engineering Agencies (Falkirk) had a very interesting stand. The Moray Firth ARS provided a display of amateur constructed equipment, including a G2DAF-type receiver by GM3IAA.

During the exhibition, the ladies of the party went on a coach trip of Speyside with tea at Cullen House, the resi-

dence of the Countess of Seafield.

Business Meeting

The business meeting was held in the Public Institute, Fochabers. The R.R. welcomed the members, and after paying tribute to the excellent work of the Moray Firth ARS under Mr W. G. Cecil, GM3KHH, ably assisted by Mr A. W. Smith GM3AEL, and Dr. J. M. Lyons, GM3GUJ, the two Deputy R.R.s, he introduced the Society's President, Mr R. F. Stevens, G2BVN, and invited

questions from members. These were soon forthcoming and, inter alia, Mr Stevens dealt ably with questions concerning the future location of Headquarters, finance, and contests. At the close of the meeting, the R.R. read a letter from the RSGB members in Shetland, claiming 100 per cent membership and requesting that the display of QSL Cards, which accompanied the letter, should be presented to the President. This was carried out by GM3KHH.

Dinner-Social

In the evening, members were joined by their wives and friends in the Public Institute, Fochabers. At the conclusion of a sumptuous repast, the R.R. proposed the loyal toast to Her Majesty the Oueen.

After a short interval, the roll call of amateurs present was made by GM3KHH, Deputy R.R. and ORM Secretary, who also read a telegram conveying greetings from 9H1AI (GM3PGX). Sandy Fried, GM5ABN/KP4BRY, of the United States Navy, proposed the toast to the RSGB to

which the President replied.

Peter Zanre and company (Elgin) provided an interval of musical entertainment which was followed by the toast to the Guests, the City and Royal Burgh of Elgin and the County of Moray, proposed by Mr E. G. Ingram, GM6IZ. Lord Provost G. A. Smith replied in a speech which was most interesting and humorous. Mr Stevens presented the Lord Provost with a bound copy of the 1965 RSGB BULLETIN. On behalf of DARC, the President handed to Rod Langston, GM3SDZ, a certificate for the leading GM station in the 1965 WAE DX Contest.

Lieutenant Catterall, RN Lossiemouth, on behalf of an anonymous donor, presented a trophy for an annual constructional competition, to the Moray Firth ARS. The trophy was received by Mr G. M. Grant, GM3UKG, the Vice-President of the society.

(Continued on Page 677)



Guests present at the Region 12 ORM included RSGB President R. F. Stevens, G2BVN, and Council Members E. G. Ingram, GM6IZ, and J. F. Shepherd, GM3EGW.

Northern Radio Societies' Association Convention

THIS year the Northern Radio Societies' Association held its second Convention at Belle Vue, Manchester, on 3-4 September in the main exhibition hall, a vast building, ideal for its purpose. Whatever criticisms can be levelled at this year's Convention, lack of space is not one of them.

For the organisers, the Convention started nearly a year ago after the successful conclusion of the 1965 event. Months of planning and discussions took place during which it was decided to try a two day event. The management of

Belle Vue offered the main exhibition hall.

Stand erection started on the Friday afternoon and by late evening most of the amateur stands were ready. Early on Saturday morning the commercial exhibitors arrived to set up their stalls and by shortly before 11 a.m. the first members of

the public were being admitted.

Most of the member societies had stands depicting some aspect of Amateur Radio, and some splendid exhibits resulted. In addition, other bodies arranged exhibits, among them the RSGB (a bookstall), C. R. Emary Esq., G5GH, RSGB Honorary Certificates Manager (certificates and awards), Manchester City Police and RAEN, British Amateur Television Club (closed circuit TV) and British Amateur Radio Teleprinter Group (Teleprinters).

Talk-in stations were active on 160m, 4m and 2m and general stations on 80, 20 and 15m. It had been hoped to put on a 70cm station but at the last moment this fell through due to "circumstances outside our control". A lot of difficulty was experienced with electrical noise, which at times was quite severe, and with aerials, the latter being particularly difficult to erect at this site with the result that we worked fewer stations than we should have liked. All con-

tacts are being QSL'd.

Highlights of the Convention were the opening by Chief Superintendent F. White, Director of Communications for Manchester City Police whom we were very pleased to welcome, a lecture by Mr P. Jones on V.H.F. Aerials (a repeat of this lecture on the Sunday was unfortunately washed out by a Brass Band practising in the next room) and the Grand Draw.

The Quiz Final held on Sunday afternoon was between Manchester and District Amateur Radio Society and Bury and Rossendale Radio Society. It was level pegging at half time, second time in the contest for the Manchester team, who pulled away to win by a convincing margin in the second half. The question master was Mr A. D. Patterson, GI3KYP, Executive Vice-President of the RSGB, representing the Council.

The Grand Draw attracted a lot of interest: the first prize, a portable TV set, was won by Mrs M. Houldsworth (XYL of G6NM). About 16 other prizes of smaller value were also distributed.

After the close at 6 p.m. and the clearing away of the stands a small dinner was held at a local restaurant. The organizers were sorry that not enough people were prepared to come to an official dinner to make it worth while but the few who did attend the informal meal thoroughly enjoyed themselves.

The NRSA currently consists of ten member societies in the northern area: Ashton-under-Lyne and District, Bury and Rossendale, East Lancashire, Eccles and District, Liverpool and District, Manchester and District, South Manchester, Stockport, University of Manchester, Institute of Science and Technology and Wirral Amateur Radio societies. Membership of the Association, which exists to promote a radio convention each year, is open to any recognized radio society in the northern area at the discretion of the Committee.



Chief Superintendent F. White opened the convention on the Saturday afternoon. He is seen in company with E. C. Wiggell, Vice-Chairman, NRSA, and I. D. MacArthur, G3NUQ, Chairman.





Above: The 20m and 160m exhibition station, Below: The 2m and

News from Headquarters

Mr A. D. Patterson, BASc, GI3KYP/EI4BC, to be President During 1966

In accordance with Article 10 of the Society's Articles of Association, the Council has appointed Mr A. D. Patterson, BASc, GI3KYP, to the office of President, with effect from I January, 1967. Mr Patterson will be the first Irish member to serve as President.

Mr Patterson is at present Executive Vice-President and Chairman of the Finance and Staff Committee. He is also a member of the Membership and Representation Com-

mittee.

A "Profile" of Mr Patterson was published in the June 1966 issue of the RSGB BULLETIN.

Mr Norman Caws Re-elected Honorary Treasurer

In accordance with Article 12 of the Society's Articles of Association, the Council has re-appointed Mr Norman Caws, F.C.A., G3BVG, to the office of Honorary Treasurer for a new three-year term of office commencing 1 January, 1967.

President's Visit to the ITU

During a recent visit to Geneva the President, Mr R. F. Stevens, G2BVN, was accorded an interview by Mr M. Mili, the Deputy Secretary-General of the International Telecommunications Union. Many matters concerning the Amateur Service were discussed with Mr Mili who evinced keen interest in the current activities of the RSGB and IARU. Mr Mili was handed a bound copy of the last volume of the BULLETIN, and asked that other RSGB publications should be sent to him.

New Director of CCIR

The new Director of CCIR is Jack W. Herbstreit W0IIN of the United States who succeeds Leslie Hayes retiring after 17 years service in the CCIR Secretariat. The new Director graduated in 1939 from the University of Cincinnati and since 1946 has been associated with the Central Radio Propagation Laboratory of the US National Bureau of Standards and latterly Deputy Director of the Institute of Telecommunication Sciences and Aeronomy. Since the death of Dr Ernst Metzler of Switzerland in 1963 the post of Director of the International Radio Consultative Committee (CCIR) of the International Telecommunication Union has been filled adinterim by Leslie Hayes, formerly on the Engineering staff of the BBC.

Mr J. A. Ratcliffe New President of IEE

Mr J. A. Ratcliffe, formerly Director of the Radio and Space Research Station of the Science Research Council, has been elected President of the Institution of Electrical Engineers for the session 1966-67.

Advice to Users of Commercial Equipment

If all else fails, read the instruction book!

Mrs Rubie Matthews

It is with much sorrow that we have to report the death of Mrs Rubie Matthews, wife of W. H. ("Bill") Matthews, G2CD.

On behalf of all members we express our deepest sympathy to G2CD in his great loss.

Reciprocal Agreement with Finland

A reciprocal licensing arrangement is now in force between Finland and the United Kingdom.

Society Trophies and Prizes

The Council has made the following awards for 1966:

Founder's Trophy to Mr J. P. Hawker, G3VA, in recognition of his outstanding services to the Society in the preparation of technical literature.

ROTAB Trophy to Mr R. V. E. Walsh, GI4RY, in recognition of his consistent DX work for many years.

Calcutta Key to Mr M. Margolis, G3NMR, in recognition of the outstanding service rendered by him and his wife to the cause of international friendship through the medium of Amateur Radio.

Ostermeyer Trophy to Mr R. C. Marshall, G3SBA, for his article "The G3SBA Top Band Transmitter," published in

the March 1966 issue of RSGB BULLETIN.

Courteney Price Trophy to Mr F. E. Garrett, G3MVZ, for the development of the G3MVZ Transistorized Transmitter, described by Dr P. C. A. Posford, G3TFW, in the October 1965 issue of the RSGB BULLETIN.

Wortley Talbot Trophy to Mr J. R. Gazeley, BRS20533, for his article "A Fully Transistorized Converter for 432 Mc/s" described in the July 1965 issue of the RSGB BULLETIN.

Norman Keith Adams Prize to Mr W. Browning, G2AOX, for his article "Keeping Track of Oscar," published in the January and February, 1966, issues of the RSGB BULLETIN.

Bevan Swift Memorial Prize to Mr C. E. Newton, G2FKZ, for his article "The Society's IGY Aurora Programme" published in the May 1966 issue of the RSGB BULLETIN.

The Council has decided not to award the Varney Trophy

for 1966.

Amateur Radio Hall of Fame

An International Amateur Hall of Fame is being organized to provide permanent recognition of individual contributions made by amateurs all over the world to the advancement of Amateur Radio.

Each year five amateurs will be honoured by having their names and call signs enscribed on a plaque to be displayed at the International Amateur Radio Club in Geneva, Switzerland. Each of the five will receive a replica of the

plaque.

The five amateurs will be selected from nominees submitted by fellow amateurs from all parts of the world to a board of distinguished judges, themselves internationally known to the Amateur Radio fraternity. Nominations will be called for in the following fields of activity:

(a) Advancements in electronic techniques and equip-

ments;

(b) Traffic and DX activity;

(c) Achievements in exotic phases of Amateur Radio: i.e., moonbounce; OSCAR; space probes;

(d) Emergency and Disaster communications;

(e) Development of Amateur Radio.

Nominees may be any man or woman holding a radio amateur's licence issued by a recognized authority in a member country of the ITU.

The Hallicrafters Company will provide the plaques and will donate advertising space for the announcements.

Amateurs everywhere are invited to join in honouring those amateurs who have made significant contributions to the art in their respective fields by submitting their names, call-signs and a brief outline of accomplishment by 31 December, 1966, to Dorothy Strauber, K2MGE, Secretary, International Amateur Radio Hall of Fame, 12 Elm Street, Lynbrook, N.Y. 11563, USA.

BCC 69D Manuals

J. D. Harris, G3LWM, 107 Cozens Road, Ware, Herts., possesses a quantity of manuals for the BCC 69D mobile transmitter/receiver, and is willing to supply copies to owners of these sets on receipt of 2s. to cover postage costs.

- Can You Help?

 D. Walsh A4812, Ballylynch, Carrick-on-Suin, Co. Tipperary, Ireland, who wishes to correspond with anyone using a Marconi R220 V.H.F. receiver on four metres?
- P. W. F. Jones, G3ESY, 94 Holme Lacy Road, Hereford, who requires the circuit diagram for the R209 receiver.
- K. Harvant Singh, BERS886, 31 (774) Upper Museum Road, Taiping, Perak, Malaysia, who requires manuals for the Marconi CR100 and Eddystone 640 and 750 receivers? Mr Singh would also like to correspond with other members.

Silent Kevs

We record with sorrow the passing of the following

Maurice Palmer, G6OZ, of Weston-super-Mare. Harold Hilton, G3LWQ, of Ainsdale, Southport.

Obituary

Captain H. J. Round, M.C.

Captain H. J. Round, M.C.

The death occurred on 17 August. 1966, at a nursing home in Bognor, Sussex, of Captain Henry Joseph Round, M.C., A.R.C.S., aged 85. A prolific inventor with 117 patent applications to his credit he was one of the great names in wireless communication.

Capt Round joined the Marconi Company in 1902 and within a few years he had investigated wireless propagation problems, experimented with dust-cere tuning inductances, devised the elements of direction finding and constructed one of the first radio telephones. He became a personal assistant to Marconi and was conspicuous for his ability to rectify obscure faults in the apparatus of the period before World War I. By 1913 he had done considerable work on the thermionic valve and was among the first to discover that it could generate continuous wave oscillations. Before the start of World War I he had demonstrated radio telephony, using thermionic valves, and had patented numerous valve improvements. He had also devised an auto-neterodyne circuit and a comprehensive transmission system which included the first use of automatic grid bias.

During the 1914-1918 war he built a network of direction-finding stations using thermionic valves and it was a network of these stations which led to a deduction that the German Fleet was about to put to sea. The Grand Fleet obtained the information early enough to effect an interception and the Battle of Jutland was the result. In 1920 Admiral Sir Henry Jackson (later to become President of the RSGB) publically credited Captain Round as the man responsible for the encounter.

In 1919 he developed new types of transmitting valves and in March of that year directed the installation of a telephony transmitter in Ireland which became the first European station to span the Atlantic with telephony. Further experimental telephony work at Chelmsford led to the early broadcasts from the Marconi

mitter in Ireland which became the first European station to span the Atlantic with telephony. Further experimental telephony work at Chelmsford led to the early broadcasts from the Marconi station 2MT at Writtle and subsequently to the establishment of the original London broadcasting station 2LO at Marconi House, for which Capt Round designed the transmitting equipment. He became chief of the newly-formed Marconi Research Group in 1921 and soon his inventive genius was in full flood. He was seponsible for the Marconi "Straight-Eight" Receiver, an artificial echo system for broadcasting studios, screened grid and pentode valves, sound recording systems and a great many other

pentode valves, sound recording systems and a great many other

pentode valves, sound recording systems and a great many other devices and circuits.

During World War II he worked on ASDIC for the Admiralty, continuing with this work until 1950. In 1952 he was awarded the highly-prized Armstrong Medal by the Radio Club of America.

During recent years—as a research consultant—he invented new magneto-strictive devices for use in Marconi echo sounders, introduced the first permanently magnetized nickel transducers and the first belt recording system for echo sounders.

Captain Round will be mourned by all who remember the early days of the radio industry and especially by those old timers of the amateur movement who recognized that although a professional of great skill, he possessed the truly enquiring mind of the real experimenter.

J.C. experimenter.

Society Affairs

A Brief Report on the August 1966 meeting of the Council

THE meeting was held on 8 August, 1966, and was attended by Messrs R. F. Stevens (President), N. Caws, J. Etherington, J. C. Foster, E. G. Ingram, L. E. Newnham, A. D. Patterson, G. M. C. Stone, J. F. Shepherd, G. Twist and E. W. Yeomanson (Members of the Council), John A. Rouse (General Manager and Secretary) and P. C. M. Smee (Assistant Secretary).

Apologies for Absence were submitted on behalf of Messrs L. N. Goldsbrough, J. C. Graham, W. A. Roberts, J. W.

Swinnerton and Louis Varney.

Hospitality Panel

It was reported that a list of members willing to entertain overseas visitors on behalf of the Society is being prepared by Mr G. A. Leicester, G3IKC.

Recommendations of Committees

The Council accepted recommendations relating to the results of the Third 144 Mc/s Contest (Portable) 1966 and the Second 70 Mc/s Contest 1966 (V.H.F. Contests) the co-opertion of a new member to the Mobile Committee, the purchase of equipment for use in connection with the investiga-tion of TV1 (GPO Liaison and TVI), the award of the Raynet Cup for the year 1965-66 (RAEN), the institution of a Senior Four Metre Award (V.H.F.) an offer by the First-Class Operators' Club to donate a trophy in memory of the late L. H. Thomas, G6QB (H.F. Contests).

Membership and Affiliation

The Council elected 83 new members (65 Corporate, 18 Associate) and accepted eight applications for transfer from Associate to Corporate grade.

The subscriptions of three members were waived on the

grounds of blindness and disability.

Affiliation was granted to the following: Cheshunt and District Radio Club East Worcestershire Amateur Radio Group.

New Members of the International Amateur Radio

It was resolved to cast the Society's votes in favour of the admission to the IARU of the following: Amateurs Radios Algerians, Cyprus Amateur Radio Society, Liberian Radio Amateur Association and the Radio Society of East Africa.

Regional Representatives' Conference

The preliminary agenda for the Conference to be held in London on 8 October 1966 was discussed.

RSGB News Bulletin Service

Arising from a discussion of this Service, it was agreed that a detailed review of the Society's News Bulletin Service should be made at the forthcoming Regional Representatives Conference. It was also agreed that the bulletins may be transmitted on s.s.b.

Minutes of Committees

The Minutes of the following Committee meetings were received as reports: V.H.F. Contests (22.6.66.), Mobile (29.6.66.), Technical (4.7.66.), Exhibition (25.7.66.), GPO Liaison and TVI (18.7.66.), RAEN (23.7.66.), V.H.F. (25.7.66.) and H.F. Contests (28.7.66.).

The meeting ended at 9.30 p.m.

CONTEST NEWS

RESULTS—REPORTS—RULES

Oxford D/F Qualifying Event-19 June

Twenty-one teams, a record for the Oxford event, took part in the RSGB D/F contest on 19 June, organized by Michael Hawkins and Eric Mollart.

The two transmitters were 17 miles apart—probably 25-30 miles by road—the route between them being chosen to test the ability of the navigators. To confuse and deceive competitors, the transmitter frequencies were only separated by 10 kc/s and the signal strengths were in inverse proportion to their distances from the start.

from the start.

Transmitter "A", G3SRJ/P, was situated 4½ miles from the start in an overgrown ditch near the River Evenlode. A full wave aerial of fine gauge wire produced a polar diagram which caused competitors to concentrate on an area 60 yards from the transmitter. In fact P. Simmons from Loughborough spent two hours in this way, humping a receiver which looked like a converted AR88! The organizers, having carried their gear several hundred yards to the site, were disgusted to see the Williams brothers from Slade drive to within ten yards of the transmitter by a track which was unknown to them.

which was unknown to them.

Transmitter "B", G3MDD/P was 12½ miles from the start in thick undergrowth in Rushbeds Wood. As its name implies the area is very swampy and A. Hitchcock and E. Bristow frequently found themselves minus boots. Mrs Bristow, following, landed in a small stream, much to the delight of competitors. At the transmitter, as Brian Mahoney was about to hand in his entry

form, another competitor, described as "charging like a wounded buffalo and covered in blood" launched himself over the top of Brian, thrust his entry form into the operator's hand and qualified for the National Final as a result.

The winner of the competition, A. Hitchcock from Derby, was so elated that he left his receiver on a grass verge at the side of the road. It was subsequently presented to him as first prize at Stanton St. John Village Hall where 65 participants enjoyed tea prepared and served by Mrs Mollart and her charming helpers!

		RESULTS		
Position	Name	District	A Stn.	B Stn.
1	A. Hitchcock	Derby	14.46	16.02
2	P. Williams	Slade	14.30	16.06
3	G. Peck	H. Wycombe	15.11	16.16
4	B. Mahoney	Rugby	14.50	16.161
5	L. Harding	Rugby	15.02	16.17
6	D. Roome	Derby	15.03	16.171
7	R. Boby	Oxford	16.20	15.02
8	E. Bristow	Oxford	14.57	16.23
9	I. Butson	Oxford	15.02	16.25
10	G. Taylor	Rugby	15.01	16.30
11	W. North	H. Wycombe	16.30	15.21
12	V. Bratton	Oxford	15.023	16.31
13	J. Mordaunt	Oxford	15.00	
14	D. Ball	Oxford	15.031	
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	A. Bristow	Oxford	15.04	
16	P. Tyler	Oxford		16:15

High Wycombe D/F Qualifying Event-31 July

The High Wycombe Qualifying Event took place on 31 July when 17 teams assembled at the start. Station A was hidden by ferns in the centre of a large wood 8 miles north of the start and Station B was also located in a wood 3½ miles south of the start.

Station B was also located in a wood 31 miles south of the start. After the competitors were all clear of the start, the organizers, Mr North, G3TRY and Mr Bristow, BRS27109, left to enjoy the fun at the two transmitter sites. On arrival at the B station Mr North was very surprised to find that E. Mollart and team were already there. Mr Bristow received a similar surprise when he found that G. T. Peck had managed to get in the vicinity of the A transmitter almost as quickly. At this stage it appeared to both organizers that the competition had been made too easy, but this was not to be so.

but this was not to be so.

Eleven of the 17 competitors decided to go for the distant A station first and this was unfortunate because heavy rain began to fall in this area soon after the start. In a very short time competitors in the wood were soaking wet, and this probably accounted for the fact that the first competitor to actually locate the A station did not reach it until 15.05. At the B station the weather remained fine until near the end of the contest and E. Mollart had no difficulty in finding this station at 14.11½. He also appeared to have no difficulty with the A station, arriving there at 15.18 to easily win the contest. The only other competitor to find both stations was M. P. Hawkins.

Over 60 rather damp participants sat down to tea at Burgers

Cafe, Marlow. The High Wycombe Challenge Cup was presented to E. Mollart by Miss Findlay, who, together with Mr Findlay of the RSGB Contests Committee are always welcome on these occasions. Thanks were expressed by the organizers and competitors to Mr Burger who placed his restaurant at their disposal, to Mrs Mollart and her lady helpers who prepared and served an excellent meal, and also to G3SRJ and G3PQH who operated the transmitters under very wet conditions.

Posn.	Name	Group	A Station	B Station
1	E. L. Mollart	Oxford	15.18	14.113
2	M. P. Hawkins	Oxford	15.51	14.42
3	R. T. Hoffman	Rugby	15.05	
2 3 4 5	G. T. Peck	High Wycombe	15.17	-
	TA. Hitchcock	Derby	15.19	-
3	T. Gage	Oxford	15.19	
7	J. Mordant	Oxford	15.21	-
7 8 9	I. A. Jackson	Rugby	15.22	-
9	E. Treloggen	Oxford	15.23	
10	F. Alsop	Derby	15.24	-
11	R. Pearce Boby	Oxford		15.451
12	P. Tyler	Oxford		15.48
13	I. R. Butson	Oxford	15.49	1005000000
14	J. R. Vickers	Stratford-on-Avon	15.50	
15	P. Simmonds	Loughborough		16.04
16	V. F. Bratton	Oxford	16.15	240000000000000000000000000000000000000
17	D. E. Newman	Rugby	-	16.18

Second High Wycombe Qualifying Event—21 August

A qualifying event held in the High Wycombe district on 31 July took place in torrential rain and, as a result of the exceptionally severe weather conditions, no competitors qualified for the National Final. In view of this, the Contests Committee agreed to an additional Qualifying Event, which was again held in the Wycombe area, on Sunday, 21 August, this time in favourable weather.

The two transmitters were arranged in opposite directions, G3SRJ/P was three miles to the North East on Downley Common, and G3TRY/P nine miles to the South West near Nettlebed. Both transmitters were well concealed but quite near accessible roads and yet the event proved rather more difficult than had been expected, with only three of the 13 competitors who started locating both transmitters.

		RESULT	S	
			Time of	Arrival
Position	Name	District	Station "A"	Station "B"
Section Control	1. R. Butson	Oxford	16.03	14.44
2	R. T. Hoffman	Rugby	15.17	16.16
3	V. F. Bratton	Oxford	16.17	14.27
4	T. Gage	Oxford	575	14.49
5	P. Tyler	Oxford	120	14.53
6	E. W. Bristow	Oxford	-	14.58
7	D. A. Findlay	Edgware		14.59
8	K. R. Vickers	Warwick	-	16.07
8	O. L. Harding	Rugby	-	16.14
10	E. Treloggen	Oxford	16.25	-
0.00	A. R. Green	Nottingham	(10)(00)	
-	D. E. Newman	Rugby		
-0	R. Pearce-Boby	Oxford	- 2.5	

Second 432 Mc/s Contest 1966

The only change in the rules for this contest from those of last year is the overnight close-down which has been requested by a number of entrants. Listeners are reminded that their logs submitted for the Championship carry a multiplier of three for this band.

1. When: 18.00 to 23.59 GMT on Saturday, 15 October and 06.00 to 12.00 GMT on Sunday, 16 October.

2. The General Rules for RSGB contests published in the January 1966

issue of the RSGB BULLETIN will apply except as superseded by the rules of this contest.

Stations may operate from more than one site.

- Stations may operate from more than one site.
 Contacts may be made on any mode permitted in the entrants Amateur Sound) Licence except A2 (m.c.w.), on frequencies between 432 and
 - 5. Scoring will be on the basis of one point per kilometre.
- . Contest Exchanges. RST or RS reports followed by the contact number and location (e.g. RST 599001, 4 north Macclesfield, Cheshire).

This location must be identifiable without ambiguity on the Ordnance Survey "Ten-mile" map. Alternatively, five-character QRA locators may be exchanged. It is the responsibility of the receiving operator to obtain the information necessary to calculate his distances correctly.

7. Entries. (a) Logs should be tabulated in columns headed in this order: "Date/Time (GMT)": "Call-sign of station contacted": "My report on his signal and serial number sent"; "His report on my signal and serial number received": "Location of station received": Call-sign of operator "(Multi-operator entries only): "Points claimed." Logs

sign of operator "(Multi-operator entries only); "Points claimed," Logs must show clearly when the location is changed.

(b) The cover sheet must be made out in accordance with the General Rules and the declaration signed. Multi-operator entries should be so marked and the operators listed. The QTH as sent, QRA if used, and the NGR full six-figure reference should be recorded. Stations outside the area of the National Grid should show latitude and longitude.

(c) Entries must be post-marked not later than Monday, 30 October, 1966.

8. Awards. At the discretion of Council three awards will be made; to the leading ford station, the leading portable station and the runnersum.

the leading fixed station, the leading portable station and the runner-up. The overall winner will receive a miniature cup and the other two stations a Certificate of Merit.

Second 1296 Mc/s Contest 1966

The contest is timed to start at the end of the 432 Mc/s Contest, and cross-band contacts either way are permitted, scoring halfpoints.

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

1. When: 12.00 GMT to 18.00 GMT on Sunday, 16 October, 1966.

- 2. The General Rules for RSGB contests published in the January 1966 issue of the RSGB BULLETIN will apply except as superseded by the rules of this contest.
- Contacts may be made on any mode permitted in the entrant's Amateur (Sound) Licence on frequencies between 1296 and 1299 Mc/s.
- 4. Scoring will be on the basis of 10 points per kilometre for stations on the 1296 Mc/s band and 5 points per kilometre where one station is in the 432 Mc/s band.

5. Contest Exchanges. RST or RS reports followed by the contact number and location (e.g. RST 599001, 4 north Macclesfield, Cheshire). This location must be identifiable without ambiguity on the Ordnance Survey "Ten-mile" map. Alternatively, five-character QRA locators may be exchanged. It is the responsibility of the receiving operator to obtain the information necessary to calculate his distances correctly.

6. Entries. (a) Logs should be tabulated in columns headed in this order: "Date/Time (GMT)"; "Call-sign of station contacted"; "My report on his signal and serial number sent"; "His report on my signal and serial number received"; "Location of station received"; "Call-sign of operator" (Multi-operator entries only): "Points claimed."

(b) The cover sheet must be made out in accordance with the General Rules and the declaration signed. Multi-operator entries should be so marked and the operators listed. The QTH as sent, QRA if used, and the NGR full six-figure reference should be recorded. Stations outside the area of the National Grid should show latitude and longitude.

(c) Entries must be post-marked not later than Monday, 30, October 1966.

7. Awards. At the discretion of Council a miniature cup will be awarded to the winner and Certificates of Merit to the runner-up and the non-transmitting member submitting the best check log.

transmitting member submitting the best check log.

Second I-8 Mc/s Contest 1966

The rules for this year's Second Top Band Contest are as follows:

1. When: 22.00 GMT on Saturday, 19 November, 1966, to 08.00 GMT on Sunday, 20 November, 1966.
2. Eligible Entrants: All fully paid-up members of RSGB resident in G, GC, GD, GI, GM, and GW.

3. The General Rules published in the January, 1966 issue of the RSGB BULLETIN relating to RSGB contests will apply.

4. Contacts: C.w. (A1) only in the 1-8-2 Mc/s band.

5. Scoring: Three points for contacts with stations in the entrant's own county and those counties having a common boundary with that of the entrant and five points for all other contacts.

6. Contest Exchanges: RST reports followed by the contact number starting with 001 and the county code letters given on page 50 of the January, 1965, issue of the BULLETIN, e.g. for a contact from Surrey 579005SY. All reports must be acknowledged with "R."

7. Logs: (a) Must be tabulated in columns headed (in this order): "Date/Time GMT," "Call-sign of station worked," "My report on his COLUMN

signals and serial number sent," "His report on my signals and serial number received," "County code letters received," "Points claimed." The county code letters as sent must be entered at the top of each log

(b) The cover sheet must be made out in accordance with RSGB Contests Rule 4. The declaration must be signed.
(c) Entries must be postmarked not later than 5 December, 1966.

8. Power Input: The d.c. input to any stage of the transmitter shall not

8. Power Input: The d.c. input to any stage of the transmitter snatt not exceed 10 watts.

9. Awards: At the discretion of the Council, the Victor Desmond Trophy will be awarded to the winning station and certificates of merit to the stations placed second and third. In addition, the Maitland Trophy will be awarded to the Scottish member with the highest aggregate number of points in this contest combined with the First 1-8 Mc/s Contest 1967.

A certificate of merit will also be awarded to the non-transmitting member submitting the best check log. Check logs submitted by non-transmitting members for consideration for the award of a certificate of merit should give in this order the following details: Date/Time (GMT); Band; Call-sign of station heard: Report and serial number sent by station heard; Call-sign of station being worked; any other information required by the above rules. by the above rules.

8-9 October	-VK/ZL Contest (C.W.)	12 February	-First 70 Mc/s Contest (Open)*
15-16 October	-Second 432 Mc/s Contest*	18-19 February	-First 1-8 Mc/s Contest
15-16 October	(See this page) -VU/4S7 Contest (Phone)	4-5 March	-Second 144 Mc/s Contest (Open)* and 144 Mc, Listeners' Contest*
15-16 October	-RSGB 21/28 Mc/s Telephony Contest (See page 330, May 1966)	2 April 15-16 April	-Low Power Contest -Second 70 Mc/s Contest (Open)* and 70 Mc/ Listeners' Contest*
16 October	-Second 1296 Mc/s Contest*	7 May	-Third 144 Mc/s Contest (Portable)*
	(See this page)	27-28 May	-First 432 Mc/s Contest (Open)*
22-23 October	-CQ WW DX (Phone)	28 May	-First 1296 Mc/s Contest (Open)*
29-30 October	-VU/4S7 Contest (C.W.)	3-4 June	-National Field Day
29-30 October		2 July	-Fourth 144 Mc/s Contest (Portable)*
	(See page 413, June 1966)	8-9 July	—1.8 Mc/s Summer Contest
12-13 November	-RSGB 7 Mc/s DX Contest (C.W.)	23 July	-Third 70 Mc/s Contest (Portable)*
	(See page 413, June 1966)	2-3 September	V.H.F. NFD/IARU Contest*
13 November	-OK DX Contest (C.W.)	10 September	-80 Metre Field Day
19-20 November	-Second Top Band Contest	23-24 September	-RSGB 21-28 Mc/s Phone Contest
	(See this page)	14-15 October	-Second 432 Mc/s Contest (Open)*
26-27 November	-CQ WW DX (C.W.)	15 October 28-29 October	-Second 1296 Mc/s Contest (Open)* -RSGB 7 Mc/s DX Contest (Phone)
4 December	-Fourth 70 Mc/s Contest (C.W.)*	11-12 November	-RSGB 7 Mc/s DX Contest (C.W.)
	1967	18-19 November	-Second Top Band Contest
14-15 January -	-Affiliated Societies' Contest	3 December	-Fourth 70 Mc/s Contest (C.W.)*

CLUBROOM

A Monthly Survey of Club and Group Activities

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

AERE (Harwell) ARC have voiced strong feelings on the use of the QRA locator during contest working putting forward arguments which were published in "Letters to the Editor" last month. Equally strong are their feelings in having the p.a. valve of the NFD transmitter limited to a type which does not have an anode dissipation exceeding 13.5 watts. This they believe is hardly a proposition in view of the groups already equipped with transmitters employing valves with a greater rating, and suggest as an alternative that all /P stations must be capable of one hour's continuous operation without the aid of a

p.e. set or an endless supply of charged accumulators. G2HIF. British Amateur TV Club make known that Grant Dixon has some tape recorded lectures available, two of the titles of which are "Getting started in Amateur TV" and "70cm reception." From Lille, France, T. Fabris reports that he has been receiving British TV amateurs at between S8 and S9. He hopes to be operational himself on 437.5 Mc/s (625 lines) shortly. G6OUH/T.

Cambridge and District ARC is getting into its stride again after the holiday season, and members are looking forward to the Bumper Junk Sale which is to be held on 14 October. Master vocalist will be Arnold Tomalin, G3PTB, whose inimitable descriptions of the gear available are enjoyed as much as are the bargains offered. G5BQ.

Cambridge University Wireless Society will resume their meetings on Tuesday, 10 October, with a short tape and a film. Thereafter meetings will be fortnightly. G3TG Y.

Chippenham and District ARC have worked out an extensive programme for the winter months. A special note should be made of the Junk Sale to be held on 25 October. It is also hoped to arrange for a party of members to visit the RSGB International Radio Communications Exhibition. New members and visitors are always welcome. G6NV.

Cornish ARC have formed an s.s.b. group under the leadership of G30FN and G3LPB. G3LPB has built a prototype s.s.b. exciter which it is hoped will be copied by others and so stimulate activity in this mode. In the current issue of Cornish Link is part two of an article by GW3UUZ on the "Joys of Top Band on a Lighthouse" the concluding remarks of which contain more than a grain of truth-" No matter how much wire you put up as an aerial, how low the earth resistance, or how good the receiver, it is the density between the headphones which really counts." G3OCB.

Crawley ARC are as busy as ever with meetings well attended. G3TR has been in hospital recently. Everyone wishes him a

speedy recovery. G3FRV

Crystal Palace and District RC are meeting on the 15 October for a Hi-Fi evening and have fingers crossed that Lo-Fo will arrange to be absent. V.H.F./NFD was enjoyed by all, despite the weather. Only one major catastrophe marred the occasion, fortunately 15 minutes from the end of the event, when the p.e. set ceased to function after an expensive sounding clatter. Investigation showed that the piston of the engine had decided not to move with the turn of the crankshaft. G3FZL.

Dorking and District RS report that the work on the club's ex GPO van is now virtually complete thanks to the supervision by G3HZJ, and that the resulting mobile station should be on the air soon. Visitors and prospective members are always

welcome to attend club meetings. G3HZJ.

Echelford ARS are hoping that the 70 Mc/s net started by G2BJM and G3DOR will prosper and flourish according to the addage, great oaks from little acorns grow. If it does, Thursday nights at 10 will provide yet another meeting ground for members, and one which we venture to say might prove, in the long run, to be more popular than dear old Top Band with its

inevitable assortment of electronic "musi-cal" accompaniments. G3RHF.

Fylingdale RC held its second exhibition in conjunction with the Whitby (N. Yorks) Regatta and during which the marquee in which the exhibition was housed was flattened by a force 9 gale. The members on duty at the time sustained quite serious injuries, and one SWL badly concussed. While nearly all the display boards and literature were lost, the equipment was rescued thanks to the efforts of the Police at the exhibition and members of the club summoned by urgent telephone calls. Despite this set-back, the exhibition was voted a great success and, undaunted, the club is looking forward to the next. G8ANO.

Fareham and District ARC were delighted when G3UZI/M called into the local net for under this cloak lies the call 4S7IW. Ian volunteered to talk on amateur activities in Ceylon, and the prized possession of the club is the pennant which he presented to them. A beer and skittles evening is to be held shortly, and it is hoped that in the not too distant future to visit the local TV studios. G3EER.

Glasgow University RC. This is a proposed new club the inaugural meeting of which is to be held on Friday, 14 October at 7.30 p.m. The programme includes election of officers and committee, a talk by the Council Member for Scotland, GM3EGW, and a film. The meeting will in fact be jointly with the RSGB Glasgow Group, and will be held in the Engineering Building of the University. An open invitation is extended to anyone interested in



From 20-26 June the York Amateur Radio Society operated a station at the York Industries and Hobbies Fair. The station G3HWW/A was operated throughout the week by G3DTA and G3FTS. Many contacts were made and good reports were received from a number of Central and Eastern European countries.

Amateur Radio to attend. Further details from] GM3VAP, Engineering Library, University of Glasgow, W.2.

Greenock and District ARC is another new club which was launched recently. Meetings are at fortnightly intervals, the next being on 14 October at the Arts Guld commencing at 7.30 p.m. Prospective members can be assured of a warm welcome. GM3VCD.

Lichfield ARS report that their membership is steadily increasing but are, nevertheless, always happy to welcome prospective new members and visitors. Meetings are held on the first Monday and the third Tuesday in each month at the Swan Hotel. Lichfield. G3VIQ.

Lothians RS report that several of their members will be participating in the Jamboree-on-the-Air. New members are always welcome, especially from the University of Edinburgh and Heriot-Watt College which have no radio societies. GM3PSP.

Midland ARS will be meeting on Tuesday, 18 October, at the Birmingham and Midland Institute at 8 p.m. for a lecture, the details of which it is hoped to announce in the RSGB News Service. The club was very pleased to note that the results of NFD showed that they considerably improved their position over the previous year and so were rewarded for all the hard work which was put into the event. G3JDJ.

Mid-Sussex ARC. A group with this title has recently been formed to serve those interested in Amateur Radio in the Haywards Heath, Burgess Hill and Hassocks areas of Sussex. Meetings are held on the first and third Wednesdays of each month at the Primary School, Lindfield, near Haywards Heath. Visitors and prospective members are assured of a warm welcome. G3RXJ.

Northern Heights ARS have a very full programme arranged for October with meetings taking place on the 6th, 12th, 26th and 29th, the last being a party to the RSGB Radio Communications Exhibition. Conditions at the Halifax Agricultural Show where a demonstration station was set up were more than grim. Continuous rain all day turned the field into a sea of mud by lunch time, and one wanted boats rather than boots to survive. G3MDW.

Purley and District RC stalwarts had a wet and windy weekend at their V.H.F. NFD location, but enjoyed it nevertheless. 7 October will be a natter night, and on 21 October there will be a Junk Sale at which many rare and unrepeatable bargains will be offered. *G3FTO*.

Radio Amateur Invalid and Bedfast Club are pleased, and justifiably proud to report that several of their members were successful in the recent RAE. Success by some always breeds endeavour in others, and from endeavour stems success. G3LWY.

Royal Signals ARS will be holding their Annual General Meeting in the Council Room, Second Floor, Seymour Hall, at 4.30 p.m. on Friday, 28 October, and would like as many members as possible to attend.

Southgate RC will be meeting on 13 October for the purpose of judging entries in the constructional contest for the G6QM Trophy. They hope that there will be many entrants with a wide range of equipment, and that those members not actually displaying equipment will give the event their full support. G3TDM.

Stratford-upon-Avon and District ARC are meeting on 20 October for the W1BB tape and slide lecture at a venue to be arranged. Early in September a D/F hunt was organized and thoroughly enjoyed by all participants. Some onlookers observed that the degree of enjoyment seemed to be related to the amount of mud collected on the basis of the more the mud the greater the enjoyment. Not so successful was a v.h.f. field day outing at which the equipment steadfastly refused to function correctly for any length of time. G3RPJ.

Surrey Radio Contact Club report that membership and attendance at meetings has increased so much within the last few years that they have now moved to a more spacious meeting place. This is at the "Blue Anchor." South End, Croydon, where adequate parking space is available and the general facilities are excellent. The change of venue has entailed a change of meeting dates to the third Tuesday in each month, and the first meeting at the new premises will take place on 15 November. G3KGA.

South Birmingham RS are holding their AGM on 19 October and hope that as many members as possible will attend. Over Saturday and Sunday 22-23 October the club will be running a



Over the August Bank Holiday, the Harlow and District Radio Society staged an Exhibition station at the Harlow Town Show. Seen at the Exhibition station are G3NNI, G3SZF, G3TXI, and the Town Beauty Queen, her attendant and two Princesses. The Station G6UT operated on all bands from 160m to 2m. Attendance at the show was 39,000.

station in the Jamboree-on-the-Air under the call-sign G3OHM. As this station will be in the Scout Hut, Pershore Road, which is the regular meeting place, it will be sort of ohm from home. G3OMG.

Wirral ARS AGM is on 5 October. As we have observed many times before, the AGM is the most important meeting of the year for at this members can voice their opinions and in doing so indicate to the committee a general pattern for the activities of the ensuing year. G3FOO.

Copy for inclusion in the December Bulletin should arrive not later than 11 November. To be absolutely sure that this deadline is not missed, it is suggested that contributors should post at least by 8 November.

When sending copy, please do be sure and include the call-sign of a licensee whom interested persons can contact as there is no doubt but that this adds to the value of the printed report.

GB2RS SCHEDULE

2

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

Frequency 3600 kc/s	Time 9.30 a.m. 10 a.m. 10.15 a.m. 10.30 a.m. 11 a.m. 11.30 a.m. 12 noon	Location of Station South East England Severn Area Belfast North Midlands North West England South West Scotland North East Scotland
145-10 Mc/s	9.30 a.m. 10.00 a.m.	Beaming north from London 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. 12 noon	Beaming north from Leeds 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.

Forthcoming Events

Details for inclusion in this feature should be sent to the appropriate Regional Representatives by the first of the month preceding publication. A.R.s and club secretaries are reminded that the information submitted must include the date, time and venue of the meeting and, whenever possible, details of the lecture or other event being arranged. Standing instructions cannot be accepted.

REGION I

REGION I
Ainsdale (ARS).—5, 19 October, 2 November, 8 p.m., 77 Clifton Road, Southport.
Allerton (Liverpool) (SRHS).—Thursdays, 8 p.m., 3rd Allerton Scout Group Headquarters, Church Road, Woolton, Liverpool.
Ashton-under-Lyne (AUL&DARS).—7, 21 October, 4 November, 8 p.m., Ashton-under-Lyne Technical College.
Blackburn (ELARC).—6 October (Film Show), 3 November ("Amateur TV Transmission," by G30TA and G6SXC[T), 7.30 p.m., YMCA, Limbrick, Blackburn.
Blackpool (B&FARS).—Every Monday, 8 p.m., Pontins Holiday Camp, Squires Gate. Morse tuition from 7.30 p.m.
Bury (B&RS).—II October (Constructional competition), 8 November ("Beginners Guide to

competition), 8 November ("Beginners Guide to S.S.B.", by Jim Heath), 8 p.m., Old Boars Head Hotel, Crompton Street (private room).

Chester.-Tuesdays, 8 p.m., YMCA. Except first

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

Crewe & District.—3 October (Visit by Regional Representative), 7 November, 8 p.m., Earl of Crewe Hotel, Nantwich Road.

Eccles (E & DRC).—Tuesdays, 8 p.m., Patricroft Congregational Schools, Shakespeare Crescent, Patricroft, Eccles. Every Thursday Club Top Band net 20,30 hours.

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

Wavertree. (ULARS).—10, 24 October, 7 November, 7,30 p.m., Students' Union, 2 Bedford Street North, Liverpool 7.

Macclesfield.—11, 25 October, 8 November.

8 p.m., The George Hotel, Jordangate.

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

(M & DARS).-Wednesdays, 7.30 p.m., 203 Droylsden Road, Newton Heath, Manchester 10. Morecambe.—5 October, 2 November, 125

Preston.—11 October, 8 November, 7.30 p.m., St. Paul's School, Pole Street, Preston.

Southport (SRS).—Wednesdays, 8 p.m., and Sundays, 4 p.m., Sea Cadets Camp, The

Esplanade.

Stockport.—5, 19, 29 October (Halloween Party), 2 November, The Blossoms Hotel, Buxton Road, Stockport.

Wirral.—5, 19 October, 2 November, 8 p.m., Harding House, Park Road West, Claughton, Billows, Park Road West, Claughton, Park Roa

REGION 2

REGION 2

Heckmondwike (SVARS).—I3 October ("How to use Meters" by Mr L. W. Burkitt), 20 October (Visit to Baird Television), 27 October (Visit to Elland Power Station), first meeting 7.30 p.m., Heckmondwike Grammar School.

Hull (H & DARS).—Fridays, Hull East Riding Corp. Soc. Ltd., Hessle Road Branch, Hull.

Northern Heights.—5 October (Visit to Emley Moor), 12 October ("Transmission of sound on a light beam" by Mrs. Mary I Shaw, G3OMM), 19 October (Visit to Huddersfield Tech. College), 22 October (Scott Jamboree-on-the Air), 26 October ("Radio Astronomy" by Mr. L. M. Dougherty), 29 October (Visit to Radio Communications Exhibition in London), 7.45 p.m., Sportsman Inn, Ogden, Halifax.

REGION 3
Birmingham (SBRS).—19 October (AGM),
8 p.m., The Scouts Hut, Pershore Road, Selly
Park, Birmingham, 29.
Learnington Spa (MWARS).—Mondays, 10
October (Demonstration of Sommerkamp FR
100B receiver), 24 October (Personal Radiotelephones by Mr A. Dryborough), 8 p.m., 7
Regent Grove, Learnington Spa.

Salop (SARS).—10 November (Demonstration by Daystrom Ltd.), 17 November (Hot Pot), 7.30 p.m., The Old Post Office Hotel.

REGION 4
Burton-on-Trent (ARC).—23 November (Annual Dinner—Midland Hotel contact November Harrison, G3ACR, 38 Baker Street, Stapenhill, Burton-on-Trent).

Burton-on-Trent).

Derby (D& DARS).—5 October (Surplus Sale),
12 October (Committee Meeting—Open
Evening in Sub-Basement), 19 October (to be
announced), 22-23 October ("Jamboree on the
air"), 26 October (Electronic Organs), 29
October (Annual Trip to London—International Hobbies Exhibition), 2 November
(Bring and buy sale), 7.30 p.m., Room 4, 119
Green Lane, Derby.

(Bring and buy sale), 7.30 p.m., Room 4, 119 Green Lane, Derby.

Heanor (H&DARS).—II October (Transmitting Evening), 18 October (Films—Room 3), 25 October (Question Time), 1 November (Surplus Sale), 7.30 p.m., Club Room, South East Derbyshire College of Further Education, Ilkeston Road, Heanor, Derbys.

Leicester (ARS).—Mondays 7.30 p.m. (Slow Morse Practice), Sundays 10.30 a.m., Club Rooms, Old Hall Farm, Braunstone Lane, Leicester.

oughborough (LARC).—Fridays, 8 p.m., Club Rooms, Bleach Yard, Wards End, Lough-Loughborough

Club Rooms, Bleach Tard, yvards End, Loughborough.

Melton Mowbray (ARS).—20 October, 7.30 p.m., St. John's Ambulance Hall, Asfordby Hill, Melton Mowbray.

Newark (NSWC).—Mondays, Thursdays, 7.30 p.m., The Hall, Guildhall Street, Newark.

Nottingham (ARCN).—Tuesdays, Thursdays, 7.30 p.m., Room 3, Sherwood Community Centre, Woodthorpe House, Mansfield Road, Natzinaham.

Peterborough (P & DARS).—Fridays, 8 p.m., Old Windmill behind The Peacock Inn. London

Road (opposite Murkitts Garage).

Spilsby (S & DG).—7 October (Autumn Junk Sale and Hamfest). 7 p.m., The Bull Hotel,

Halton Road, Spilsby.

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

Bedford (B & DARC).—Meetings on Second Tuesday and last Thursday of the month at 7.45 p.m. Westfield School, Queen's Road, Bedford. (Meetings commence with Slow

Morse Practice.)

Cambridge (C& DARC).—7 October (Informal)

14 October (Bumper Junk Sale), 21 October (Informal), 28 October (Quick Starting—by GSUM), 4 November (Informal), Fridays 7.30 p.m., Club Headquarters, Corporation Yard, Victoria Road, Cambridge.

(CUWS) .- Freshmen particularly welcome at Psychology Department, Downing Site, Downing Street on Tuesdays during term at

uton (L& DARS).—11 October (Invitation Speaker G5AAT/K4GNM), 18 October (Surplus Sale—Messrs. Hannington), 25 October (Talk on Transistors), I November (TVI). Tuesdays 8 p.m., ATC Headquarters, Crescent

Tuesdays 8 p.m., ATC Headquarters, Crescent Road, Luton, Befordshire. March (M & DRAS).—Tuesdays 7,30 p.m., rear of Police Headquarters, March, 1sle of Ely. Royston (R & DARC).—Wednesdays 8 p.m., Manor House Social Club, Melbourn Street,

Royston, Herts.

Shefford (S & DARC).—Thursdays, 7.45 p.m.,
Church Hall, High Street, Shefford, Bedford-(All meetings commence with Slow

REGION 6
Cheltenham Group.—First Thursday each month, 8 p.m., Great Western Hotel, Clarence Street, Cheltenham.

REGION 7

Acton, Brentford & Chiswick (ABCRC). October (Insulation Breakdown by GSZA), 7.30 p.m., AEU Club, 66 High Road, Chiswick. Ashford (Mddx) Echelford ARS.—12, 26 October, 7.30 p.m., Links Hotel, Ashford Bexley Heath (NKRS).—13 October ("Acrials," by Harold Shelvey), 7.30 p.m., 27

by Harold Shelvey), 7.30 p.m., 27 October (NFD Film and Club Station), 8 p.m., Congregational Church Hall, Chapel Road, Bexley Heath.

Chingford (SRC).—Fridays (first in each month), 8 p.m., Friday Hill House, Simmons Lanc, Chingford, E4.

Croydon (SRCC).—11 October, 7.30 p.m.,
Blacksmiths Arms, South End.
Dorking (D & DRS).—11 October (Informal
Meeting), 8.00 p.m., Wheatsheaf, 12 October
(Formal Meeting), 8.00 p.m., Star & Garter,

Cormai Precently, 8.00 p.m., stat & Garter, Dorking.

Ealing (E& DARS).—Tuesdays, 7.30 p.m., Northfields Community Centre, Northcroft Road, Ealing, W13.

East Ham.—First and third Tuesdays, 7.30 p.m.,

East Ham.—First and third Tuesdays, 7.30 p.m., 12 Leigh High Road, East Ham.

East London.—16 October (Electronics in Trinity House Service), 2.30 p.m., Wanstead House, The Green, Wanstead, Ell.

East Moseley (TVARTS).—5 October (A further instalment of "Nuclear Power" by T. Taylor), 2 November (Caernarvon Trophy-Judging), Prince of Wales, Bridge Road, East Moseley, Edgware & Hendon, (FADRS).—10 October (Edgware & Hendon, FADRS).—10 October (Edgw

Prince of Wales, Bridge Road, East Moseley.

Edgware & Hendon (EADRS).—10 October ("Transmitters for NFD" by G3MNO), 24 October (Night of formation), 8.00 p.m., John Keble Hall, Church Close, Deans Lane, Edgware.

Gravesend (GRS).—19 October, 7.30 p.m., RAFTA Club, 17 Overcliff Road.

Guildford (G & DRS).—14 October (Natter Night), 28 October (Surplus Sale), 8 p.m., Club HQ, Stoke Park.

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

Harrow (RSH).—Every Friday, 8.00 p.m., Roxeth Manor School, Eastcote Lane.

Havering (H & DARC).—12, 26 October,

Havering (H & DARC).—12, 26 October, Romford.

Romford.

Holloway (GRS).—Mondays, Wednesdays, 7.30 p.m., (RAE & Morse), Friday (Club), 7.30 p.m. Hounslow (HADRS).—17, 31 October, Canteen Mogden Main Drainage Department, Mogden Works, Isleworth.

Ilford.—Thursdays, 8.00 p.m., 579 High Road, Ilford.—Thursdays, 8.00 p.m., 579 High Road, Ilford.—Sesex.

Kingston.—13, 27 October, fortnightly, 8.00 p.m., YMCA, Eden Street, Fridays—weekly Morse classes, 2 Sunray Avenue, Tolworth.

Leyton & Walthamstow.—18 October, 7.30 p.m., Leyton Senior Institute, Essex Road, London, E10.

London U.H.F. Group.—6 October (Peter

ondon U.H.F. Group.—6 October (Peter Blair, G3LTF on 70cm), 3 November (Aerial Noise), 7.30 p.m., Bull & Mouth, Bloomsbury

Way, Holborn.

Loughton.—7, 21 October, 7.30 p.m., Meeting alternate Fridays, Loughton Hall, (Nr. Debden

Station).

Maidenhead (M & DARC).-18 October, 7.30

p.m., Victory Hall, Cox Green, Maidenhead.

New Cross.—Wednesdays, Fridays, 8.00 p.m.,
225 New Cross Road, SE14.

Norwood & South London (CP & DRS).—15

October (Hi-Fi Evening), CD Centre, Catford,
London SE6.

London, SE6.

Paddington (P& DARS).—7.30 p.m., Beauchamp Lodge, 2a Warwick Crescent, W2.

Purley (P& DRC).—7 October, (Club on 4 metres), 21 October (Junk Sale), 8.00 p.m., Railwaymen's Hall, Side Entrance, 58 Whyte-

cliffe Road, Purley.

Reigate (RATS).—13 October (Surprise Night). 7.30 p.m., George & Dragon, Cromwell Road, Redhill

(R & DRS) .- Tuesdays, 8.15 p.m.,

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

Scout ARS.—22-23 October (Jamboree on the Air), 2 October (Discussion), Baden Powell House, Queens Gate, South Kensington, SW7.

Science Museum.—4, 18 October, 6.00 p.m., Science Museum South Kensington, Sideup (CVRS).—6 October, 7.30 p.m., Congregational Church Hall, Court Road, Eltham.

Slough (SDR Group).—First Wednesday every month, 8.00 p.m., United Services Club, Wellington Street.

month, 8.00 p.m., United Services Ciuo, Wellingston Street.

South London Mobile Club.—8 October (Discussion), 22 October (Junk Sale), 8.00 p.m., Clapham Manor Baths, SW4.

Southgate & District.—13 October, 7.30 p.m., Parkwood Girls School (behind Wood Green Tarkwood Girls School (b

Town Hall).

St Albans (Verulam ARC).—19 October, 7.30 p.m., Cavalier Hall, Watford Road, St

Albans.

Sutton & Cheam (SCRS).—18 October, 8.00 p.m., The Harrow Inn, High Street, Cheam.

Welwyn Garden City.—13 October, 8.00 p.m., Vineyard Barn, Digswell Road.

Wimbledon (W& DRS).—14 October, 8.00

p.m., Community Centre, St. George's Road, Wimbledon, SW19. Wembley (GECARS).—Every Thursday, 7.00 p.m., Telephone H. Rees, ARNold 1262, first.

REGION 8

Crawley (CARC).—12 October ("Communica-tion in the 70's" by G3NVB), 8 p.m., Trinity Congregational Church Hall, Ifield, 26 October

(Visit to the RSGB International Radio Com-

(Visit to the ASGB international natio Sim-munications Exhibition).

Tunbridge Wells (WKARS).—7 October (Junk Sale), 21 September ("S.S.B." A discussion chaired by G3PAH), 4 November ("Avionics" by G3NPU), 7,30 p.m., Adult Education Centre, Monson Road, Tunbridge Wells.

REGION 9

Bath.—21 October, 7.30 p.m., RNR Training Centre, James St. West, Bath. Bristol.—28 October, 7.15 p.m., New Lecture Theatre 644, Royal Fort, Bristol University, Woodland Road, Bristol 8.

Bristol (BARC).—Mondays and Thursdays, 7.30 p.m., 43 Ducie Road, Barton Hill, Bristol 5. Burnham-on-Sea (BoSARS) .- Second Tuesday in each month, 8 p.m., Crown Hotel, Oxford Street.

Street.

Camborne (CRAC).—First Thursday in each month, Staff Recreation Hall, SWEB Head-quarters, Pool, Nr. Camborne.

(CRAC V.H.F. Group).—First Thursday in each month, 7,30 p.m., The Coach and Horses, Ryder Street, Truro.

Exeter.—First Tuesday in each month, 7,30 p.m.,

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 (S& DARC).—7 October (Film night and Social), 21 October (Talk by G5ZT), 7.30 p.m., Burraton Toc H Hall, Warrington Rd., Saltash.

South Dorset (SDRS) .- First Friday in each month, 7.30 p.m., Labour Rooms, West Walks, Dorchester.

Taunton.—Alternate Thurdsays commencing 29
September, 7.00 p.m., Lecture Theatre, Taunton
Technical College.

Torquay (TARS).—29 October (Talk by G3UFZ S.T.C. Ltd.), 7.30 p.m., Club HQ, Belgrave Road, Torquay.

Vells (WARS).—Mondays, 8 p.m., EMIE (Wells) Sports and Social Club, Chamberlain St., Wells, Somerset.

St., Wells, Somerset.

Weston-super-Mare.—First Friday in each
month, 7.30 p.m., Main Engineering New Block,
Weston Technical College, 7 October (Lecture
by G.P.O. Rep.).
Yeavil (YARC).—Wednesdays, 7.30 p.m., Park
Lodge, The Park, Yeovil.

REGION 10 Cardiff.—10 October (A.G.M. and Quiz), 7,30 p.m., TA Centre, Park Street, Cardiff.

REGION II
Llandudno (CVARC).—20 October, ("Simple
Home-Made Test Equipment" by Mr B. Clark,
GW3HGL), Cross Keys Hotel, Madoc Street, Llandudno.

REGION 13 Edinburgh (LRS).—13 October (Mr Spankie, BBC), 27 October (Visitors' Night), 7.30 p.m., YMCA, South St. Andrew Street, Edinburgh.

REGION 15

Belfast & District RSGB Group,—Third Wednesday in each month. 8 p.m., War Memorial Building, Waring Street, Belfast.

REGION 16 Basildon (BDARS).—Details of meetings from

G3JB.

Chelmsford (CARS).—4 October, 7.30 p.m., Marconi College, Arbour Lane, Chelmsford.

Great Yarmouth (GYRC).—Fridays, 7.30 p.m., The Manager's Office, the Old Power Station, Swanstons Road, Great Yarmouth.

Ipswich (IRC).—26 October, 7.30 p.m., Red Cross HQ, Gippeswyk Hall, Ipswich.

Norwich (NARC).—Meetings at Old Lakenham Hall, Mansfield Lane, Norwich. Details from G3TLC.

Region 12 ORM

(Continued from page 668)

Mrs Smith, wife of the Lord Provost, assisted by G2BVN and GM3KHH, drew the raffle tickets; the major prize being no less than a 12 lb salmon caught by GM3NCS. Other prizes were donated by GM2FHH, GM3EGW, Electrosil, Adcola, Short Wave Magazine, Eveready, Jackson Bros. and Oxley. The salmon was won by Mr A. F. Hunter, GM3LTW, RR for Region 14.

Mr H. Bell, GM3SKQ, President of Caithness ARS, made an apt toast to the YLs and XYLs which was replied to by Mrs Cecil, wife of GM3KHH. The vote of thanks was given by Mr Smith, GM3AEL, President of the Aberdeen ARS in

a very witty speech.

The programme for Sunday, 21 August, began with morning coffee at the Laverock Bank Hotel, Lossiemouth, where members were met by Lieutenant Daysh, RN, who provided two buses which took the party on a most interesting visit to the Royal Naval Air Station. The tour included the electronic workshops, u.h.f. receiver station, Ground Central Approach, Radar and Control Tower. The tour was followed by lunch at Laverock Bank Hotel,

A total of 65 were present from Regions 1, 2, 7, 12, 13, 14, and 16. Council was represented by the President, Mr R. F. Stevens, Mr E. G. Ingram, GM6IZ and Mr J. F. Shepherd, GM3EGW.

Special Events Stations

The Gravesend Amateur Radio Society in association with the Gravesend and District Scout Association have organized a special events station for the weekend 22-23 October 1966. The Station will be operating from the Scouts Training Ground, Hopehill Meopham, on all h.f. bands, using a.m. and s.s.b. and the call GB3HH. Schedules may be arranged by writing to Mr T. F. Biddlecombe, 39 Portland Avenue, Gravesend, Kent.

BATC CONVENTION

8 October 1966

10 a.m. to 6 p.m. in

The Conference Suite Independent Television Authority 70 Brompton Road, London, SW3

- ★ Exhibition of Members' Equipment
- ★ Symposium of Members' Papers
- General Meeting

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Granada Lectures on problems of communication in the modern world will be held in London Guildhall on 17 October—"Telecommunications in the next few years" (F. C. McLean, C.B.E., BBC Director of Engineering); 24 October—"From the few to the many" (Sir Kenneth Clark); 31 October—"Technology and Power" (Sebastin de Ferranti). Admission is free and tickets are obtainable from Granada Television Ltd., PO Box 494, 36 Golden Square, W1. The lectures-the eighth in an annual seriesare arranged by the British Association for the Advancement of Science in conjunction with Granada Television Ltd.

Scientific Instruments Exhibition

This exhibition is to be held at the Design Centre, London, from 4 October to 19 November, 1966. Full details may be obtained from the Press Office, Design Centre, 28 Haymarket, London, SW1.

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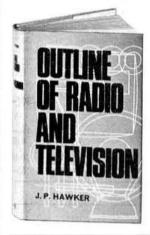
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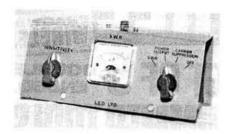
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