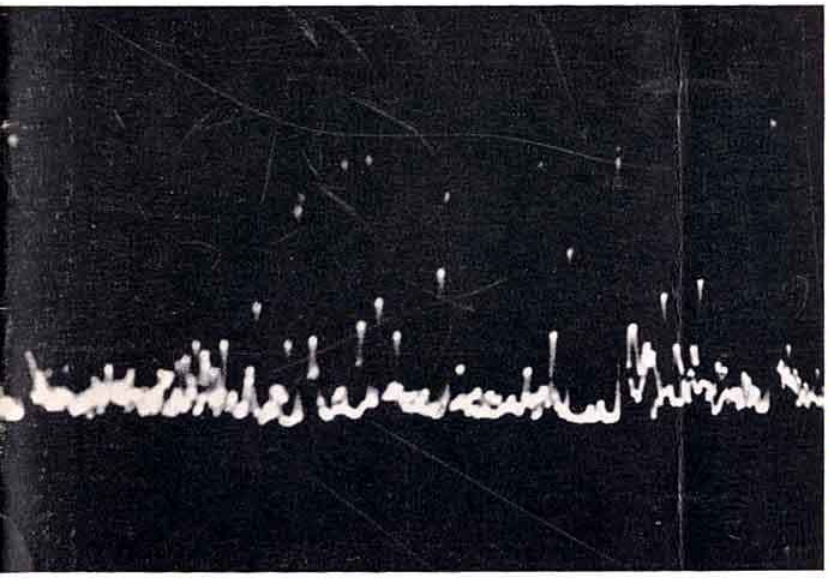
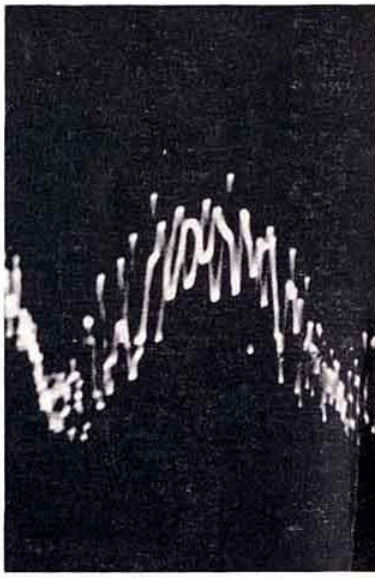
RSGB

BULLETIN

JANUARY 1965
VOL. 41, No. 1



PANORAMIC RECEPTION



JOURNAL OF THE RADIO SOCIETY OF GREAT BRITAIN

Volume 41 No. 1

January 1965

3/- Monthly

R S G B BULLETIN

CONTENTS

EDITOR:
John A. Rouse, G2AHL

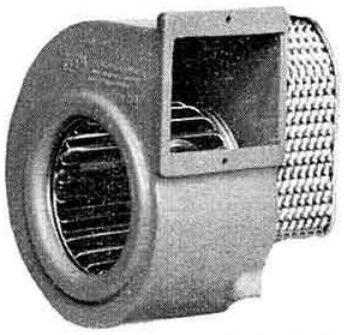
EDITORIAL ASSISTANT:
T. R. Preece, G3TRP

EDITORIAL OFFICE:
RSGB Headquarters, 28 Little Russell Street, London, W.C.1.
Telephones: HOLborn 7373
HOLborn 2444

ADVERTISEMENT MANAGER:
Mrs. P. D. Harvey, Sawell & Sons Ltd., Ludgate Circus, London, E.C.4
Telephone: FLEet Street 4353

The RSGB Bulletin is published on the first Wednesday in each month by the Radio Society of Great Britain as its official journal and sent to all members.
The closing date for copy for the next issue is January 8.

AIR BLOWER



FOR COOLING VALVES AND ANY ELECTRONIC EQUIPMENT

NOW ONLY

49/6

Carriage Paid U.K.

SIZE 26BTM (APPROX 4½" CUBE)

New Features :

MOULDED CASE

MOTOR COVER

FREE DISCHARGE VOLUME:

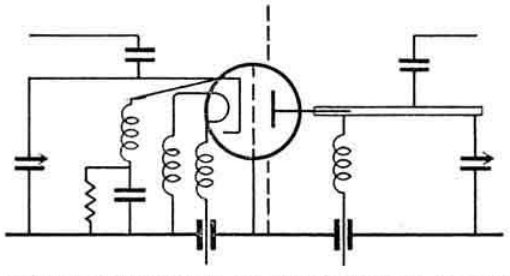
40 CUBIC FEET PER MINUTE

230v SUPPLY

CASH WITH ORDER ONLY

AIRFLOW DEVELOPMENTS LTD
Lancaster Road, High Wycombe, Bucks

A2521 LOW NOISE 70 and 23CM RF AMPLIFIER



70CM—GAIN 22dB NOISE FACTOR 6·8dB

23CM—GAIN 15dB NOISE FACTOR 11·5dB

Full details are available on request

G.E.C.

The M-O Valve Co Ltd

Brook Green, London W6
Telephone: RIVerside 3431

NEW from Labgear

THE BACKGROUND-NOISE FREE MOBILE MICROPHONE

Price 64/- **Fixing clip 5/-**

The rising response of this microphone discriminates against low frequency 'thumps' and 'bangs' and engine noise. It is designed for close speaking and yields outstanding high intelligibility. Supplied complete with 'push to talk' switch and non-kink lead.

Write for further details on:—

E5140	One Sixty Twin	£15.15. 0
E5141	D.C. P.S.U. for E5140	£8. 0. 0
E5142	AC P.S.U. for E5140	£7. 7. 0
E5143	Speech Compressor	£5. 0. 0
E5145	Reflectometer	£7.19. 6

Labgear Limited

CROMWELL ROAD CAMBRIDGE
Telegram: Labgear Cambridge
Telephone: Cambridge 47301 (4 lines)

RADIO SOCIETY OF GREAT BRITAIN

INCORPORATED
1926

PATRON — H.R.H. THE PRINCE PHILIP
DUKE OF EDINBURGH, K.G.

COUNCIL 1965

PRESIDENT	E. W. YEOMANSON, G3IIR
IMMEDIATE PAST PRESIDENT	G. M. C. Stone, AMIEE, AMIERE, G3FZL
HONORARY TREASURER	N. Caws, FCA, G3BVG
ORDINARY ELECTED MEMBERS	J. C. Foster, G2JF R. C. Hills, BSc(Eng), AMIEE, AMIERE, G3HRH E. G. Ingram, GM6IZ A. O. Milne, G2MI L. E. Newnham, BSc, G6NZ R. F. Stevens, G2BVN J. W. Swinnerton, TD, BSc (Econ)(Hons), AIL, G2YS Louis Varney, AMIEE, AIL, G5RV
ZONAL REPRESENTATIVES	H. A. Bartlett, G5QA L. N. Goldsbrough, BSc(Oxon), G3ERB J. C. Graham, G3TR R. H. James, AMIEE, AMIERE, GW3BFH A. D. Patterson, BASc, GI3KYP F. K. Parker G3FUR J. F. Shepherd, GM3EGW

GENERAL MANAGER AND SECRETARY

John A. Rouse, G2AHL

REGIONAL REPRESENTATIVES

Region 1.—North Western. B. O'Brien, G2AMV, 1 Waterpark Road, Prenton, Birkenhead, Cheshire.
Region 2.—North Eastern. J. R. Petty, G4JW, 580 Redmires Road, Sheffield 10, Yorkshire.
Region 3.—West Midlands. W. A. Higgins, G8GF, 33 Cedars Avenue, Kingswinford, Brierley Hill, Staffs.
Region 4.—East Midlands. F. C. Ward, G2CVV, 5 Uplands Avenue, Littleover, Derby.
Region 5.—Eastern. S. J. Granfield, G5BQ, St. Luke's, 47 Warren Road, Cambridge.
Region 6.—South Central. L. W. Lewis, G8ML, 34 Cleevelands Avenue, Cheltenham, Gloucestershire.
Region 7.—London. P. A. Thorogood, G4KD, 35 Gibbs Green, Edgware, Middlesex.
Region 8.—South Eastern. Norman D. Mattock, G2DFG, " Brackstones," 185 Cheriton Road, Folkestone, Kent.
Region 9.—South Western. R. E. Griffin, G5UH, 13 Alexandra Road, Uplands, Bristol 3.
Region 10.—South Wales. C. H. Parsons, GW8NP, 90 Maesycoed Road, Heath, Cardiff, Glamorgan.
Region 11.—North Wales. J. E. Thornton Lawrence, GW3JGA, " Perranporth," East Avenue, Bryn Newydd, Prestatyn, Flintshire.
Region 12.—North-East Scotland. G. B. Woffinden, GM3COV, 5 Rockwell Crescent, Thurso, Caithness.
Region 13.—South-East Scotland. G. P. Millar, GM3UM, 8 Plewlands Gardens, Edinburgh 10.
Region 14.—West Scotland. D. W. R. Macadie, GM6MD, 154 Kingsacre Road, Glasgow, S.4.
Region 15.—Northern Ireland. J. William Douglas, GI3IWD, 21 Wellington Gardens, Bangor, Co. Down.
Region 16.—East Anglia. P. J. Naish, G3EIX, 6 Mildmays, Danbury, Chelmsford, Essex.
Region 17.—Southern. L. H. F. Southwell, G3JLS, 15 Hollybank Road, Hythe, Southampton, Hants.

QSL BUREAU MANAGER

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

MEMO

To:	From:
All members	Editor, RSGB Publications

Assistant Editor for RSGB Publications

The right man to fill a responsible position on the RSGB Headquarters staff is required immediately.

This man (or woman for that matter) can write quickly and clearly, is painstaking without being pedantic, has a ''feel'' for modern English, has an enquiring mind and a forward-looking attitude to life, has a sympathy for the work of others (as do all editors, of course!) and would like to work on the RSGB Bulletin and associated publications. Almost certainly he is an active radio amateur. He could probably have written this advertisement far better, with shorter sentences, less words and more information during the intervals in a VOX-controlled QSO. He will have had several years' experience in journalism.

He will find the work alternately challenging and mundane and will be ready to act as Assistant Editor of the RSGB Bulletin within a short time.

The salary is expected to be not less than £1200 p.a.

If you are this individual you are invited to write, giving details of education and career to date, to the General Manager, Radio Society of Great Britain, 28 Little Russell Street, London, W.C.1.

A HOME-BREWED CRANK-UP

By Rev. J. L. R. CRAWLEY, G3LBX*

THE telescopic pole to be described was designed to carry a Mosley TR33. Jr three element beam to a height of some 50 ft., and to keep it there in the face of the strongest gales of the Northumbrian coast. For two years it has cheerfully accepted the worst storms, coming through with flying colours.

In addition to being able to withstand adverse weather conditions, the pole had to be capable of being lowered so as to place the beam at a height suitable for adjustments and periodic checks. This lead to the choice of a telescopic construction.

The general arrangement of the device is quite straightforward as will be seen from Fig. 1. It consists of three sections, each about 18 ft. in length, fitting one inside the other, the lowest section being 3 in. in diameter. The middle and upper sections each decrease in diameter by about ½ in., so allowing clearance for the hauling wire between the sections. The need for this clearance will be seen from Fig. 2. Although not essential, it would be an advantage if the tops of the lower and middle sections were fitted with a reducing collar which would assist in keeping out the weather. All sections are steel tubes.

At the top of each of the three sections, three iron rings are welded at 120° intervals. These form the anchorage for the guy wires: a tie-off point for the hauling wire, and a mounting point for the free sheave pulley block associated with each section.

All guy wires are insulated from the mast by an insulator placed in each wire close to the terminating ring. In addition, further insulators are placed along the length of each guy wire so that no part of any guy wire becomes resonant at the highest frequency to be used.

The guy wires are terminated at ground level in three steel stakes—set 120° apart—embedded in concrete. The stakes are made from steel tube, one end of which has been flattened for a short distance, and drilled through the flattened section accordingly. See part of Fig. 4. Bottle screws—sometimes called wire tensioners—are included in each guy wire, thus allowing adjustment of the tension of each wire individually.

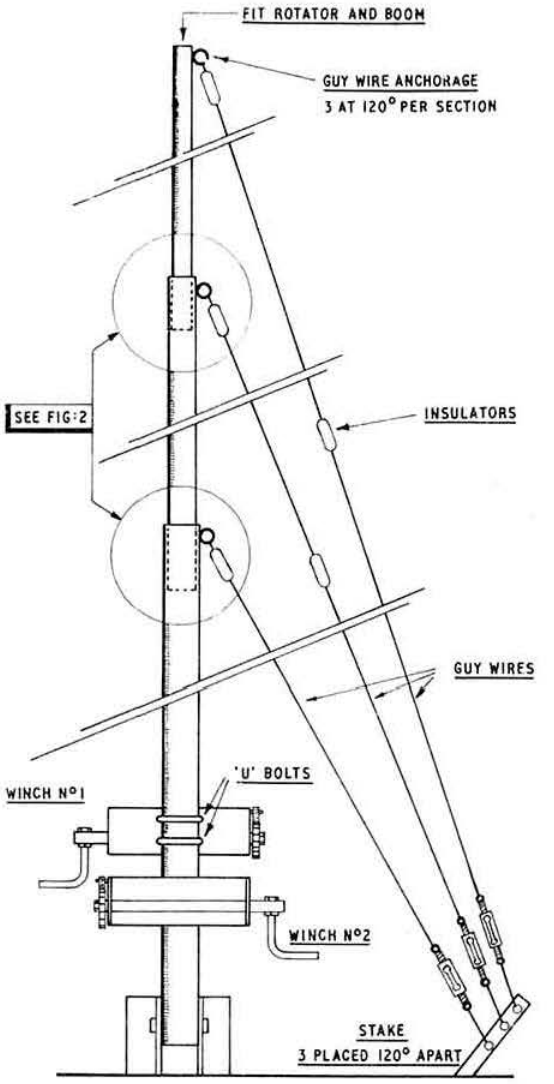


Fig. 1. General impression of completed mast. Note that while only one set of guys is illustrated, three sets at 120° intervals are used.

Telescoping System

The middle and top sections of the mast are elevated by means of a hauling wire, one hauling wire to each section.

Consider the middle section in Fig. 2. The hauling wire is made fast to one of the iron rings. It is then passed into the lower section via a hole made for this purpose, down the tube and around a fixed pulley firmly fitted to the bottom of the middle section, back up the tube—in the space between the inner and outer tubes—and out through an exit hole positioned under another iron ring. From here it travels over a free pulley and down to a winch secured to the bottom end of the lower section. Wind up the winch, and up it goes.

This system is duplicated for the top section of the mast, the wire terminating on a separate winch.

Fixed Pulleys

It is important to ensure that the fixed pulleys inserted in the bottom ends of both the middle and upper sections are solidly fixed. The writer found the best way was to use a pulley which was just big enough to enter the lower section, but of such a size that it had to be forced into the upper section. After fitting the pulley to the bottom of the secton concerned, hardwood chocks were driven, one up each side of the sheave, to firmly lock it into position. The downward thrust of the mast itself will retain the pulley in position, stabilized by the chocks.

* Longhoughton Vicarage, Alnwick, Northumberland.

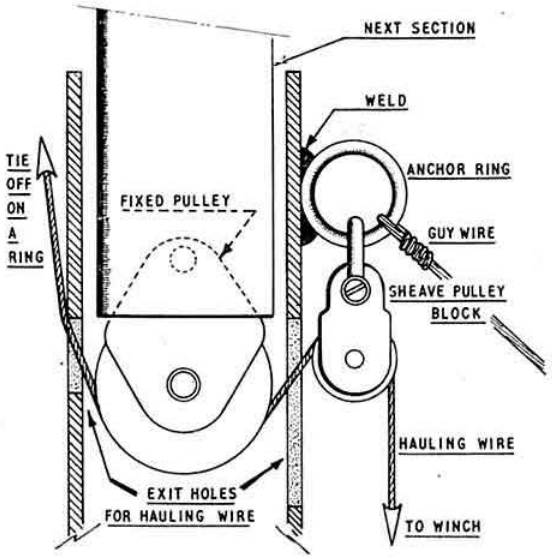


Fig. 2. Hoisting arrangements, and route taken by hauling wire. Note that there must be sufficient space between the tubes to allow free passage of the hauling wire.

Winch

A simple winch, see Fig. 3, is needed for each hauling wire. If you cannot cope with constructing this yourself a local blacksmith, or small engineering works may be prepared to help. A ratchet system is essential, and two types are illustrated. One employs a standard cut gear—ex-mangle—with a locking arm and pin, while the other uses a normal gravity operated lock. The gravity type is much to be preferred as it is self-locking during the cranking operation.

The winches are secured to the lower mast section by large U bolts which encircle the mast, two U bolts being used for each winch.

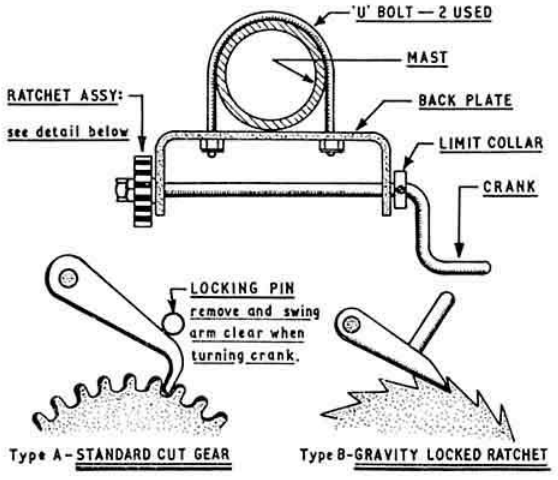


Fig. 3. Construction of the winches showing alternative locking and ratchet arrangements.

Base Fitting

This is illustrated in Fig. 4. Two 3 in. angle irons are embedded in concrete to a depth of about 4 ft., with about another 18 in. above ground, these posts being separated by about 4 in. In the writer's case, the whole of the telescopic pole is used as a quarter wave vertical on 80m, and this has a direct bearing on the manner in which the pole is fitted to the ground stakes, for, under such conditions, the pole must be fully insulated.

Under ordinary circumstances, all that is needed is a hefty steel pin which passes through the ground stakes and the pole. If the pole itself is to be used as a radiator, then this pin must be fitted with a tough insulated sleeve, and washers used between the pole and ground stakes. The general method of mounting is shown in Fig. 4(a), and the construction of the insulated pin detailed.

Assembly

After all the ground work has been completed, the mast is assembled on the ground with all sections closed up. It is then set on the ground stakes swivel pin, hoisted to the vertical, and the lower guys† made off, final tension adjustments being by manipulation of the bottle-screws. The middle section is then cranked up, guys made off and tensioned, followed by the top section. While not anticipating any calamity, do cut the guy wires to the approximate length and roughly tie them off before enthusiastically, and speedily, cranking up the various sections. If it does fall down—it will be with a whacking great thump!

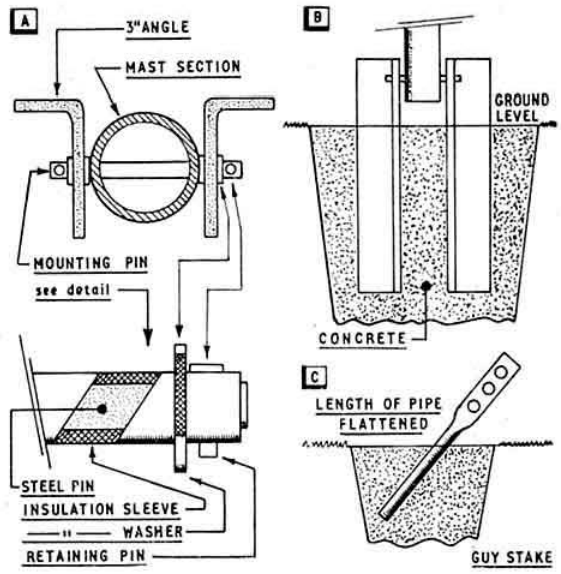


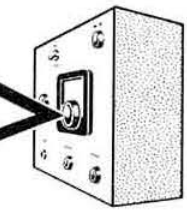
Fig. 4. Ground work for base of mast and guy stakes together with details of an insulated mounting pin. (See text.)

Once the pole is correctly guyed, it can be lowered for the fitting of a CDR rotor, and the array of your choice.

Very little maintenance is required other than the generous use of an oilcan on the pulleys and hauling wires from time to time, and the prudent use of paint to minimise rusting.

† The guy wires should be of " 10 ton snatch " specification, and the hauling wires of " 2 ton stress "—EDITOR.

PROGRESSING THROUGH AMATEUR RADIO



Part 3

By P. G. MARTIN, G3PDM*

OF the material appearing in this series, a large fraction of it will, in future, be of a constructional, rather than theoretical, nature. In pursuance of this scheme, we present this month details of a multimeter, which is a device for measuring voltage, current, and resistance over a wide range of values and with a fair degree of accuracy.

Let it be understood that such instruments require a number of precision components (particularly resistors) and these must either be bought at quite inhibitive cost, or selected carefully from standard components using techniques which are described here. This, together with the requirement of a sensitive meter movement, explains why good multimeters are so expensive when bought ready-made. However, no shack is complete without one of the instruments, and any effort or expense incurred in obtaining one is very quickly repaid.

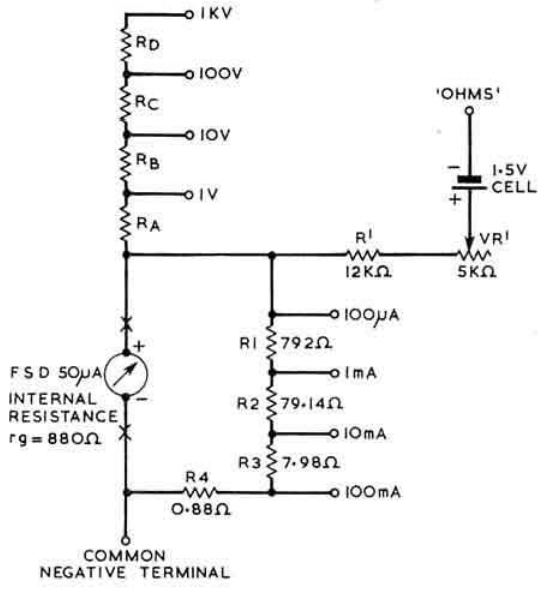


Fig. 1. Circuit of the d.c. section of the multimeter.

Most measuring equipment makes use of at least one moving coil meter. The operation of these depends on the magnetic effect of the current, the theory of which will be covered next time. Suffice it to be said that a current deflects the meter movement by an amount proportional to the current so that a needle connected to this movement and passing over a scale can give an accurate indication of the meter current.

A very useful term in connection with meters is *full-scale deflection* (f.s.d.). This is the current required to swing the needle of the meter from one end of the scale to the other, and it depends on the physical structure of the meter movement—magnet strength, spring tension, and so on. Now we can say that at the heart of any multimeter will be found a basic meter movement with a full-scale deflection of between about 20 and 100 microamps (μA). Such a movement is, of course, very sensitive, and being finely made, is also extremely delicate. Allowing currents much greater than the f.s.d. to flow through the meter will result in the needle getting twisted round the stops at the scale ends, or the meter coil getting burnt out. Either is pretty catastrophic.

The rest of a multimeter comprises a series of resistors, a rectifier (in instruments measuring a.c. as well as d.c.), and a small battery (used in resistance measurement).

A meter movement alone can only measure currents between zero and its f.s.d. To measure higher currents, or any voltages, networks of resistors must be used to adjust its characteristics. Resistors in parallel with the meter are called *shunts*, and enable the meter to measure higher currents; resistors in series with the meter, called *multipliers*, enable it to read voltages.

Practical Circuit

Fig. 1 shows the circuit of a multimeter with four current ranges, four voltage ranges, and a resistance range. It will measure up to one kilovolt, up to 100 milliamps, and up to about 50 K ohms.

A 50 μA meter is the centre of the system, the one used originally measuring " Röntgens/hour," but the scales were easily changed. These meters are available from a number of surplus equipment dealers. Its resistance was measured as 880 ohms, and once that is known, it is quite simple to calculate all the resistance values.

If you should use a meter other than the one specified,

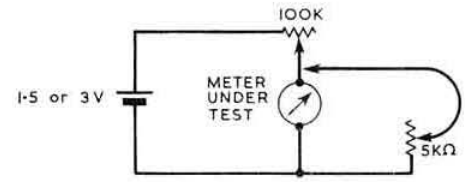


Fig. 2. Hook-up for measuring the resistance of a sensitive meter. Adjust the 100 K ohm potentiometer so that the meter reads full-scale deflection, then connect the 5 K ohm potentiometer across the meter and adjust it so the meter reads exactly half of full-scale deflection. The part of the 5 K ohm potentiometer then in circuit equals the meter resistance, and can be measured with an ohm-meter.

*RSGB Technical Development Sub-committee

you will need to measure its resistance. This would be advisable anyway, in case the resistance of the recommended item varies from one specimen to another. The system of measurement used originally requires an accurate ohm-meter, which is, of course, borrowed from someone, and the procedure is outlined in Fig. 2. It is not possible to measure the resistance of a very sensitive meter directly with an ordinary ohm-meter, as it will pass a milliamp or so in the process, but if you are lucky the resistance may be marked somewhere on the scale.

The Compound Shunt

We must now work through the simple calculations giving the values of the four shunt resistors.

At the first terminal, the sensitivity is 100 μA. When measuring a current of 100 μA, 50 μA will flow through the meter, and the same will flow through the series resistors R1, R2, R3 and R4, as the total shunt resistance is made equal to the meter resistance.

When it is required to measure 1 mA using the second

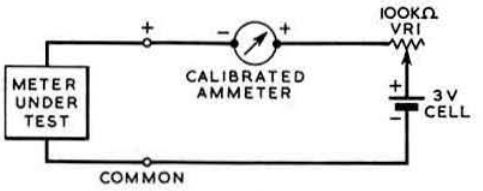


Fig. 3. Circuit used for finding required shunt resistors.

terminal, 50 μA must flow through the meter (as before) *and* R1, and the rest—950 μA—through the remaining resistors R2, R3 and R4. We can equate the voltages (I × R components) across these networks, and obtain:

$50(r_g + R1) = 950(R2 + R3 + R4)$

$50(880 + R1) = 950(880 - R1)$

This gives R1 = 792 ohms

A similar argument for a current of 10 mA through the third terminal gives:

$50(r_g + R1 + R2) = 9950(R3 + R4)$

$50(880 + 792 + R2) = 9950(880 - 792 - R2)$

hence R2 = 79·14 ohms

Similarly R3 = 7·98 ohms

and R4 = 0·88 ohms

The values of these four resistors can be quickly worked out for any meter used as the basic movement, whatever its f.s.d. or internal resistance, r_g.

We now come up against a little difficulty—that of finding resistors of the values just calculated. But there are easy ways out of anything like this if you can borrow some equipment from a friend. This time it is just a reasonably accurate d.c. ammeter.

Use a 10 ohm resistor for R3, 100 ohms for R2, and forget R4 for now. Connect the circuit of Fig. 3 to the 100 μA terminal of the meter, and adjust the circuit current with VR1 to 100 μA, as read on an accurate ammeter. Now connect standard 1 K ohm resistors (any tolerance) in place of R1, until one is found which causes the meter to read exactly full-scale deflection. The meter should then be calibrated at suitable intervals from 1 to 10.

Now connect the external circuit to the 1 mA terminal, adjust the circuit current to 1 mA, and try the various 100 ohm resistors in place of R2 until the meter reads full-scale deflection again.

Take a length of resistance wire with resistance just over 1 ohm (such as about 3 in. of 26 s.w.g. Eureka wire), and place it in the position of R4. Try various 10 ohm resistors in place of R3, with a circuit current of 10 mA, until the meter reads f.s.d. again, and repeat for a circuit current of 100 mA, this time trimming the length of the resistance wire. This can conveniently be wound round a high value composition resistor when all adjustments are made.

At this stage, then, we have a multi-range ammeter.

The Multiplier Resistors

The calculations around these are simpler, and Ohm's Law can be used for resistance ($R = \frac{V}{I}$), where V is the required f.s.d., and I the meter sensitivity—note that this is now 100 μA instead of the original 50 μA, because of the shunt resistors in the meter circuit.

Once a value for R is found for a given range, the resistance of the meter and parallel shunts must be subtracted from it, as well as any multiplying resistors further down the chain.

$$\text{Hence } R_A = \frac{1\text{ V}}{100 \times 10^{-6}\text{ A}} - \frac{880}{2} = 9560 \text{ ohms}$$

$$R_B = \frac{10\text{V}}{1 \times 10^{3}\text{ A}} - \frac{880}{2} - 9560 = 90 \text{ K ohms}$$

Similarly, R_C = 900 K ohms and R_D = 9 M ohms

If you use a different meter, these calculations will be very simple to repeat.

If the accuracy of the meter is to be, say, two per cent, then the tolerance of these resistors used must be of the same order, and a 9560 ohm resistor of that tolerance would be almost impossible to find. We therefore resort to a technique similar to that used for the current section of the meter, only this time an accurate voltmeter must be borrowed, one which is capable of reading from one volt to, preferably, one kilovolt.

Connect the circuit of Fig. 4 to the 1 volt terminal, adjust the applied voltage to the same, and try various 10 K ohm resistors in the place of R_A until one is found which gives f.s.d. on the new meter. Wire it in, and repeat the process for the second terminal, applying 10 volts and trying 100 K ohm resistors. Repeat similarly for the remaining two ranges, but if a source of 1 kV is not available, use about 250 volts, and find a 10 M ohm resistor which deflects the meter to exactly 2·5 on the scale.

Measurement of Resistance

In this section of the multimeter, we have a 1·5 volt cell connected in series with the meter and the resistors R′ and VR′, which are such that the meter reads exactly f.s.d. when the OHMS and COMMON terminals are joined together, which condition corresponds, of course, to zero external resistance. When setting up, the two leads are shorted and VR′ adjusted to satisfy this.

If a resistance is connected between the two terminals, the meter reading will fall as this resistance is increased. Hence the resistance scale will read backwards. It is also non-linear, being more cramped at the high resistance end, but resistors up to 100 K ohms may be measured easily.

The resistance scale may be calculated in two ways. Obviously, if many high-tolerance components of suitable " round " values are available, the scale could be calibrated using these in turn, and in various series and parallel

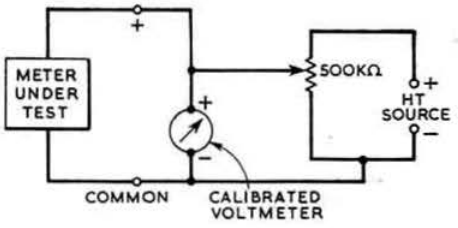


Fig. 4. Circuit used for finding required multiplier resistors.

arrangements. Alternatively, it can be calibrated theoretically, knowing that with a 1·5 volt cell, and a total resistance contributed by R′ and VR′ of 15 K ohms will give exactly full-scale deflection with no external resistance.

More Ohm's Law calculations come into this, and the meter reading for a given external resistance is obviously given by:

$$I = \frac{1{\cdot}5}{15{,}000 + R_{ext}}$$

or something similar if a different meter was used. From this formula, the following points should be marked on the scale:

R (ohms)	Current scale calibration	R (ohms)	Current scale calibration
1000	9·38	40,000	2·73
2000	8·83	50,000	2·31
3000	8·34	60,000	2·00
4000	7·90	70,000	1·77
5000	7·50	80,000	1·58
10,000	6·00	90,000	1·43
15,000	5·00	100,000	1·31
20,000	4·29	200,000	0·70
25,000	3·75	500,000	0·29
30,000	3·33		

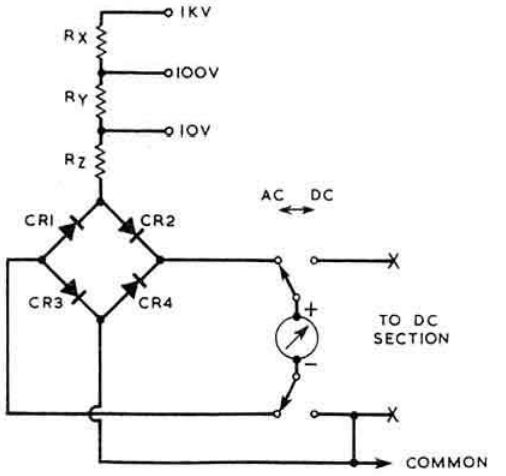


Fig. 5. The a.c. section of the meter. The four diodes are specified in the text, and the 2-pole changeover switch is fitted to the front panel.

A.C. Voltage Measurement

This facility is not included in the model multimeter, because the values of multiplying resistors needed in the a.c. voltage arm depend greatly on the characteristics of the rectifier used to change the a.c. into d.c. However, it is quite simple to add to the circuit, and find the resistors experimentally, by the same procedure as before.

The meter should be removed from the circuit of Fig. 1 at the points X-X, and replaced with the arrangement in Fig. 5. The changeover switch which takes the meter from the d.c. circuits to the rectifiers has been included on the front panel of the prototype, so the only change necessary in the construction would be to make the panel slightly wider so as to accommodate the three extra terminals.

The bridge rectifier CR1-4 should consist of either a small copper oxide meter rectifier (a common junk-box item), or four germanium diodes connected in the usual bridge configuration. The OA70 diode would be suitable here. Silicon diodes, and others, are unsuitable for this purpose, as they require an appreciable positive voltage across them before conduction starts (as much as 1·5 volts).

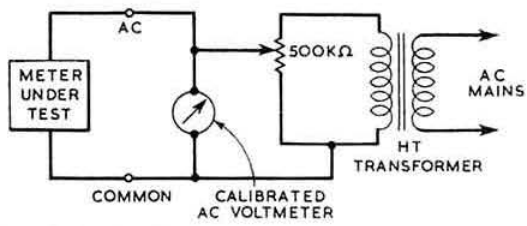


Fig. 6. System for adjusting component values in the a.c. section of the meter. The source of a.c. voltage can be any h.t. transformer secondary with an output of 250 volts, or greater.

As when calibrating the other ranges, the job is easy when a ready-calibrated instrument is available: this time an a.c. voltmeter. Set up the circuit of Fig. 6, and apply 10 volts a.c. to the 10 volt a.c. terminal of the meter. Working from high values to low, find a resistor for R_Z which gives a reading near f.s.d. Then take a bundle of the nearest preferred value and find one which gives exactly f.s.d. Repeat this for other voltages and terminals.

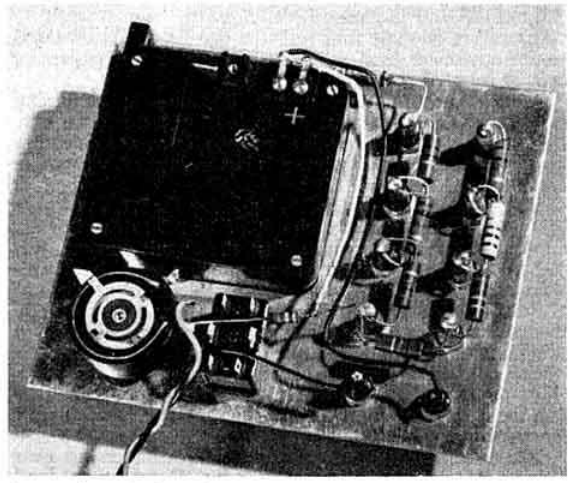
The scale for a.c. voltages will be slightly non-linear, because the resistance of the diode bridge is not independent of voltage. This should be checked, and if the a.c. scale is sufficiently different from the d.c. scale, mark another scale on the meter, calibrated in conjunction with the borrowed a.c. voltmeter.

Construction

It is recommended that all the components of the multimeter be mounted on a panel, about 6 in. × 4 in., or according to the size of meter used, so that this can be screwed on top of a suitable box or case. One of the familiar diecast boxes could be used here, or perhaps another idea of the constructor's invention. In the prototype, the battery for the resistance section was mounted in a clip inside the case, and a twisted flex was routed to the relevant terminals on the panel.

Remember that there is complete freedom in layout when building such an instrument as a multimeter, because no

(*Continued on page 24*)



A rear-of-panel view of the multimeter showing the layout of the components. The shunts and multipliers are on the right of the meter in this picture with the potentiometer and change-over switch below.

TECHNICAL TOPICS By PAT HAWKER, G3VA

The Cost of Amateur Radio . New A.M./S.S.B./C.W. Detector . Diode Bandspread Tuning
Japanese Filters . Regenerative I.F. circuit . G3SYC Front-end . R.F. Power Transistors
Transistor Characteristics . H.T. from A.F. for Mobile Operation . Silicon Transistors

TECHNICAL journalism has been defined by one cynic as " scribbling on the back of advertisements." This is always a chastening and suitably humbling thought for those of us who endeavour to fill the pages between the prestige page advertisements at the beginning of the BULL and the even more essential " classifieds " at the back.

In truth, in Amateur Radio the advertisements often reflect the " state of the art " every bit as much as the editorial. For every reader who is stirred to try out a circuit from *TT* we guess that there are about five who are more concerned with weighing up the pros and cons of that new Brand X receiver or s.s.b. transceiver offered at £100, £200 or so on—up to £600 for the latest frequency-synthesized, solid-state receiver.

It is clear that there is an increasing tendency for new gear to become more complex, and to be built to higher technical standards, and hence to become a high-cost commodity. Such equipment appears to find a reasonably assured market. What other conclusion can one draw from some of those illuminating " classifieds "—such as the one the other month seeking to dispose of gear bought only six months before and with a retail value of over £400.

Thinking back to our school days in the 'thirties when it was a matter of careful deliberation whether to remain content with a 6s. 6d. 6L6 p.a. or really splash out on a 17s. 6d. T20, and the receiver, of course, was a battery 0-V-1—we wonder whether there is not a real danger of the hobby slipping away from those to whom it should have most appeal, and upon whom its future really depends.

For it is no good expecting youngsters to be attracted to a hobby in which for many years they would have to be content with inferior gear or results, unless they happen to have made a " pop " record. Fortunately, this is still not the case. Home-construction and modification of older gear—government surplus or secondhand—can provide at moderate costs gear which, if not always so convenient to install or operate, or so compact, can at least hold its own on the air with the de luxe models. It is all very well jokingly defining " surplus " as " cheap in theory—expensive in practice," but we feel that if ever we start erecting a high-cost barrier to the newcomer, it will be a sad day for Amateur Radio.

Some years ago, we wrote in *A Guide to Amateur Radio* that " fortunately, results depend much more upon the skill and knowledge of the operator than upon the possession of a well-filled purse." This perhaps is less true today, but at least has not yet been entirely outmoded.

For all these reasons some of the most welcome sights at the 1964 RSGB Exhibition were the group projects such as that of the Wirral Society for building modern s.s.b. and a.m. transmitters at less than £40 each. The pooling of knowledge and test equipment is surely the answer to the problems of setting up and alignment of complex gear—though we hope that members are being encouraged to do this individually rather than one or two gen-men doing the lot.

A.M. S.S.B. C.W. Detector

After such a dose of moralizing, we feel obliged to provide some possible pointers to updating or constructing low-cost receivers. Fortunately a number of interesting circuits have come to light recently.

For instance, from the " Noteworthy Circuits " feature of *Radio-Electronics* (November, 1964)—originating from Philco who have a patent pending on the circuit—comes a new detector/a.g.c. circuit designed for optimum performance on a.m./c.w./s.s.b. without the need for the independent detectors involved with s.s.b. product detectors, and permitting a.g.c. to be used on all modes.

The arrangement, Fig. 1, consists basically of a 6AS6 valve used as a grid-leak power detector. When S1 is in the a.m. position, the crystal-controlled b.f.o. is disconnected. The incoming i.f. signals are rectified in the grid/cathode circuit and the detected signal amplified in the anode circuit. A.g.c. is taken off from the cathode circuit with the 1N91 crystal diode used to delay the operation of the a.g.c. until the signal strength reaches a satisfactory level. S2 selects the a.g.c. time-constant.

On s.s.b. and c.w. the b.f.o. signal is fed to the suppressor of the 6AS6 and mixes with the incoming signals in the

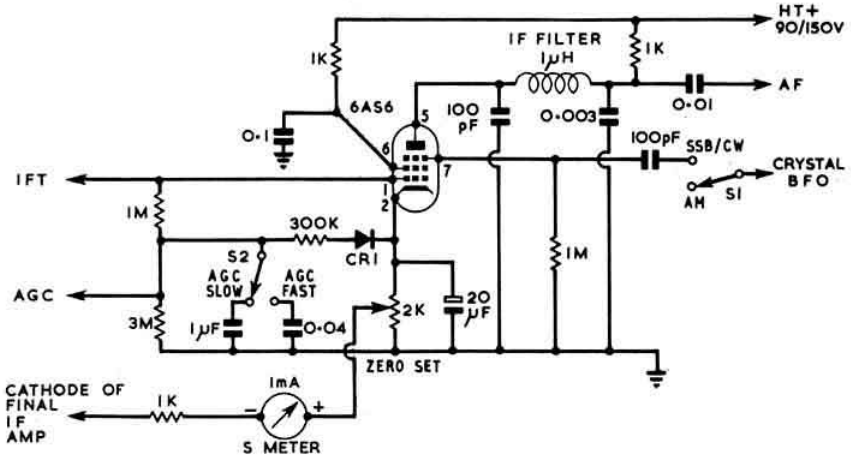


Fig. 1. Philco circuit for combined a.m./s.s.b./c.w. detector/a.g.c. system. CR1, 1N91 or similar crystal diode.

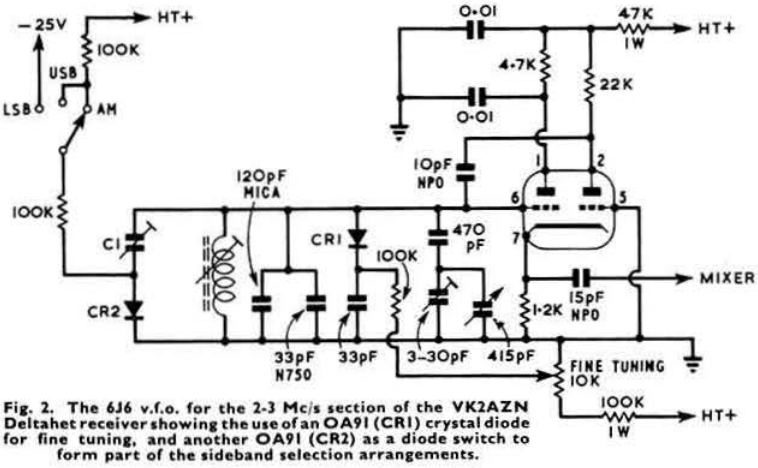


Fig. 2. The 6J6 v.f.o. for the 2-3 Mc/s section of the VK2AZN Deltahet receiver showing the use of an OA91 (CR1) crystal diode for fine tuning, and another OA91 (CR2) as a diode switch to form part of the sideband selection arrangements.

anode circuit. It is claimed that the b.f.o. (which need not be crystal-controlled) is thus isolated from the detector circuit and so does not affect the a.g.c. level.

Crystal Diode Bandspread Tuning

When the selectivity of an old receiver has been stepped up—for example by means of a crystal or mechanical filter —the tuning knob is often found to be too coarse for easy tuning of c.w. and s.s.b. signals. This can be overcome by the provision of a small bandspread or fine tuning adjustment of the h.f. oscillator tuning (or the second oscillator with some multiple conversion models). It is not always convenient to fit an additional tuning capacitor, and a possible alternative is to make use of the voltage/capacitance characteristics of semiconductor diodes.

We have already referred to the use of the special silicon voltage variable capacitors, such as those made by Hughes (*TT*, October, 1961) for tuning over a complete band, and we were interested to note that all tuning in the latest MST (Marconi self-tuning) commercial point-to-point receivers uses this technique for the pre-selector circuits, in conjunction with a frequency synthesizer. A tip which one of the Marconi engineers gave us was that to retain high-*Q* characteristics it may prove advisable to restrict the diode capacitance change to a lesser figure than that suggested by most diode makers.

The above technique uses silicon junction diodes but, of course, all semiconductor diodes, including the much cheaper germanium point-contact diodes, show some capacitance change with voltage: and this can be used to provide a fine tuning control. This technique, incidentally, has been used in transistor broadcast receivers fitted with an s.w. band (Portadyne and some Japanese models), in television tuners (Alba) and some time ago in an automatic frequency control system for v.h.f./f.m. in a Murphy combined radio and television model.

The technique is also used in the full receiver version of the Deltahet described by Ian Pogson, VK2AZN (*Radio, Television & Hobbies*, September/October, 1964) in conjunction with a cathode-coupled oscillator of the type recommended some years ago by G2UJ (*TT*, August, 1960). VK2AZN uses an OA91 diode with potentiometer control to provide easy tuning of s.s.b. signals: see Fig. 2.

High Performance Filters

One of the main improvements in high-class receivers in recent years has been the better shape factors of the i.f. selectivity characteristics, made possible by the use of mechanical and multiple-crystal filters or with pot cores at low i.f. Such filters, if bought as complete packages, are still fairly costly in the UK and we were most interested to see the prices at which they are now being retailed in Japan.

This was made possible by G3IDG who sent along a copy of the Japanese *CQ Ham Radio* magazine which runs to more than 200 circuit-packed pages monthly. The advertisements show that mechanical filters now sell in Japan at just under £5, while bandpass 455 kc/s crystal filters with a shape factor (6 db/60 db) of 2·8 are offered at about £3 16s., and some with wider pass-bands and unspecified shape factors at under £3.

We also noticed elsewhere that a new Japanese double-conversion amateur-bands-only receiver (Trio 350) incorporating a mechanical filter has been announced recently. Although we do not know what this sells for in Japan, it is being advertised in the United States (as the Lafayette HA-350) for less than £70.

There is no doubt that the standard of the Japanese amateur gear is shooting up, with the real possibility that in a few years JA-land may become the centre of the amateur component and equipment market instead of the United States. It will take more than a 15 per cent import levy to enable our makers to compete with some of their prices, particularly if the trade grows to an extent which would allow the very wide differences between the prices in Japan and those asked in the UK for the same equipment to be reduced.

Regenerative I.F. Circuit

The regenerative i.f. stage, as an alternative to the related *Q*-multiplier technique, has been knocking around for a long time. But we were interested to see a very simple scheme for adding regeneration reported in *Radio-Electronics* (November, 1964). This makes use of the suppressor grid of an i.f. pentode and allows the regenerative facility to be easily switched in or out: see Fig. 3. Instead of grounding the suppressor, for regeneration this goes to earth via a variable resistor, which acts as regeneration control. The circuit is the subject of a US patent.

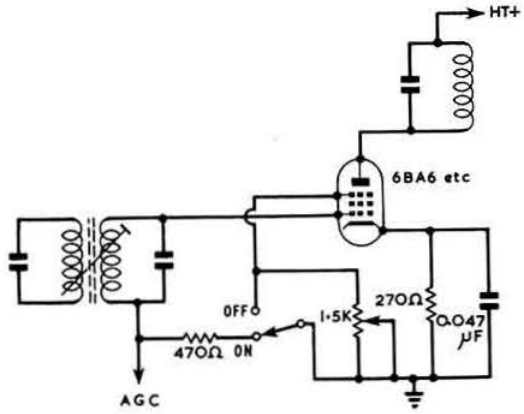


Fig. 3. Simple method of obtaining regeneration control for i.f. amplifier.

Simple Front-end

Brian Booth, G3SYC, recently supplied some details of a front-end of a home-brew single-conversion receiver which he has built. He prefers this to a " good HRO " for his particular interest which is 3·5-3·6 Mc/s c.w. There are several features which contribute to reasonably simple construction including the absence of an r.f. stage and the non-adjustable crystal filter which provides a high degree of selectivity despite the use of a 1·6 Mc/s i.f.—and, since the equivalent noise resistance of the pentode mixer is theoretically less than 10,000 ohms, the sensitivity should not be far from the usable optimum on this band.

Fig. 4 shows the main details of the front-end, with the exception of the 6AM6 Vackar oscillator which is directly based on the G3GFN design in the February, 1964 BULLETIN and which he has found to be very stable. The pentode section of the 6U8 forms the mixer with cathode injection from the isolating triode section. G3SYC finds that the a.c. coupling between the cathodes rather than the more usual d.c. coupling is easier to set up.

The crystal filter uses four FT243 crystals (all 1630 kc/s) to provide an extremely sharp, though asymmetrical pass-band, suitable for c.w. reception. The band-pass front-end tuning uses Electroniques coils. Complete line-up of the receiver is 6U8 mixer; 6BA6 first i.f.; 6BA6 second i.f.; 12AU7 product detector; EF86 first a.f.; EL84 output; 6AM6 v.f.o. and 6C4 b.f.o.

This type of approach—a home-brew receiver tailored to one's own operating interests—is one which we have long advocated. It allows high performance to be obtained without the complexities which daunt so many home constructors, and without the birdies and other spurious responses of all but the very best multiple conversion designs—and with due regard to modern concepts such as the importance of cross-modulation characteristics.

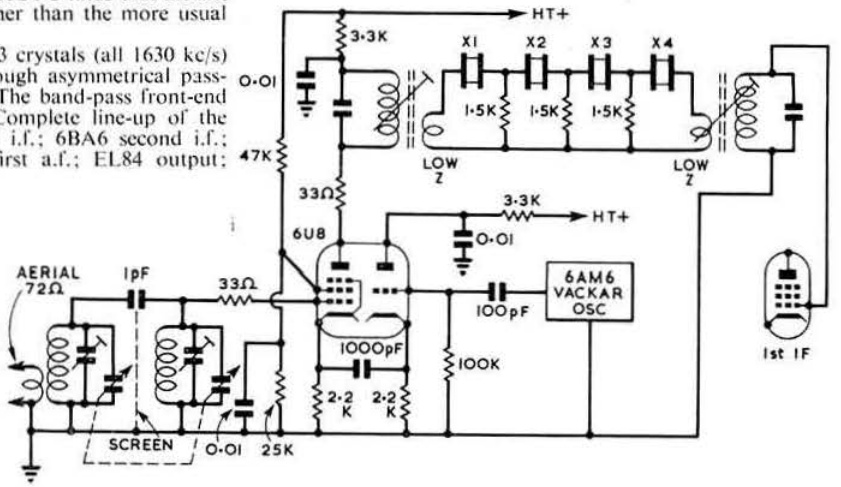


Fig. 4. The G3SYC front-end for a 3·5-3·6 Mc/s c.w. receiver using 6U8 mixer.

R.F. Power Transistors

As briefly mentioned in the last *TT*, Reg Hammans, G2IG, who has for some time been studying intensively the use of transistors in many types of circuits, has come up with some very pertinent remarks on the important subject of r.f. power transistors.

It is his contention that the relatively low watts/£ factor can only be justified for normal amateur operation where mains supplies are not available and in particular for mobile work. This implies—if maximum advantage is to be obtained from transistors as opposed to valves—operation direct from the 12V car batteries without any form of h.t. converter.

He points out that careful study of the characteristics of almost all r.f. power transistors which have come on the market recently, suggests that the higher output powers now available result primarily from the increases in maximum permissible collector voltage ratings, while the important maximum collector current ratings have remained relatively stagnant. Very few transistors at reasonable prices will accept a maximum collector current as high as 800mA (that is average collector current of about 400mA).

In those cases where it is not maximum collector current which limits the power, it is often total dissipation but this can rarely be reached with a 12V supply. G2IG wonders why the makers seem to be concentrating so much more upon increasing collector voltage rather than current ratings.

Our own opinion is that this is largely a matter of what has become possible with improved fabrication processes rather than deliberate policy, although there has been a demand for better voltage ratings for some other applications such as line output stages for television receivers. With h.f. transistors the active area of the transistor is limited.

Commercially, of course, there are a number of applications where the power source is 24V rather than 12V (e.g. aircraft) and again for many portable applications, using rechargeable cells, the limitation is total wattage rather than voltage.

But—apart from experimental use—this current limitation is undoubtedly a serious drawback from the amateur mobile viewpoint, and also for domestic use since a 25-50V power supply is generally as bulky and expensive as the usual valve h.t. supply.

G2IG draws attention to the British Clevite silicon epitaxial planar type BSY84, quoted at 30s. 9d. for small quantities. This has a maximum collector/emitter voltage of 80, a maximum collector current of 1 amp., a gain/frequency product of 120 Mc/s and a total power of 5 watts at a case temperature of 25 C—and all in a TO5 outline.

Another view on recent h.f. power transistor trends is that the limitation now is not so much frequency or power (for those with about £65 to spare there is a 3TE120 device which puts out more than 50 watts at 70 Mc/s with 8db gain and a 28V supply) but gain. Silicon structures often end up with power gains as low as 4 to 6db. In a new Clevite series it is claimed that a real improvement has been made by changing to an *emitter*-to-case connection instead of the usual *collector*-to-case. According to the makers, this reduces input and feedback capacitances.

Transistor Characteristics

There is often some confusion about the high-frequency performance of transistors since this is specified in several different ways. The following notes which refer primarily to small-signal types are based on information from an article in *Electronics World* (September, 1964) and from other sources.

Alpha cut-off frequency (f_α). This is the frequency at which the common-base current gain is 3db down on its l.f. value. To a rough approximation, the corresponding frequency in

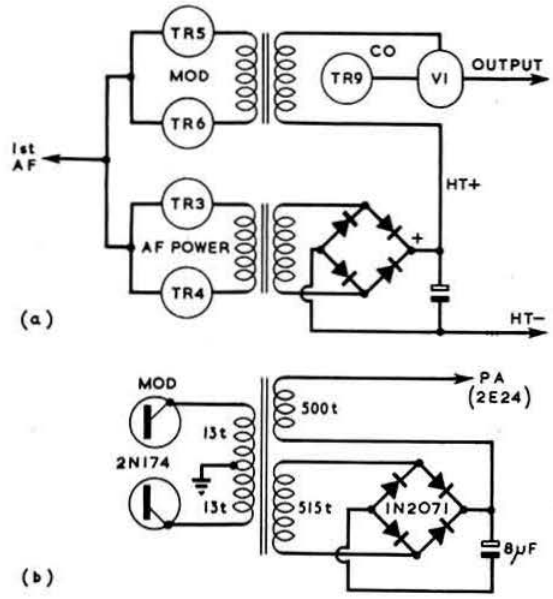


Fig. 5. (a) Block diagram of modulation/power arrangements on the Mobiltrans " 40. " TR3-TR6 type SPI251, TR9 2N697, V1 Compactron 8156. (b) Circuit detail from K5CXN " Five transistors—two tubes—35 watts " rig.

a common-emitter circuit (f_β or $f_{\alpha e}$) is f_α/β. Transistors are commonly used as r.f. amplifiers up to about $0{\cdot}25f_\alpha$; as fixed frequency oscillators to $1{\cdot}25\ f_\alpha$; as variable oscillators to $0{\cdot}8\ f_\alpha$; as mixers (self-oscillating) to about f_α; and as mixers (separate oscillator) to $2\ f_\alpha$.

Maximum frequency of oscillation (f_{max} or f_{osc}). This is the frequency at which in a neutralized common-emitter circuit with input and output impedances matched the power gain is one. For use as a v.f.o. a transistor should have f_{max} at least twice the operating frequency. Each time the frequency is halved the power gain increases by about 6db.

Gain-bandwidth product (f_T). This is the frequency at which the a.c. common emitter current gain (β or h_{fe}) is equal to one. Transistors for switching and wide band amplifiers are usually rated in this way. A high f_T is usually indicative of a high f_{max}. The h.f. power gain of a transistor is proportional to f_T/r'_bC_c where r'_b is the ohmic base lead resistance and C_c the collector-junction capacitance.

Power h.f. transistors have been made possible by photolithographic techniques permitting fine geometries and improved diffusion techniques both of which lower r'_b. Low C_c is obtained by an epitaxially formed collector region.

Thus, as we have noted in many recent *TT*, considerable progress is being made in h.f. power transistors and fully transistorized rigs form a good field for experimental work. Nevertheless, valves are likely to be used in most p.a. stages for quite a while yet.

Mobile H.T. Source

An interesting technique for mobile operation which combines some of the advantages of transistors with valves is outlined in a *QST* (October, 1964) review of the Mobiltrans " 40 " single-band, controlled-carrier, a.m. transmitter plus converter for use with a broadcast car radio. The same technique, although in a somewhat different form, has been fully described by K5CXN in *QST* (April, 1962).

The Mobiltrans 40 is entirely transistorized with the exception of the p.a. For this valve the h.t. is derived from rectifying output from a pair of a.f. transistors connected alongside the main a.f. modulator pair. In the original K5CXN circuit a single pair of transistors is used for both modulation and h.t. supply, although in this rig (which had a valve c.o.) a second conventional d.c. inverter was used for this stage. For tune-up purposes the modulator (or h.t. pair) is made to oscillate. Fig. 5(a) shows the block schematic of this part of the Mobiltrans arrangement and Fig. 5(b) gives details of the K5CXN circuit.

With no speech, current drain on the car battery is quite low. Heavy consumption occurs only on speech peaks, when the transmitter input rises to 30 to 40 watts. K5CXN kept consumption low also by the use of quick-heat valves, but the Mobiltrans p.a. valve is a Compactron type. We have heard the suggestion made that quick-heat valves have a reliability factor substantially below that of conventional types, but have been unable to find any confirmation of this, although it would seem logical in view of the heavy current surges. On the other hand, some makers particularly stress reliability in their advertisements for such valves.

Silicon Transistors

Until recently, all the less expensive transistors used for entertainment equipment in the UK have been of the germanium type, although the more expensive silicon types (with type numbers beginning with a " B ") have been used for many industrial and professional communications applications for a number of years. Improved manufacturing processes have now considerably reduced the price gap between the two types. Several entertainment-type silicon transistors—including v.h.f. silicon planar types—are becoming available.

Whereas the maximum junction temperature for germanium devices is about 75-100°C even with considerable derating silicon types work up to about 150-160°C and have very much lower reverse leakage currents and higher reverse voltage ratings.

As an example, the BF115 is a small-signal *n-p-n* silicon r.f./i.f. transistor which can be used instead of the AF117 and similar germanium types. Compared with the AF117, the BF115 has considerably lower feedback capacitance (about 0·7 pF instead of 2·4 pF) enabling greater stage gains to be achieved without affecting stability; the low knee

(Continued on page 22)

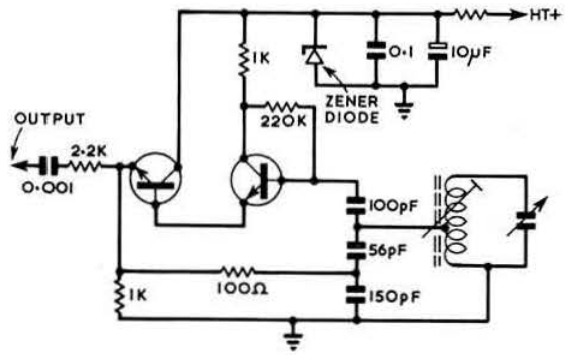


Fig. 6. Simplified circuit of a wide-range v.f.o. using two n-p-n silicon transistors in a super-alpha pair (Darlington compound). The original circuit for transmitting used two BSY26 transistors with the supply stabilized by an OAZ247 Zener diode, but the basic arrangement might be adapted with lower cost transistors for a receiver h.f. oscillator etc.

Single Sideband

By G. R. B. THORNLEY, G2DAF*

SINGLE sideband reception and transmission is inherently a frequency translation process, i.e., in the receiver the incoming signal is translated down to the tunable i.f., then down to the filter i.f., and finally down to the required audio spectrum. In the transmitter this process is reversed and the audio frequency is translated upwards—usually in two or three steps—until r.f. output is obtained in the required amateur band.

This frequency translation is obtained by a process of heterodyning in which the original signal, F1, is made to beat against a second frequency, F2, obtained from a stable oscillator within the equipment. Either the sum, F1 + F2, or the difference, F1 − F2, is extracted from the frequency conversion stage to feed the following circuits. In either case only the sum or the difference frequency is required, and the input signal, F1, and the local oscillator, F2, must be attenuated to a low level in order to avoid spurious beat frequencies and give a clean output.

Some time ago the General Radio Company of America issued details of a double-balanced mixer design claimed to give an exceptionally clean output with low distortion level, and which also eliminated the appearance of the input signal and local oscillator signal from the output.

This information is a natural follow-on to the discussion on mixers given in *Single Sideband* in the November, 1964

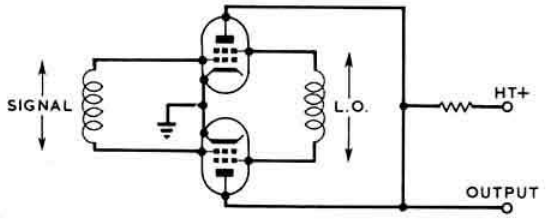


Fig. 1. Common double-balanced mixer circuit. The input signal and local oscillator signal are cancelled in the anode circuit.

issue of the BULLETIN. Almost every piece of sideband equipment uses two or three frequency conversion stages—these are an essential part of the circuit—and their correct operation can make all the difference between a first-class and a mediocre signal.

Double-Balanced Mixer Circuit with Clean Output

A double-balanced mixer circuit is desirable for many communication and measurement systems. The balance system, when properly designed, will eliminate the appearance of the input signal and local oscillator from the output.

In many communication and measurement systems the use of balanced mixer circuits is highly desirable. A balanced mixer circuit is one which is so designed that either the input signal frequency or the local oscillator frequency does not appear in the mixer output.

In one form of single sideband generation, for example the modulator, a balanced mixer circuit is used which eliminates the local oscillator (carrier) frequency from the output, leaving the input signal and the two sidebands. One sideband is then extracted from the mixer output by filtering.

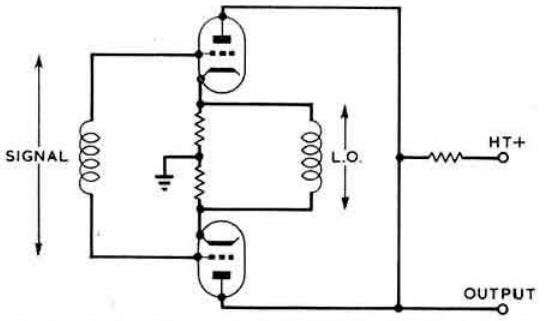


Fig. 2. A variation of Fig. 1. The local oscillator signal is applied to a pair of cathodes rather than to a pair of grids.

Occasionally, a mixer circuit is required in which both the local oscillator and the input signal frequencies are cancelled in the output, leaving only the beat signals or sidebands. Such a circuit is called a double-balanced mixer.

A common double-balanced mixer circuit is shown in Fig. 1. In this circuit two valves are used, each having two control grids. The local oscillator signal is applied as a balanced push-pull signal to one pair of grids and the input signal is similarly applied to the other pair of grids. The two anodes are connected in parallel. Since both the input signal and local oscillator signal are applied in opposite phase to each valve, their effect is cancelled in the combined anode current, leaving only the beat signal and harmonics of the inputs.

A variation of this circuit employing a double triode is shown in Fig. 2. In this circuit the local oscillator signal is applied to a pair of cathodes rather than a pair of grids.

Both of the above-mentioned circuits require well balanced push-pull drive for proper operation. Since many input signals occur as single-ended signals, some form of single-ended to push-pull converter is usually required. Such a converter circuit is often difficult to design and expensive to produce. In addition, the above circuits often require two balancing adjustments to equalise the g_m of the two valves and a drive amplitude or phasing adjustment.

A circuit without these disadvantages is shown in Fig. 3. In this circuit a single-ended input signal is applied to both the grid of one valve and the cathode of the other, and a single-ended local oscillator signal is applied to the other grid-cathode pair. The two anodes are connected in parallel. The circuit may be thought of as a pair of grounded-cathode amplifier stages driven in parallel with a pair of grounded-grid amplifier stages with a common anode load. Since the gain of the grounded-grid stages is equal and opposite to

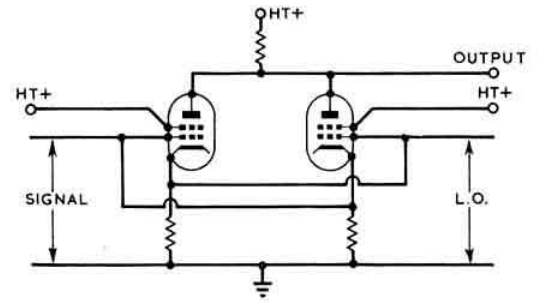


Fig. 3. This circuit has none of the disadvantages of Figs. 1 and 2. The output contains only the beat signal and even order harmonics of the input.

* 5 Janice Drive, Fulwood, Preston, Lancs.

† The series of articles on the G2DAF s.s.b. transmitter, and the G2DAF linear amplifier, have been reprinted as a booklet entitled *S.S.B. Equipment*, available from RSGB Headquarters, price 3s. post paid.

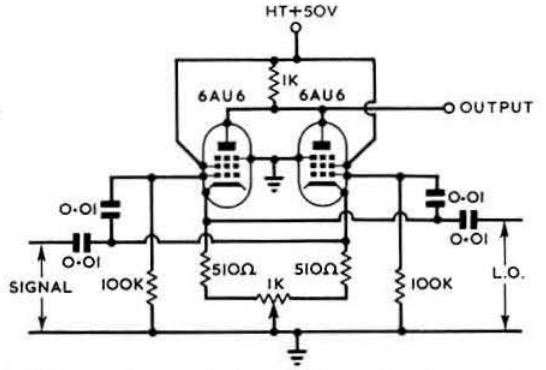


Fig. 4. A potentiometer in the cathode provides d.c. g_m balance. The circuit is inherently broadband.

that of the grounded-cathode stages, the net gain is zero at the input frequencies. The output contains only the beat signal and even order harmonics of the inputs. The only balancing adjustment necessary is a d.c. g_m balance. This is obtained in the circuit of Fig. 4 by the potentiometer in the cathode circuit. Because of the low impedance of the grounded-grid stages, the circuit is inherently broadband and will operate over a wide range of frequencies without tuning. The circuit shown in Fig. 4 exhibits a conversion transconductance of about 1500 μmhos with a local oscillator drive of 0·5 volt.

Two variations of the basic circuit are shown in Fig. 5. The triode circuit of Fig. 5(a) does not balance as well as the pentode circuit because of direct feedthrough from input to output through the anode-to-grid capacities. For operation over a very narrow band, however, the grid-anode capacities can be neutralized by shunt inductors. The transistor circuit of Fig. 5(b) is a direct counterpart of the triode circuit of Fig. 5(a).

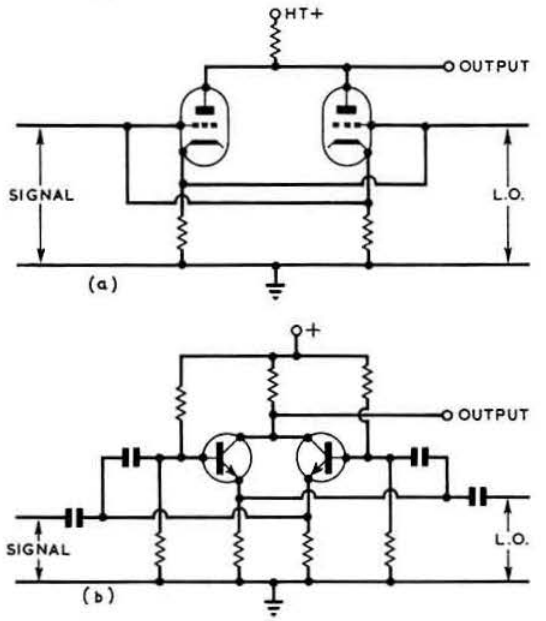


Fig. 5. Variations of the basic circuit. Fig. 5(a) does not balance as well as the pentode circuit owing to direct feed-through from input to output through the anode-to-grid capacities.

Kokusai Filter—Impedance Matching

From letters received, it would appear that there is some confusion in regard to the action of the coil T2 coupling the diode modulator to the Kokusai mechanical filter in the G2DAF s.s.b. transmitter Mk. 2, shown in the circuit diagram Fig. 6, page 242, April 1964 BULLETIN.†

The manufacturer does not give any values for input or output terminal impedance. Inspection of the internal circuitry given on the data sheet shows a parallel resonant circuit shunted by a crystal transducer for both input and output. Additional Kokusai technical information in the writer's possession also states, "Both input and output should be connected to high impedances. Since mechanical filters tend to be rather sensitive to capacitances across both input and output terminals care should be exercised not to lower the impedance by stray capacity. In the case of the circuit shown, when the impedance across terminals P-B and G-E drops below 30K ohms, there is a possibility of change of operating characteristics."

It is clear from this that the Kokusai filter is designed to operate into relatively high impedance input and output loads. If this filter is connected directly across the output of a diode modulator presenting a low impedance load of a few hundred ohms, the transducer coil would be heavily damped, there would be loss of signal and a possible change in the filter passband characteristics.

The coil L2, together with its two resonating capacitors, forms an auto-transformer giving an impedance step-up of about 100 : 1, which gives the required matching conditions. This circuit was adopted after a considerable amount of experimental work using a wobbulator and an oscilloscope, because it appeared to give the best signal output together with the least ripple in the filter passband. Adjustment is also very simple, requiring only the setting of the dust core of L2 for maximum signal output through the filter.

Appeals for Rare Drugs

Members are reminded that the policy of the British Red Cross Society is not to accept requests for rare drugs from individual radio amateurs even when such requests are passed on to them via the police authorities. The British Red Cross Society recommend that when a United Kingdom amateur is asked by a foreign amateur to accept a message for a rare drug he should advise the sender to contact his National Red Cross Society.

Only requests from, or through, National Red Cross Societies, can be dealt with by the British Red Cross Society and any drugs obtained would be sent to the National Red Cross Society concerned.

Technical Topics

(Continued from page 20)

voltage permits an improved a.g.c. characteristic to be achieved; it has better resistance to voltage surges; and of course, considerably better performance at higher temperatures. One advantage of some germanium types is low-noise performance at v.h.f./u.h.f.—but even for this application low-noise silicon types are available.

Silicon types thus appear to offer many real advantages for amateur use provided that the prices are reasonably competitive; for example, in hybrid designs with mixed valves and transistors where the valve heat can be a real handicap with germanium types. Another possibility for the not too distant future is the unipolar field-effect transistor (FET) and the basically similar metal-oxide semiconductor transistor (MOST). These devices resemble valves in having very high input impedances compared with conventional valves.

RTTY

By J. A. McELVENNEY, G3LLV*

THE fourth AGM of the BARTG was held at "The Olive Branch," Homer Street, Marylebone, on October 31 last. Coinciding, as it did, with the last day of the Exhibition, a large attendance resulted; some 50 members and guests were present, together with a contingent of PA0s headed by PA0FB and PA0LQ.

After the meeting was opened by the President, G6NZ, the Minutes of the previous AGM were read and approved, and matters arising from the minutes were then discussed. These included the group's new manual, printing of which had been delayed, the activity night and the RTTY test transmissions put out by the group. These tests were started late in 1963 after permission had been obtained from the GPO. They are to be found between 3525 and 3550 kc/s at 11.00 GMT every Sunday and are transmitted by G6CW, G2HIO, G2FUD or G3LLV, using standard shifts and signalling speeds.

When giving the Secretary's report, Dr A. C. Gee, G2UK, noted the large increase in membership. The group had nearly 200 members, 42 having joined in the previous three months. The increase in RTTY interest was helped by an easing in the supply of surplus teleprinters, due in no small part to G2FUD, who had done much to publicize the whereabouts of these and other pieces of equipment. Activity abroad was also on the increase and such countries as Ireland, Belgium, Austria and the Faeroe Islands were now on the active list. A letter from Reg Farr, G8IJ, had been received asking for RTTY assistance with the RSGB Intruder Watch. The President spoke of the importance of this matter if the bands were to be kept clear, and urged all interested members to get in touch with G8IJ.

John Curnow, G6CW, a well-known Midland RTTY operator, was elected President in place of Len Newnham, G6NZ, who was then declared Vice-President. At this point G2UK announced that due to pressure of work he was unable to carry on as Honorary Secretary but would be able to continue as Honorary Treasurer. The writer, having "volunteered," found himself with the task of Secretary. G8DD and G3MBQ were elected to the committee and the resignation of a committee member, G3HKT, was accepted. It was noted with particular pleasure that the next President of the RSGB, Eric Yeomanson, G3IIR, was an active RTTY'er. For the last two years he has been responsible for the live RTTY demonstrations at the Communications Exhibition. This stand has proved to be very popular indeed.

The meeting ended with an interesting talk on terminal units by PA0LQ and the usual ragchew. It was an experience to see the PA0s discussing technical points in fluent English.

This report would be incomplete without paying tribute to G2UK. A founder member of the BARTG, he has for the last five years carried out the duties of Honorary Secretary. It is quite true to say that without "Doc," the Group would not be in the healthy position it is.

Creed 7B Electrical Circuits

With the increase in supply of surplus teleprinters, mostly Creed 7Bs, there has been a similar increase in the demand for information about them. To try to give a detailed account of operation, maintenance, lubrication and the electrical circuits would require far more space than is available, and consequently these few notes are limited to the electrical circuits only.

Perhaps the best way to become aquainted with the 7B is to connect it up in a local loop. This completes the circuit between the keyboard and the printing mechanism, allowing the operator to check and become familiar with the mechanics. Fig. 1 shows a simplified circuit of the 7B, together with a basic 80V + 80V supply and the connections required for local copy. The 4000 ohms resistor in the centre-tap of the transformer is to limit the current through the electromagnet to 20 mA. On the basis of 20 mA through 200 ohms, the series resistance of the electromagnet coils, it might seem that an 80 volt supply is wasteful but, if a square wave current is to be pushed through this highly inductive circuit, it is necessary. If the printer mechanism races, the polarity of the supply is incorrect and should be reversed. Although these are not the connections that will be used when the printer is integrated into the station, the 80V+ 80V supply will still be required. The transformer voltages shown are suggested ones and may be deviated from, but the secondary should not be less than 60 volts. If a different voltage is used the 4000 ohm resistor should be altered to give a standing current of 20 mA through the electromagnet coils and MR1 chosen accordingly. The terminal blocks, X and Y, are easily identified as they are under the base near to the keyboard.

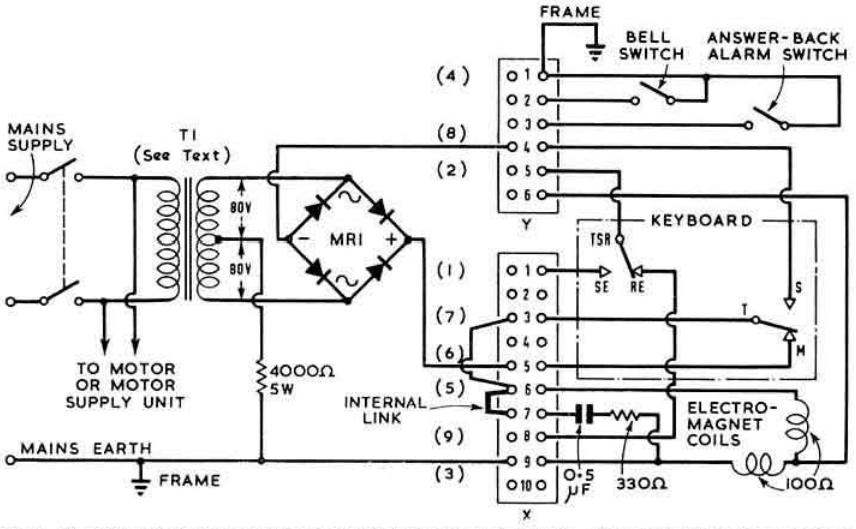


Fig. 1. Simplified signalling circuits of a Creed 7B showing a simple 80 + 80 volt supply and connections required to obtain local copy for initial tests. MR1 is a 250V 30 mA type. The numbers in brackets are pin numbers for a 9 pin plug which is sometimes fitted.

Fig. 2 shows the basic connections to the motor. The most common motor is of the series wound d.c. type, with voltages ranging from 100 to 250 volts. The current required will depend on the motor but, if an input power of about

* Honorary Secretary, BARTG, 15 Havelock Square, Broomhill, Sheffield 10.

70 watts is assumed, it can be calculated. Some of the less common motors are 24 volts d.c. shunt wound, while the dual voltage d.c., a.c. only and the a.c./d.c. types designed for higher voltages are all series wound and have a governing resistor of 1000 ohms. A value of 50 ohms is used for the low voltage motor. On the dual voltage and a.c./d.c. motors, the field connections are brought out to the side of the motor, and a wander plug or link panel is used to alter the motor to suit a different supply. In the case of the a.c./d.c. motor, the fields are connected in parallel for a.c. operation, and in series for d.c. The supply polarity is not really important, but the weight operated starter switch should be placed in the live side. This switch is arranged to stop the motor if no signals have been received after 1½ minutes. A circuit for a motor supply is not shown because of the wide variety of motor voltages.

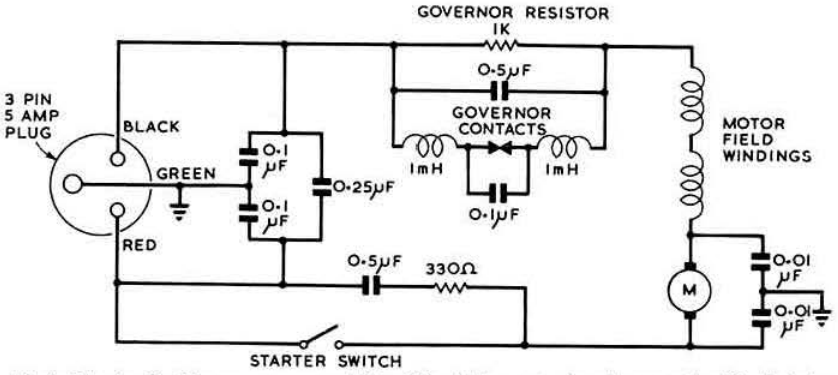


Fig. 2. The circuit of the more common 110 to 250 volt d.c. motor found on surplus 7Bs. Polarity is not important.

Contests and Awards

The fourth annual world-wide sweepstakes of the RTTY Society of Southern California were held recently. This contest, involving nearly every country that has RTTY stations, is extremely popular. The exact number of active countries is in doubt but it must lie somewhere between 30 and 50. As this contest is only an annual affair there has, in recent months, been some pressure on the BARTG to organize another contest for the spring. The committee has agreed to this, and has arranged that the BARTG RTTY DX Contest will be held on March 20 and 21, 1965.

The most coveted award for the RTTY'er is the RTTY WAC certificate issued by *RTTY Magazine*. At this time, the ARRL does not endorse their DXCC award for purely RTTY operation, so the BARTG is considering issuing a certificate of this type. It will be offered to those amateurs who show proof of working a given number of countries on RTTY, and should be available in the next few months.

New Year's Resolutions

Once again the New Year is upon us. May I suggest that you resolve to dig that RTTY gear out of the corner and make a showing on the bands. To all those who are plagued by RTTY interference, almost always commercial, I would say that if you cannot lick them, join 'em. All the best for the New Year, 73 es benu de G3LLV.

Region 1 Field Day

The 1964 event has been won by G3OAG/P, operated by himself and G3RTU. They entered as individuals rather than a club and achieved an all time record for the highest score with 188 points. They operated exclusively on 14 Mc/s with a ground plane aerial on the top of Winter Hill. Messrs S. J. Gilbert, G3OAG and K. T. Kahn, G3RTU, are to be congratulated on their achievement.

Runners-up are Wirral, G3NWR/P, with 133 points, followed by Liverpool, G3AHD/P, with 111 points.

Progressing Through Amateur Radio

(Continued from page 16)

frequencies above the audio range are covered—nor any amplifiers—and so the lead length does not matter. This is perhaps one of the rare occasions when one can concentrate on making a really nice-looking piece of gear, with a most pleasing panel layout.

If you feel discouraged by the apparent difficulties in making this unit, glance at a multimeter catalogue, feel in your pocket, and think again. The only real problem could be the borrowing of the calibrated instruments mentioned before. You need a meter which can measure d.c. voltage and current, a.c. voltage, and resistance. Many commercial multimeters have all these features, and almost any will do if you are not interested in the a.c. ranges. Use one at school or work, or borrow one from someone better off than you, but always remember that you cannot calibrate an instrument like this without some form of accurate reference. In other words, if you try to get something for nothing, it won't work!

SAID FORTY YEARS AGO

"I was in at the beginning, because I go back to the time of Clerk Maxwell whose great treatise was published in 1873. In 1875 I spent the whole summer studying it. His theory of electromagnetic waves excited my wild enthusiasm at the time. It was all mathematics in those days. Nobody knew how to produce electromagnetic waves or how to detect them. Then Hertz and I found them together, but Hertz found them much more thoroughly and satisfactorily and they are truly Hertzian waves based upon Clerk Maxwell's researches. We found how to produce them and how to detect them in an infantile manner until Marconi came and put the matter on a substantial basis. Of course Fleming and other workers have chipped in with the valve. We used to deal with only Morse signals; I did not think that wireless telephony would be possible. Now it is easy. I knew that short-waves were more powerful in many respects than long ones, but I did not think any waves could go round the earth. I am told now that amateurs can get to New Zealand by wireless waves of short wavelength, the only wavelength they are allowed."

Sir Oliver Lodge, F.R.S. Preamble to his Presidential Address to the Radio Society of Great Britain - January 21, 1925

J. C.

THE MONTH ON THE AIR

A CHRONICLE OF EVENTS ON THE HF AMATEUR BANDS

By R. F. STEVENS, G2BVN*

THE never failing conversation piece amongst DX'ers, the ARRL DXCC, is once again in the news following a request in *The DX'er* for suggestions for improvement. WA6TGY submits ideas which basically mean that when a country alters status, either in the way of achieving independence or amalgamation with another territory, it should be deleted from the current countries list and to obtain reinstatement operators should have to submit a QSL from the " new " country. The underlying idea is apparently to stimulate activity by the promotion of new countries for DX'ers to aim at during the present period of low sunspot activity, and also to put everyone on the same basis. It is suggested that apparent anomalies should be removed from the present countries list, i.e. VR1 and KB6, also YJ1 and FU8, all count separately, yet geographically are only two places. Similarly, it is suggested that separate status should be afforded to DL and DM, but here the ideas become tricky with more than just a simple answer. Following some of the unethical behaviour associated with DXCC, and with which most of us are familiar, one questions whether DXCC in its present form really serves any worthwhile purpose. The general opinion is probably for its continuance, but the scales must be finely balanced. It is sad fact that in many cases nowadays the QSL has become more important than the QSO.

Readers are reminded that the *Commonwealth Call Areas Table* will be running w.e.f. January 1, 1965, and we look forward to receiving your entries, and it is promised that the arithmetic will be more accurate than the example given on page 798 of the December BULLETIN !

News from Overseas

From **VK4SS** the following snippets concerning activity in an area, which to him, is short haul only. **VK4ZK** plans to operate from Alice Springs in Central Australia during January using **VK5** and **VK8** prefixes. C.w. and s.s.b. will be used whenever time can be found free from duties with an oil exploration unit. **VK9CJ**, in Port Moresby, has been working Europeans on 7 Mc/s after 14.00. **FU8AA** is active on 7 and 14 Mc/s; from Antarctica **OR4VN** (14.00), **KC4USN** (06.00) and **VK0FB** (06.00) are all to be heard on 14 Mc/s c.w. **VK4SS** has QSO'd many G stations but needs GC, GM and EI on 7 Mc/s.

From Cyprus, **ZC4CZ**, Ted Ross sends a list of the 16 ZC4 stations now on the air from the Sovereign Base Area. This does not include unknown **ZC4AC**, which is observed to come up from time to time particularly during contests. ZC4CZ mentions the licence which is issued by the Joint Signal Committee (Cyprus) to persons who hold the necessary UK qualifications. The terms of the licence are almost identical to the UK licence.

ZC4TX is the club station of the 259 Signal Squadron Amateur Radio Club at Episkopi, which was established in 1960 and now has Minimitter equipment. Much of the recent club activity has been on 3·5 Mc/s c.w., and unfortunately local QRM makes 'phone operation exceedingly difficult. The club has a Moseley TA33 beam for the h.f. bands and the DXCC score is 140+. There is also operation on 144 Mc/s and the construction of a Top Band transmitter is in hand at the present time. It is planned to use a 260 ft. aerial on this band, and it is hoped that UK QSOs will result. Ex-5B4CL, our correspondent providing this information, mentions that every QSO has been QSLd together with all worthwhile listener reports. The station has also taken part in passing information regarding the operation of the 5B4WR beacon transmitter, but unfortunately this still remains QRT by order of the Republic authorities. It is a pity that this valuable service should have been interrupted during the IQSY.

ZD3A, who for a considerable period has been the only active station in Gambia, has now returned to the UK, and his home address will be found in *QTH Corner*. All QSL requests have been dealt with and enquiries regarding " strays " should be accompanied by a s.a.s.e. At the time of writing, there is no news of a replacement, and ZD3 will therefore, for the present, remain unrepresented.

The SS *Hope*, a 15,000 ton hospital ship, is at present anchored off Conakry in the Republic of Guinea. A number of operators have contacted **W8BZB/7G1** but these QSOs will not be valid for DXCC credit as the station was located on board ship. However, permission has been received to set

ZC4TX, the club station of the 259 Signal Squadron Amateur Radio Club at Episkopi.

* Please send all items to RSGB Headquarters to arrive not later than **January 13** for the **February** issue and **February 10** for the **March** issue.

QTH Corner

CE0AG	G. Hrischenko, 3156 Bruce Avenue, S. Windsor, Ontario, Canada.
CR4AJ	Box 5, Praia, Cape Verde Islands.
EL4A	K. Bale, DL4IO, 7100 Heilbronn/Brockingen, Haagstr. 18, Federal Republic of Germany.
EL4YL	via R. Krist, W6KTE, 214 S. Emerald St., Anaheim, California, USA.
K2JGG/JY	via Hammarlund DXpedition of the Month QTH.
OH3NY	Matti Paivio, Riihimaki, Ruotsink 40, Finland.
VR6TC	via W4TAJ, J. E. Maddox, 1403 Woodside Dr., Johnson City, Tennessee, USA.
VR6QE	to VK3IE (home QTH).
VK0DS	18, Daly St., Gawler, South Australia.
VK0PK	VK3TL, Ken Matchett, Smiths Rd., Templestowe, Victoria, Australia.
VK9TL	G. Demangeat, Box 798, Ouagadougou, Upper Volta Rep.
XT2HV	(home QTH) R. Scarrow, 6 Guildford Close, Worthing, Sussex.
ZD3A	via ZS1CZ, H. B. Tronson, Land Survey Office, City Engineers Department, City Hall, Cape Town, Rep. of South Africa.
ZS2MI	via HB9NL, F. Acklin, Sonnenrain, Beuron, Switzerland.
4W1G	via K9BPO, H. Charvat, 207 Mandel Lane, Prospect Heights, Illinois, USA.
7G1H	Pan American Airways, P.O. Box 610 Bis, Conakry, Rep. of Guinea.
7G1L	Box 380, Blantyre, Malawai.
7Q7DS	

* * *

RSGB QSL Bureau: G2MI, Bromley, Kent.

up a station in the Seamen's Club in Conakry using the call **7G1H.** This station will be used primarily for DX working by **WA2WUV** and other licensed *Hope* personnel. WA2WUV recently flew to Conakry with the Hallicrafters equipment for 7G1H. The SS *Hope* boasts one of the finest equipped amateur stations in the world and is now on her fourth visit, having already spent periods in South East Asia, Peru and Ecuador. Doctors and nursing staff instruct local doctors and medical personnel in the latest methods of medical care and have treated thousands of patients aboard the ship itself. QSLs for contacts with both SS *Hope* and **7G1H** should go to **K9BPO,** whose full address will be found in *QTH Corner*.

The SS *Galieni* is now making the rounds of the French Austral bases and operators at FB8's XX, ZZ and WW will be changing. It is understood that the HB9TL s.s.b. rig is now on its way to FB8XX.

Top Band News

VP3CZ has been heard by a number of UK stations including our reporter **GM3TMK,** but there is no knowledge of any QSOs resulting. VP3CZ was heard around 03.30 on 1810 kc/s, and was worked by W1BB/1 at 04.30. Using 10 watts to 260 ft. end fed wire 40 ft. high GM3TMK worked W1BB/1 at 08.00 who was 56/79 at that time. **OH3NY** is active on Top Band and GM3TMK reports QSOs with him and also **OH2HK,** the latter at 04.30. OH3NY is an ardent certificate chaser and would also like to receive photographs of amateur stations for his collection.

In a letter to G3AAE, **VP2AV** states that he is QRV on 3·5 Mc/s c.w. from 02.00 and he will QSY to Top Band on request. He is believed to be able to run up to 100 watts input on this band. It is hoped to be able to send the VP2AV 1·8 Mc/s transmitter to other VP2 islands.

An interesting QSO recently was a three way between **G3LWQ, G2CUZ** and **VO1FB** (at 00.30), the latter being a member of the Ainsdale Radio Club. The aerial at G3LWQ is 105 ft. long but at a height of only 18 ft., which should give encouragement to those who are looking for trans-Atlantic QSOs, but who do not have the space for elaborate aerial systems. Both 'LWQ and 'CUZ need Orkney for a Top Band county contact, but it is believed that the only active station in that part of the world is on s.s.b. Any takers for a domestic DXpedition to put Orkney on the lists of the county chasers?

A Top Band beacon station has been established in Rhodesia operating on 1801·5 kc/s with 10 watts input to a vertical half-wave centre fed aerial on a mountain top. The beacon sends " de **ZE1AZD** " by f.s.k. at intervals and the carrier is off for approximately 18 seconds every seven minutes. Reports have already been received from ZS, some 700 miles distant. (Tks **W1BB.**)

W1BB makes a plea for W/VE stations to operate below 1820 kc/s as the European stations seem to cluster between 1823 and 1827 kc/s. This, of course, only applies during the 160 metre tests or when DX is being heard.

A reminder for Top Band enthusiasts that the **CQ 160 Metre WW C.W. DX Contest** will take place over the weekend January 30/31. This is an event usually well supported by UK stations.

The morning of December 13 produced some excellent DX on the band with stations from SV0, OX3, 9L1 and North America being worked. 9L1TL and 9L1HX were heard with good signals, and some UK operators were able to contact W stations up to 09.00.

DXpeditions

Norfolk Island operation by VK3TL using the call **VK9TL** should have commenced by the time that this is being read, and the home QTH for QSLs will be found in *QTH Corner*.

The CE0AJ operation did not materialize as anticipated but the disappointment has been eased by the plans of VE3DGX, alias **CE0AG,** to operate from Easter Island until February 14, 1965, which should afford most DX'ers an opportunity to remove this rarely activated country from their wanted lists. VE3DGX is part of a group of Canadians who, under the sponsorship of the United Nations are engaged in research on the island, before much of its history is submerged by the construction of an air strip next year. QSLs should go to the home QTH of VE3DGX which appears in *QTH Corner*. The *Call Book* address is not now correct.

G2RO made one of his flying trips to several West Indian islands during the middle of December, but 14,060 kc/s c.w. as the main scene of operations. QSLs should go to the home QTH.

W1TYQ and OD5CL hope to operate from the Saudi Arabia/Iraqui Neutral Zone (8Z4) from January 9 for at least seven days using c.w. on 3·5, 7 and 21 Mc/s, with s.s.b. and c.w. on 14 Mc/s. QSLs should be sent to **HZ3TYQ** at the address appearing in *QTH Corner*.

At the time of writing there is no further news on the **Rodriguez** intentions of VE8CO, but it is said that this trip will have Hammarlund backing.

VK0PK on Macquarie Island was worked by several G stations in the Southern portion of the country during the end of November/beginning of December, but it is believed that the operator has now left the island. **ZL1ABZ,** who furnished many with their first QSO from Kermadec has left and the island is the scene of intense volcanic activity.

Band Activities

Another good month, and one continuing the rare phenomenon that more DX has been reported on 7 Mc/s c.w. than on 14 Mc/s c.w.: due no doubt to the fact that 14 Mc/s has been closing so early in the evenings that all the DXers have transferred their attentions to the lower frequency bands.

Last month we prophesied that the greatest excitement would be the appearance of CE0 Easter Island on the bands, but in actual fact CE0AG is expected up just at the moment that this paragraph is being typed, so no doubt there will be much to say on the subject *next* month. The biggest excitement this month has been the appearance of KG6IF on 14

Mc/s whereby many stations in Europe have achieved their first contact with Marcus Island.

Your indebtedness for this month's survey is to the following: G3AAE, G3HCT, G3HDA, G3SEP, G3SML, G8JM, BRS20317, BRS26444, A2498, A3566, A3699, A3942 and A4311.

1·8 Mc/s C.W.: K2GL 2355, VE2ATU 0525, VE2UQ 2350 and 0620, VE3AEX 0520, VO1FB 0000, W1BB/1 0520, W1BU 0515, WA1CAC 0640, W2EQS 2355 and 0600.

3·5 Mc/s C.W.: EP2RC 1840-2100, HI8WSR 0750-0845, HK3RQ 0755, KP4AOO 0735, KZ5AF 0725, PY4OD 0810, UH8AA 1830-2000, UL7CH 0100, UL7JE 0030, VK5ZP 1930-2000, VP1DR 0730, W6s 0730-0830 and 9M4LP 1910.

3·5 Mc/s S.S.B.: CN8AQ 2150, LX1JAM 2240, OX3WX 2315, YV5BPJ 0700, YV5BWP 0700, YV9AA 0545, ZL1AIX 0700, ZL2BCG 0615, ZL4LM 0625, 5N2CKH 2125, 5Z4AA 2000, 6Y5MJ 0720 and 7X2VX 2215.

7 Mc/s C.W.: BY1PK 2025-2325, CE1AD 0320, CE2DI 0255, CP5EZ 0240, CR4BB 2240, CR6AI 1915, DU1PAR 1630, EL2AD 2240, EP2BQ 1630, EP2RC 2115, ET3USA 1930, FB8XX 1820, FY7YF 2140, HC5FN 0215, HI8NPI 2235, JA1AEA 1350, JA1IBX 0825, JA7AKQ 0830, JA7BGT 0900, KP4AOO 0230, KR6BQ 1130-1910, KR6OJ 1730, KV4DB 2010, KZ5AF 0330, MP4BBW 2250, MP4BEQ 2230, VK2EO 0830 and 1925, VK2QL 2000, VK3ADB 1000, VK3XB 0830, VK4SS 1445, VK5ZP 1415, VK6RU 1600, VK6WT 1445, VK7SM 0720, VP2AX 2350, VP2KJ 2350, VP2SM 2125, VP6KL 0040, VP6PJ 2240, VP7BG 0820, VP9BG 0900, VP9FT 2110, VQ8BY 1730, VU2RM 1500, ZB2AI 1945, ZP9AY 0135, ZS1XR 2050, ZS6AJD 1915, 4U1ITU 1940, 5R8AB 1820, 5Z4IV 2100, 6O6BW 1630-2110, 6W8BL 2250, 9J2DT 1825, 9M4LP 1610, 9M4LX 2330, 9M4RS 1835 and 9Q5AB 2215.

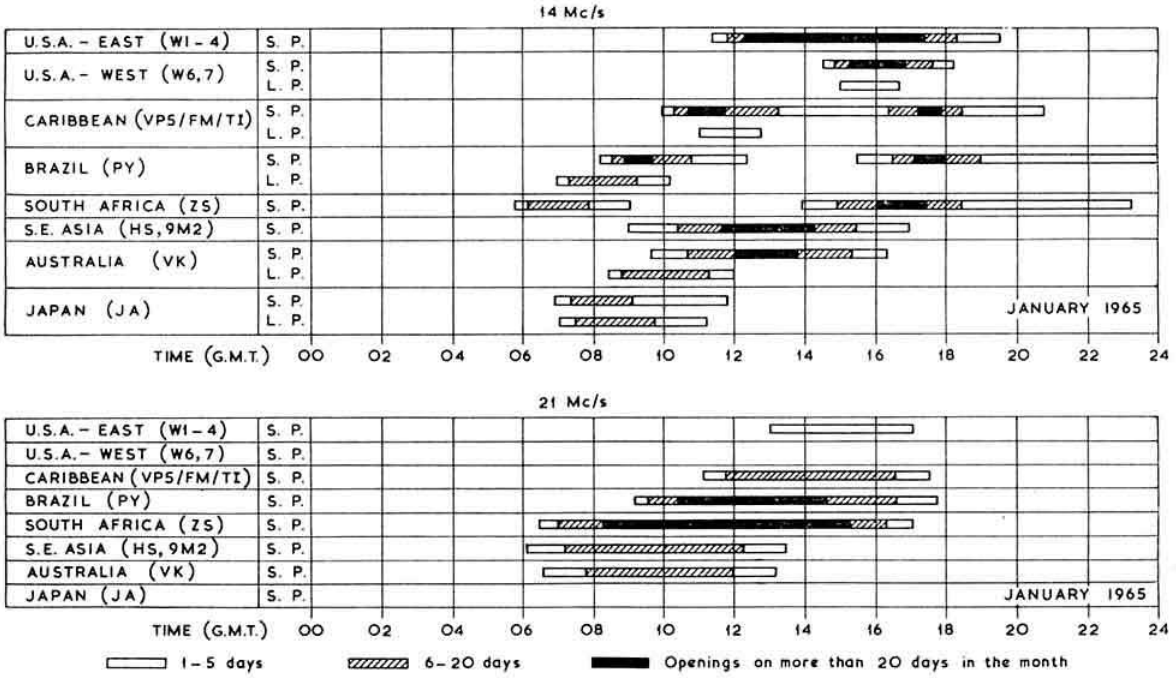
7 Mc/s S.S.B.: VK2AVA 1925, 4X4DK 1930, 5Z4AA 1920 and 9J2MI 1920.

14 Mc/s C.W.: ET3USA 1700, FB8WW Crozet Is. 1700, FB8XX Kerguelen Is. 1650, FR7ZI 1600, HK7XI 1720, HL9KA 0830, HL9KH 0940, JT1KAA 0905, KG4AM Guantanamo 1900, KG6IF Marcus Is. 0820, K3SWW/KG6 0815, KR6BQ 0815, KR6JZ 0820, LU1ZC South Shetland Is. 1930, OR4VN 1920, PZ1CP 1030, TU2AN 1930, VP8HJ 2040, ZB2AE 0810, ZD9BB Gough Is. 1840, ZP5OG 1940, 4W1F 1230, 5R8AM 1550, 5X5IU 1545 and 7Q7LA 1830.

14 Mc/s S.S.B.: CE0ZI/MM 0930, CR4AJ 1640, DU1AC 1005, EA9EO 1205, EL2AR 0810, FB8ZZ New Amsterdam Is. 1635, FG7XP 1715, FH8CD 1600, FK8AC 0800, FY7YL 0945, HR1RP 1700, HV1CN 1245, KA5DG 0905, KG6APJ 0910, KG6IF Marcus Is. 0810-0825, KH6BZF/KG6 0815, W4SLW/KG6 0920, KR6UD 0830, KV4CF 1100, KX6BQ 0750, MP4MAH 1215, MP4TBJ 1155, OA4KY 1235, OD5AX 1200, OX3LP 1610, PZ1BW 1030, VE1AJR/SU 1455, TG9EL 1220, TG9RR 1650, TG9ST 0855, TI2LA 1215, TI0RC 1705, TJ1AC 1555, W8NRB/UA3 0740, VK9NT New Guinea 0930, VK0PK (a.m.) Macquarrie 1315, VK0GS Antarctica 1315, VP4TI 1045, VP7BG 1650, VP7DY 1710, VP8HK 0800, VP9CP 1740, VP9FR 1655, VQ1GDW 1600, VQ8BS 1700, XE1AB 1255, XE1CE 1755, XE1HHH 1645, XE1NC 1710, XE1PC 1645, YS1MS 1640, YS2SA 1710, ZB2AK 0800, ZP5BC 0920, 4W1G 0750, 5T5AB 0945, 5T5AD 1845, 6W8AG 0840, 7Q7PBD 1630, 7X3CT 1730, 9J2VB 1500, 9K2AU 0740, 9L1HX 0945 and 9M2DQ 1220.

21 Mc/s C.W.: CR4BB 1445, CR6AI 1155, CR7FC 1130,

PROPAGATION PREDICTIONS



The conditions on the bands during January will differ little from those of the preceding month. At the end of January the h.f. bands should remain open a little longer in the evening than previously, otherwise the forecast given for December will again apply.

The provisional sunspot number for November was 6·9, with the period of greatest activity lying between the 14th and 21st of that month. The predicted figures for February, March and April 1965 are 7·7 and 8 respectively.

One of the Royal Air Force Century Club Awards, which are now available to all amateurs who make confirmed contacts with 25, 50, 100 or 200 members of the society.

CX1OP 1730, EL2AD 1430, ET3USA 1015, FB8WW 1130, FB8XX 1140, FR7ZD 1200, HI8WSR, HK1QQ 1715, HK0AI San Andreas Is. 1605, KV4CI 1225, KZ5AF 1300, LU1ZC 1130, MP4BEK 1235, OD5LX 1110, VK6RS 1245, VK7SM 1155, VP2KJ 1405, VP7BG 1235, VP9BO 1630, VS6EY 0845, VS6FF 0850, VS9AMD 1130, VU2RM 0820, XE1OE 1435, XE1PJ 1405, ZP9AY 1650, 4S7NE 1025, 5H3HZ 1140, 5R8AN 1140, 6O6BW 1105, 9J2BC 0730, 9L1TL 1320, 9M4RS 1100.

21 Mc/s A.M.: CR4AJ 1100, CR7FP 1155, CT2AL 1255, CT3AM 1250, CT3AO 1315, FB8ZZ 1310, HK1OR 1555, HZ1AT 1230, KP4AXC 1340, KV4VX 1410, PZ1BV 1245, TJ8LY 1325, VK2, 3, 4, 5 and 6 0800-1200, VQ8BY 1350, VQ8BZ 1245, VS9ASP 0945, XE1CP 1405, 5N2AAC, 5R8AL 1220, 5X5JK 1030, 6W8AE 1235, 7Q7RM 1305, 7X2BB 1630, 9G1FF 1400, 9J2DT 1310, and 9L1WN 1530.

21 Mc/s S.S.B.: CR4AG 1225, ET3USA 1045, HC2EH 1635, KP4AXC 1235, KZ5AD 1640, MP4TBJ 1140, VK2,3,4,5,6, 0800-1230, VS9AAS 1115, XE1FFW 1610, XW8AL 1115, ZS2MI Marion Is. 1325, ZS7R 1535, 5N2JKO 1235, 6O1KH 1125, 9J2BB and 9J2MI 1240.

28 Mc/s seems to have returned to sunspot minimum doldrums, or perhaps its more ardent users are keeping quiet about what it has yielded. Perhaps next month someone will come up with a 28 Mc/s report a couple of yards long!

Contests

The **1965 French Contest** will take place as follows:
c.w. from 14.00 January 30 to 21.00 January 31.
phone from 14.00 February 27 to 21.00 February 28.
v.h.f. from 18.00 May 1 to 18.00 May 2.

The code to be exchanged consists of the signal report plus the number of the QSO. French stations will give their Department number after the call. Each QSO will score three points, and there will be a multiplier of one for each different Department or each different DUF country (other than F or FC). For the fortieth anniversary of the REF each entrant who sends a log showing more than 1,000 points will receive a special certificate. Logs should be sent to: REF, B.P. 42-01, Paris R.P., France.

The **Second Annual Tennessee QSO Party** will take place between 00.00 and 24.00 on February 7, 1965. There are c.w. and phone sections requiring separate logs, which should be sent to RATS Club, WA4NZE, 612 Hogan Road Nashville, Tennessee 37220, USA to arrive not later than March 6, 1965. All amateurs contacting ten separate Tennessee stations during the contest will be awarded a "Certificate of Achievement".

The **RSGB 7 Mc/s Contest** produced a good deal of activity on a band that would be ideal for night-time DX if only the commercials and wierdies would quit. **G8FC** QSOd 46 countries during 301 QSOs giving 3,080 points, which should produce a listing somewhere near the top.

The results of the phone section of the **1964 ARRL Contest** show **G3CAZ** as the leading G operator. The equipment in use comprises a KW Victor at 120 watts input feeding a triband cubical quad and a HQ170 receiver. G3CAZ recommends the substitution of a 6DE6 for the 6BZ6 in the r.f. stage of the HQ170 but warns that cross modulation characteristics may deteriorate, but in his case this does not present any problems.

Awards

The **British Counties Award**, described in *MOTA* last month is also available to short wave listeners on the same basis as for transmitting stations. **G3REA** was the first to claim all 98 counties—and with no substitutions.

CHC Chapter 8 has made a reciprocal arrangement with E. German Chapter 23 whereby claims for the **WADM** and **HADM** awards may be submitted through **G5GH**. The **WADM** is issued in four classes: Champion (1); Master (2); Senior (3) and Junior (4) for contacts on either c.w. or phone (no mixed applications) after July 14, 1953 with DM stations. The fee for WADM 3 and 4 is four IRC and for WADM 1 and 2, eight IRC. Full information on this award will be found in either the *Directory of Certificates* or the leaflets of AHC International.

The **HADM** award calls for proof of reception of at least ten of the 15 DM regions and the fee is four IRC. In connection with these awards the last letter of the call-sign indicates the district:

A	Rostock	I	Erfurt
B	Schwerin	J	Gera
C	Neubrandenburg	K	Suhl
D	Potsdam	L	Dresden
E	Frankfurt	M	Leipzig
F	Cottbus	N	Karl-Marx-Stadt
G	Magdeburg	O	Berlin
H	Halle		

The following information on the make-up of DM call-signs comes from G5GH:

Single operator stations use the prefix **DM2** plus three letters; club stations use **DM3, 4** or **5.** The chief operator has two letters after the call, i.e. DM3BM, whilst other licensed operators have an extra letter between the figure and the last two letters, i.e. DM3CBM, DM3RBM etc. District radio clubs use the prefix **DM6**; congresses and exhibitions, **DM7, 8** and **DM0**, whilst foreign visiting amateurs use the **DM9** prefix.

The Certificate Hunters' Club (CHC) UK Chapter 8 is endeavouring to establish a chapter (basically the US term for club) comprised of short wave listener members. David Gray, A2498 and G5GH are those concerned and would appreciate hearing from interested s.w.l's.

The **Japanese AIUEO Club** issues an award named the **Sidewinders Award** which can be claimed by UK operators who can produce proof of contact with ten different stations located in Japan including at least five JA stations. All QSOs must be on two-way s.s.b. and after January 1, 1960. The award is free but postage for the certificate is requested. This award is also available to s.w.l.'s on the same basis. Applications should be sent to: JA1AEA, J. Suzuki, 4 1614 Kanamachi Katsushika, Tokyo, Japan.

Several readers have enquired as to the meaning of *GCR*, the abbreviation of General Certification Rule. This rule has been introduced by the sponsors of many awards to

avoid the necessity of sending valuable QSL cards around the world. Where an award sponsor states that the award may be claimed by a GCR application it is necessary that the claim should be countersigned by two amateurs or an official of the applicant's national society. The declaration that is signed should state that the QSL cards relating to the contacts listed on the application have been seen and are in the possession of the claimant. Whilst a number of awards may be obtained on a GCR application, there are also many for which the QSLs must be sent, e.g. CDXC, DXCC etc.

DX Briefs

XT2HV, formerly F2XD, is now active on s.s.b. on the low end of 14 Mc/s and will be available for about six months. The QSL address appears in *QTH Corner*.

QSLs for the Trans Sahara expedition which might appear from several African countries should be sent to ON4MC.

HL9KH, the former call of Don Miller, is now a club station and QSLs should be routed via W6KTE.

G3JFF, Mike Matthews, remembered for his Pacific operations, will be leaving the UK in June for a tour in (or should it be *on*?) ZB2, from where he will be active in due course.

FH8CD, located on the island of Anjouan in the Comoros group, is active on c.w. and s.s.b. on 14 and 21 Mc/s, and has been heard in the UK with good signals.

LU1ZC and **LU8ZI** are both on Deception Island of the South Shetland group and are active on 14 Mc/s c.w. being worked by G3NKQ at 08.00.

W.e.f. January 1, 1965, all **Nigerian** licences are being re-issued in the series commencing 5N2AAA (Tks 5N2JKO).

Commonwealth Call Areas Table

Please send details of your claim for this (on a postcard) as shown on page 798 of the December issue. Copies of the Society's **Certificates and Awards** leaflet showing the call areas are available on request.

* * *

Correspondents are thanked for their co-operation and acknowledgment is made to the West Gulf DX Club *Bulletin* (W5IGJ), the LIDXA *Bulletin*, (W2FGD/W2MES), *DX'press* (PA0FX), and *The DX'er* (N. Californian DX Club). Please send all items to RSGB Headquarters to arrive not later than **January 13** for the February issue and **February 10** for the March issue.

CONTESTS DIARY

January 23-24	- Affiliated Societies' Contest (see page 539, August).
January 30-31	- First 144 Mc/s Contest (C.W.) (see page 740, November).
January 30-31	- CQ WW 160m Contest.
January 30-31	- REF (C.W.).
February 6-7	- QCWA Party.
February 13-14	- ARRL DX Contest (Phone).
February 14	- First 70 Mc/s Contest (Open).
February 20-21	- BERU Contest (see page 678, October, 1964).
February 20-21	- YL/OM (Phone) Contest.
February 27-28	- ARRL DX Contest (C.W.).
February 27-28	- REF (Phone).
March 6-7	— Second 144 Mc/s Contest (Open) and Listeners' V.H.F. Contest (see page 741, November, 1964).
March 6-7	— YL/OM (C.W.) Contest.
March 13-14	— ARRL International DX Competition (Phone).
March 20-21	— First 1·8 Mc/s Contest (see page 741, November, 1964).
March 20-21	— International S.S.B.'ers.
March 20-21	— BARTG RTTY DX Contest
March 27-28	— ARRL International DX Competition (C.W.).
April 4	— Low Power Contest.
April 10-11	— CQ WW S.S.B. Contest.
April 25	— Derby D/F Qualifying Event.
May 1-2	— Third 144 Mc/s Contest (Portable).
May 8-9	— USSR DX (C.W.) Contest.
May 9	— High Wycombe D/F Qualifying Event.
May 23	— South Manchester D/F Qualifying Event.
May 29-30	— First 432 Mc/s Contest.
June 12-13	— National Field Day.
June 27	— D/F Qualifying Event.
July 3-4	— Fourth 144 Mc/s Contest (Portable).
July 17-18	— 1296 Mc/s Tests.
July 18	— Oxford D/F Qualifying Event.
September 4-5	— Region 1 IARU Contest.
September 4-5	— V.H.F. National Field Day.
September 12	— D/F National Final.
September 19	— Low Power Field Day.
September 25-26	— 21/28 Mc/s Telephony/Receiving Contest.
October 9-10	— Raynet Rally.
October 16-17	— 7 Mc/s DX Contest (Phone).
October 24-25	— CQ World Wide Contest (Phone).
October 30-31	— Second 432 Mc/s Contest.
November 6-7	— 7 Mc/s DX Contest (C.W.).
November 20-21	— Second 1·8 Mc/s Contest.
November 28-29	— CQ World Wide Contest (C.W.).
December 4-5	— Fourth 70 Mc/s Contest (C.W.).

Unorthodox DX

Over a 15 mile path on Top Band, G3TFP (Canterbury), using a bedstead as an aerial, received a report of RS 5-8/9 from G3TDP (Ashford, Kent), who was using a lawn mower as an aerial. G3TFP gave G3TDP a report of RS 5-6. Has anybody been having any difficulty in getting it out recently?

"Electronics Letters" new IEE Publication

The Institution of Electrical Engineers Council has announced a new monthly publication which will be called *Electronics Letters*. It will consist of letters—ideally of about 500 words—describing the latest advances in research and development in electronics and allied fields. The aim will be to publish letters within two to six weeks of receipt.

The first issue will appear this year, and it is hoped that the annual subscription will not be more than £2.

ARRL DX Contest 1965

The following is a summary of the rules for this year's ARRL DX Contest.

1. The Contest periods are: **Telephony, February 13-14, and March 27-28; C.w., February 27-28, and March 27-28.**
2. The commencing time in each instance is **24.00 GMT Friday**, and the finishing time **24.00 GMT Sunday.**
3. **The object** is to work as many W-K-VE-VO-KH6-KL7 stations as possible in as many different call areas as possible **per band.**
4. **DX stations** will send the RS or RST report followed by a three-digit number representing power input. USA-Canada stations will send a number consisting of the RS or RST report followed by an abbreviation of the name of their state or province.
5. **Repeat contacts** on additional bands are permitted. The multiplier is the total call areas contacted on each band (maximum of 21 per band). Each completed QSO counts three points and an incompleted contact two points. The final score is the number of QSO points times the multiplier.
6. **Logs** should contain calls, dates, times (GMT), bands, exchanges and points. The summary sheet should indicate the sections of the contest, name, address and call-sign of the entrant, equipment used and power input, number of W/K/VE/VO call areas worked on each band, number of contacts on each band, number of hours' operation, names and call-signs of assisting persons, points claimed, multiplier and claimed score. A declaration stating "I certify, on my honour, that I have observed all competition rules as well as all regulations established for amateur radio in my country, and that my report is correct and true to the best of my belief. I agree to be bound by decisions of the ARRL Award Committee" is required. Logs and accompanying summary sheets should be sent to ARRL DX Contest, 225 Main St., Newington, Conn. 06111, U.S.A., and should be postmarked not later than **April 24, 1965.** Free log forms are available on request from ARRL.

A Combined A.M./C.W./S.S.B. Detector

By R. S. HEWES, G3TDR *

WITH the increasing use of single sideband transmissions on the 2m band the writer considered it was time to build an s.s.b. detector into his homebuilt double conversion superhet. receiver. The set was already equipped with a b.f.o. for c.w. reception. It was decided to use the product (heterodyne) detector described in the RSGB *Amateur Radio Handbook*, this being suitably coupled to the b.f.o. acting as a c.i.o. (carrier insertion oscillator).

The a.m. detector in the receiver was a conventional diode with i.f. filter network. The first difficulty was seen in fitting the product detector. A diode has a characteristically low input impedance and imposes considerable damping on the tuned circuit driving the detector. The signal input circuit of the product detector possesses a high input impedance due to current feedback in the grid cathode circuit of the valve. Little damping is therefore imposed on the tuned circuit driving the detector.

If a switch were placed between the tuned circuit and the two detectors, switching between a.m. and s.s.b. reception would alter the loading of the tuned circuit. It would therefore be necessary to retune for resonance between each mode of reception requiring the use of an extra control on the receiver. Switching in high impedance r.f. circuits is always undesirable, introducing possibly instability through stray capacity in the switch. By simple switching in the relatively low impedance cathode circuit signal grid switching is eliminated. This is achieved by using the product detector signal input triode as an infinite impedance detector on a.m.

In Fig. 1 the mode of operation is as follows:

On a.m. the cathode of V2a is switched via S1 to the 100K ohms audio load R5. The a.f. signal is then passed via filter components R4, C7, and C8 through the d.c. blocking capacitor C6 to S2.

On c.w. and s.s.b. the cathode of V2a is switched via S1 to the cathode of V2b and R6. The heterodyned c.w. or s.s.b. signal is then passed via the low pass filter R9, R10, and C11 plus R11 and R12 through the d.c. blocking capacitor C14 to S2. The pole of S2 is connected to the following a.f. amplifier. S3 is closed, supplying h.t. to the c.i.o. (b.f.o.) which injects the carrier via C12 and R7 to the grid of V2b. With a c.i.o. injection of about 2 volts r.m.s. and a signal input of about 0·3 volts r.m.s. very good s.s.b. and c.w. reception is obtainable.

Summarizing then, the advantages of using the product detector switched to an infinite impedance detector on a.m. are as follows:—

(i) There is no i.f. transformer switching and therefore no detuning effects on the tuned winding (i.f.t. secondary) between the two modes of reception.
(ii) The infinite impedance detector has better linearity and overload characteristics than the more conventional diode detector.
(iii) Damping of the i.f.t. secondary is considerably reduced giving improved selectivity on a.m. reception.
(iv) The a.m. diode is removed and the product detector valve is functioning continually in both modes of reception thereby effecting economy in operation. (For this reason the h.t. is not removed from V2b on a.m. to reduce switching to a minimum.)
(v) No modifications are necessary to the secondary of the i.f.t., hence the combined detector may be easily added to any receiver.

In some receivers a slight disadvantage of removal of the a.m. diode may be to render the a.g.c. system inoperative if this diode is also used for a.g.c. All good communications receivers however, have a separate a.g.c. system so this difficulty is eliminated. In the writer's receiver, the unused diode (half of an EB91) is now used as part of a noise

* 24 Brightside Avenue, Laleham, Staines, Middlesex.

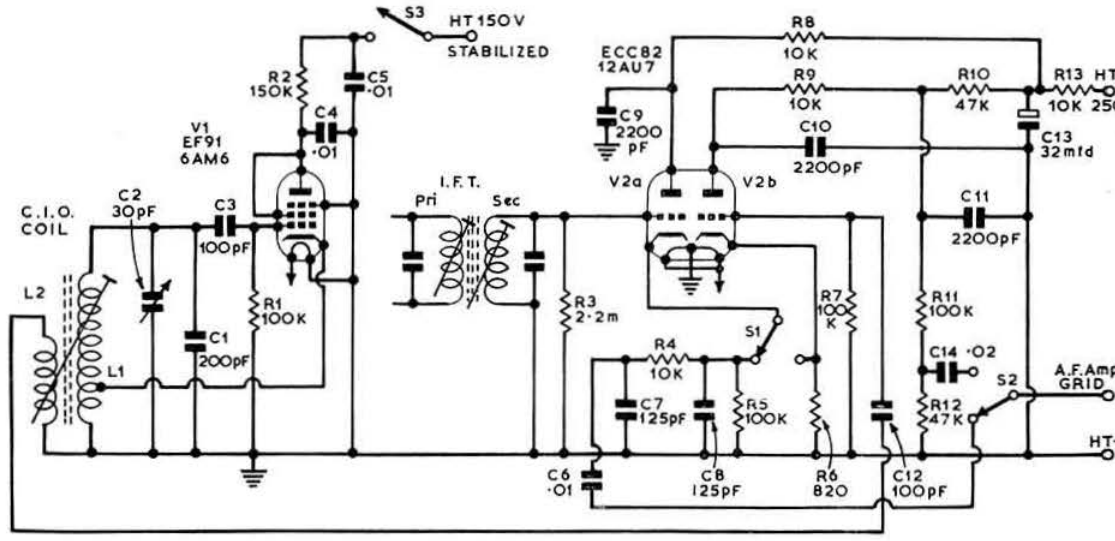


Fig. 1. Circuit diagram of combined a.m./c.w./s.s.b. detector. L1 and L2 form the c.i.o. coil. The c.i.o. valve is V1, and V2 the detector. I.F.T is the final i.f.t. of the receiver. C4 and C5 should be silver ceramic. C13 is an electrolytic capacitor. All resistors are ½ watt.

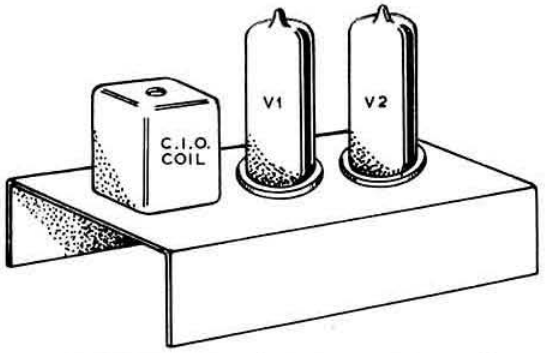


Fig. 2. Layout of the c.i.o. and detector unit. The c.i.o. coil is mounted in a ¼ in. square aluminium can. The unit can be fixed to the main chassis of the receiver with 6BA eyebolts, nuts and washers.

limiter circuit. Resistor R8 in Fig. 1 is included to give an improved amount of i.f. filtering on a.m.

The second difficulty although simply remedied was seen in applying a clean c.i.o. wave form to the product detector. A common fault with an e.c.o. having a resistive anode load is that this load produces a waveform which is badly distorted. When viewed on an oscilloscope the waveform is almost triangular in shape. Applied to the product detector this would seem likely to distort the a.f. output. When the carrier is taken from the grid circuit a clean waveform free from harmonics is available.

In Fig. 1 V1 represents the c.i.o. together with the associated circuitry. L1 and L2 form the oscillator coil. These coils in fact are those of a 470 kc/s detector transformer of the type used in a normal b.c. transistor receiver. L2 is bifilar wound with L1 to give tight coupling (L1 is the collector winding and L2 the detector winding). This transformer is ideal as a b.f.o. coil as the cathode tap (originally a collector tap) is correctly placed to maintain oscillation (at one-quarter total turns) and the detector winding provides a fairly low impedance take-off winding.

A triode connected EF91 is used as the e.c.o. Any r.f. triode or triode connected pentode (suppressor grid to ground) may be used here. Anode resistor R2 is bypassed to earth by C4 (10,000 pF silver ceramic), R2 being adjusted to give 2 volts r.m.s. at the product detector V2b. The h.t. supply is the normal 150 volts stabilized supply applied via S3. The oscillator coil is initially tuned to 470 kc/s by a ferrite core and C1, a 200 pF polystyrene capacitor. This combination gives excellent oscillator stability making s.s.b. easily readable. Fine tuning is carried out with a 3-30 pF air spaced trimmer to select the upper or lower sideband. The take-off winding L2 has little effect on the tuning of L1 and little or no loading is placed on L2 by the input circuit of V2b.

Construction

The product detector and c.i.o. are built on a 4 in. × 2 in. × 1 in. *U*-shaped 18 s.w.g. aluminium chassis as shown in Fig. 2. This is fixed on the main receiver chassis in the place originally occupied by the b.f.o. valve and coil. Making this unit small and compact reduces to a minimum unwanted stray oscillator coupling to earlier stages in the receiver. To this end the main chassis completes the screening. The a.m./s.s.b. switch occupies the normal a.m./c.w. switch position, a miniature 4 pole 2 way unit being ideal. The fourth position can be used to switch out the a.g.c. on c.w. and s.s.b.

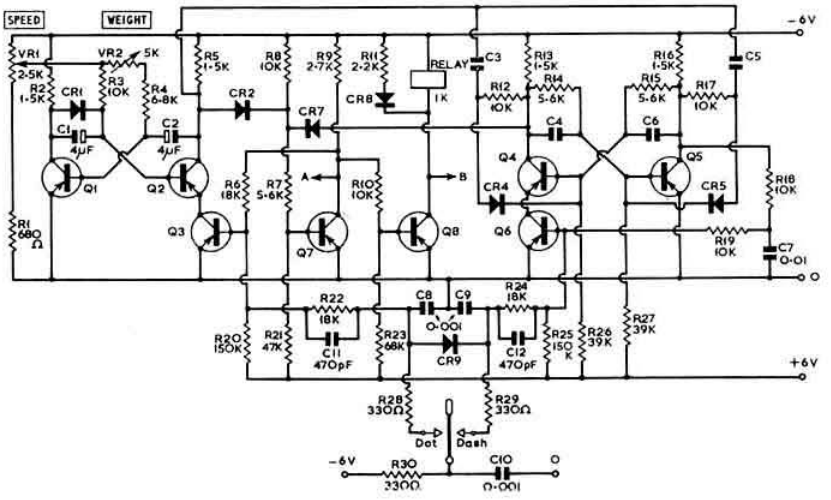
It is advisable to use screened wire for the a.f. signal leads between the switch and c.i.o. product detector unit if these are of any length. For the same reason the use of co-ax cable between the i.f.t. and the grid of V2a is advocated.

With 150 volts to V1 and 250 volts to V2a, b the current consumption is approximately 10 mA.

To conclude, the writer's receiver was designed to use a 470 kc/s second i.f. The purpose of this article, however, has been fundamentally to describe a combined a.m./c.w./s.s.b. detector and the method of fitting it to an existing receiver using any value of intermediate frequency.

G3IAS TRANSISTORIZED ELECTRONIC KEYER

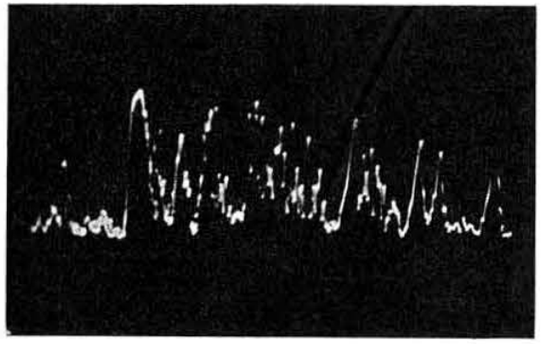
A revised circuit for the G3IAS keyer is shown alongside. The values of C8, C9 and C10 have been changed, and the value of C7 has been inserted. R22 and R24 have been re-valued, and capacitors connected in parallel with each in order to give more reliable operation. The relay winding resistance has also been altered to 1 K ohms. It should be noted that there are no diodes CR4 and CR6; these were used in the prototype, but were not found to be essential for proper functioning of the keyer.

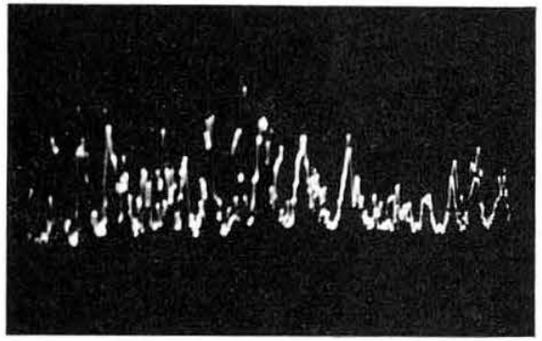


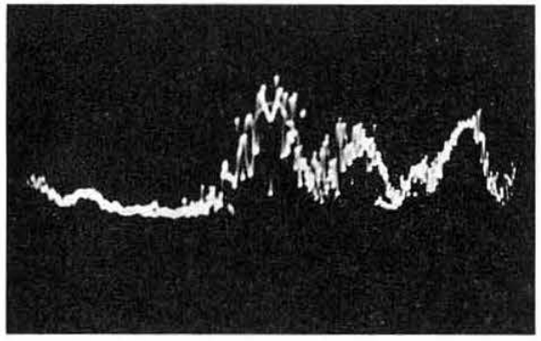
PANORAMIC RECEPTION

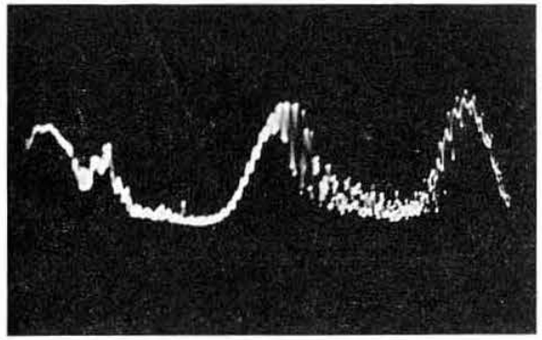
BY W. BLANCHARD, G3JKV*

PART 1 DESIGN CONSIDERATIONS









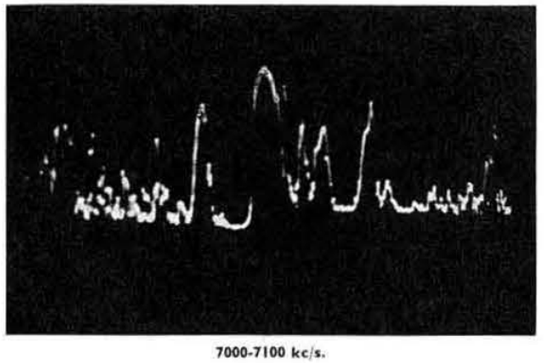
Traces taken between 20.00 and 21.00 GMT on November 11, 1964, with an AR88D and the panadaptor to be described in part 2 of this article. Left to right: (i) Top Band, 1900—2000 kc/s, with a strong local signal at 1920 kc/s; (ii) 3600—3700 kc/s; (iii) voice modulated carrier; (iv) tone modulated carrier.

PANORAMIC reception is the *visual presentation* of all the signals in a given frequency band, their display usually being on a cathode ray tube—although other methods are sometimes used. While receivers specifically designed for panoramic reception are available, they are rather expensive, and for amateur purposes they offer little advantage over a "panadaptor." As its name implies, this is a device which may be used in conjunction with a normal receiver to provide visual indication of the received signal, together with those on either side of it, within a specific—and sometimes variable—frequency width. Very little modification, if any, is required to a receiver in order to connect a panadaptor, and moreover, the receiver's normal operation is quite unaffected by the addition of the unit.

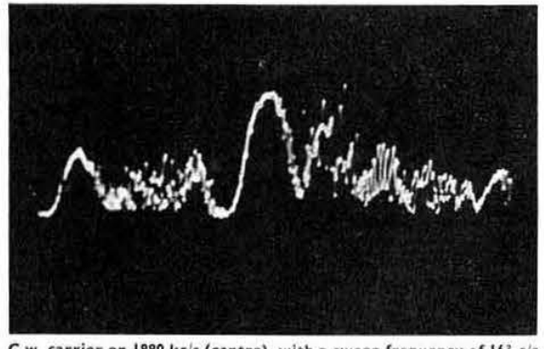
Although a panadaptor cannot be counted amongst the more common pieces of auxiliary equipment to be found in an amateur station, the fact remains that it can be a very valuable operating aid, especially on the higher frequencies. There appears to be a general impression that a panadaptor is both a difficult and expensive item to build; an idea perhaps fostered by the high price of war-surplus types, and the even more exalted cost of current commercial models. Such is not the case. Provided that laboratory standards are not insisted upon, it is quite possible to build a panadaptor having a performance comparable to surplus units—such as the BC1031—for quite nominal expenditure. As the same unit can be used for monitoring outgoing transmissions, it becomes a project worthy of serious consideration.

Precisely what does a panadaptor have to do in order to present us with a *picture* of all the signal activity going on within a certain frequency width? In order to simplify matters we will only consider the case where the display of these signals takes place on a cathode ray tube; in fact, on an oscilloscope.

If we connect the output from the detector of a receiver to the vertical plates of an oscilloscope, and switch off the horizontal sweep derived from the oscilloscope's time base, then as the receiver is tuned, each time it comes across a signal, the spot will move in a vertical direction, the amount or amplitude of the deflection depending on the strength of the signal. If we could arrange for the receiver tuning knob to be turned backwards and forwards over a selected frequency range, and at the same time couple to this a device which would cause the oscilloscope spot to move horizontally backwards and forwards across the screen exactly in step with the movement of the tuning knob, then at once we would produce a "picture" of the activity, for each time a point was reached where a signal was present, the spot would be "kicked up" by the output from the detector of the receiver. This is known as mechanical scanning. Provided that the receiver tuning and the horizontal movement of the spot remains reasonably in step at all times, then the oscilloscope base line—horizontal sweep—can be calibrated in frequency. This then allows us to see the activity, and also to fix its frequency. This is panoramic reception.



7000-7100 kc/s.



C.w. carrier on 1880 kc/s (centre), with a sweep frequency of 16⅔ c/s and a width of 50 kc/s.

While mechanical scanning methods are used, they are usually limited to specialized applications, and since it is possible to produce the same effect electronically, electronic methods normally find greater favour; added to which is the fact that it is easier to vary the width of the swept frequencies when electronic methods are used than when mechanical scanning is employed.

Direct frequency scanning methods involving the receiver tuning, whether mechanical or electronic, are usually avoided, for such a system prevents the receiver being used in its normal manner while it is being employed for panoramic reception.

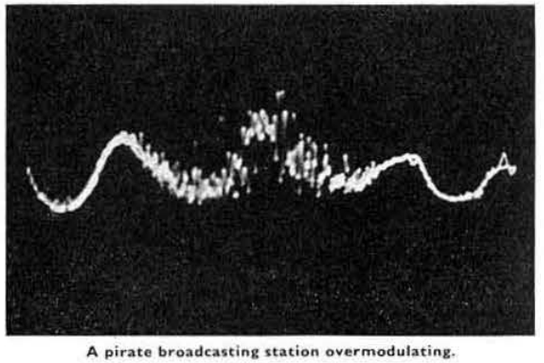
Specific Design Considerations

The basic problem is to obtain a c.r.t. display as described above from a more or less normal receiver with the minimum of complications.

Since, for the reason already given, the actual tuning of the receiver cannot be altered by the panadaptor, then the adaptor must be connected to a point in the receiver where there is available a fairly broad band r.f. signal which can be scanned. The obvious choice is the mixer anode—or first mixer anode if the receiver is a double superheterodyne. The signal here is at a constant centre frequency, and is as broad band as the preceding r.f. selectivity will allow. Connection to this point permits panoramic reception throughout the whole of the frequency range covered by the receiver, the actual amount of the scan being, broadly speaking, limited in its maximum deviation to the r.f. bandwidth. In the case of older receivers with i.f.'s of 455 kc/s or thereabouts, this may perhaps be only 20 to 30 kc/s at the lower frequencies. Some of the newer designs are much better from this point of view, having virtually a flat bandwidth of some 500 kc/s at 5 Mc/s.

Having now secured an output suitable for feeding into the panadaptor, we can turn to the unit itself. The signal fed into the panadaptor is applied to a mixing stage, which may, or may not, be preceded by an amplifier. The use of such an amplifier has certain advantages as will be seen later. The local oscillator of the adaptor is made to sweep over the desired bandwidth, and this in turn converts all the signals present at the input to a common frequency, namely the i.f. of the adaptor. The actual sweeping of the adaptor's local oscillator is controlled by the same voltage which provides the horizontal deflection of the c.r.t. This means that they stay precisely in step, and therefore the base line is accurately related to frequency. We have in effect produced the same result as would be achieved by the mechanical method previously outlined, but electronically and without becoming involved in mechanical complications. Further, as will be appreciated, the main receiver, and its operation, is not affected by the addition of the panadaptor.

The balance of the panadaptor unit follows standard



A pirate broadcasting station overmodulating.

* "Hilldean," Furnace Wood, East Grinstead, Sussex.

practice and consists of one or more stages of i.f. amplification, detector and a.g.c. circuits, and possibly a stage or two of video amplification.

The overall arrangement is shown in block form in Fig. 1. Such an adaptor will function on all the frequencies to which the receiver can be tuned, and if a v.h.f. converter is used ahead of the receiver, it will cover the converter frequencies as well. A possible drawback at v.h.f. is that due to the relatively narrow bandwidth available from the receiver for the panadaptor, the maximum sweep of the adaptor will be restricted, and it will not be possible to scan the entire band in one sweep.

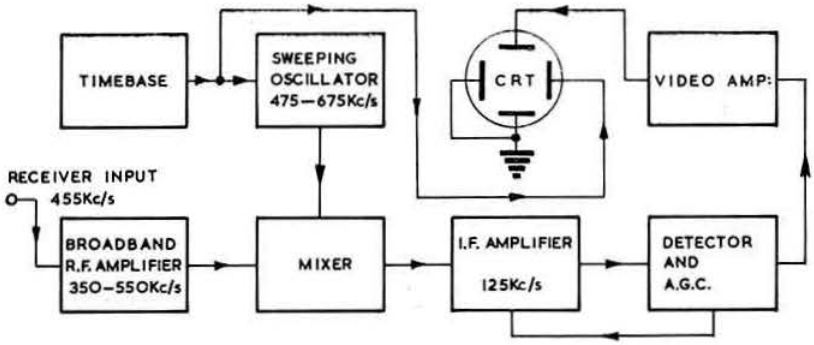


Fig. 1. Block diagram of a typical panadaptor.

If the main interest is in v.h.f. operation, and the adaptor is only required for these bands, only a small revision in design is needed to achieve a sweep of 2 Mc/s or more. In this case the adaptor input is taken from the v.h.f. converter output which, by design, is usually wide enough to cover the whole band. Under such circumstances, the adaptor's pre-amplifier stage and mixer input would have to tune to the converter output frequency, and its local oscillator frequency adjusted accordingly. Since the resolution of a panadaptor—that is its ability to show as separate " blips " two stations on closely related frequencies—is related to the selectivity of the unit, double conversion techniques may be needed in the adaptor to give the required degree of separation between adjacent carriers. However, if it were required only as a band activity monitor, a low order of selectivity might be acceptable.

The design requirements of each individual stage in a panadaptor will now be considered in detail.

R.F. Amplifier

If a broadband input is available for the panadaptor (over several hundred kc/s) then all that this amplifier is required to do is to give isolation between the receiver and the adaptor, and also to assist in preventing the oscillator of the adaptor, and that of the receiver, beating together and producing spurious signals. As in most cases the adaptor will have to work with a fairly low frequency input signal—455 kc/s or so—of limited bandwidth, more is required of it than this. The amplifier will have to introduce differential compensation in order to " boost up " the droop on each side of the input signal bandwidth, and so maintain constant amplitude, or as near to this as possible, over the range of the frequency sweep.

This point is illustrated in Fig. 2. An AR88D was connected to a panadaptor, the output being taken from the mixer anode. The receiver was tuned to 2 Mc/s and a series of 10 kc/s pips injected. The resulting display, which is uncompensated, shows clearly that for a sweep width of nearly 200 kc/s a panadaptor r.f. amplifier must be required to introduce considerable extra amplification towards the edges of the frequency band being swept if the display amplitude of a given signal is to remain reasonably constant. The ideal would be an amplifier characteristic which is the precise inverse of that of the receiver, the net effect then being constant gain.

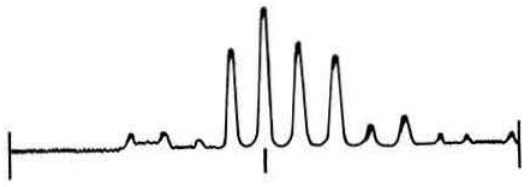


Fig. 2. Bandwidth response curve of the r.f. stages of an AR88 receiver at 2 Mc/s. Signals derived from a 10 kc/s multivibrator unit.

The provision of such an inverse selectivity curve is not as simple as it first appears, for the response of the receiver will vary with frequency, the r.f. selectivity curve becoming broader as the frequency becomes higher. Consequently, to achieve perfect compensation, the panadaptor amplifier response would also have to change according to the frequency to which the receiver was tuned, and this is more than a little difficult to arrange.

The situation is made even more complicated by the presence of the primary of the i.f. transformer in the anode lead of the receiver mixer, for this in itself modifies the shape of the bandpass curve at this point. A sophisticated way of overcoming this is by using an isolating stage between the receiver's mixer and first i.f., but as this means an extra stage has to be fitted into the receiver, it is hardly worthwhile.

Regrettably, there is no real solution which overcomes all the difficulties, and the usual practice is to adjust the compensation for the bandwidth at the lower frequencies, and to accept the effects of slight overcompensation at the higher frequencies. On the amateur bands, acceptable results can be obtained over sweep widths of about 100 kc/s on Top Band, and 200 kc/s at 40m and higher.

The usual method by which differential compensation is achieved in a panadaptor input amplifier is to use over-coupled transformers with their coupling adjusted so that maximum gain is attained at peak frequencies situated one on either side of the mean frequency. A single stage normally provides acceptable balance.

Mixer and Oscillator

While the mixer circuitry is straightforward and does not depart from normal receiver practice, the injection oscillator is quite another story.

The requirements of the mixer injection oscillator are that it should change frequency above and below its nominal setting as linearly as possible, and in addition, if the extent of the sweep is changed, then there should be very little, if any, shift of the centre frequency. These requirements cannot be met absolutely with simple circuitry, but for amateur usage, we can get near enough to them for all practical purposes.

Initially it has to be decided how wide a band the oscillator has to sweep, and this in turn depends on the r.f. bandwidth available. There is certainly no point in arranging for the oscillator to sweep some 2 Mc/s if there is only 150 kc/s of broad band signal available. If the panadaptor input

should be 500 kc/s wide, then of course it would be prudent to arrange for this amount of deviation in the oscillator frequency.

There are many ways of rapidly changing the frequency of an oscillator—other than by smartly twisting a knob—the process of which is normally called frequency modulation, the best known probably being the reactor valve.

Mechanical methods for achieving frequency modulation can be employed, two of which are as follows. There is available on the " surplus " market a transducer unit from the AYF radio altimeter, and this is essentially a loudspeaker coil unit carrying a flat metal plate instead of a paper cone. The metal plate of the transducer will oscillate relative to a fixed plate in sympathy with an alternating current applied to the coil; hence the capacity between the plates will vary. If these plates are placed across the tuned circuit of an oscillator, then the frequency of this oscillator will vary according to the changes in capacity between the plates. Being a low impedance device, the transducer requires some power for its operation, and this involves using at least one extra valve if the timebase waveform providing the horizontal scan for the c.r.t. is also to drive the transducer. Such an arrangement does not give a constant centre frequency for different sweep widths unless considerable time and care is devoted to juggling with the moving plate, and furthermore, the response of the transducer to the peaky timebase waveform is not very good. Another method is to use a variable capacitor driven by a motor, and, on the face of it, this seems to have the virtue of simplicity. The snags here are in keeping the motor in synchronism with the timebase, arranging variations in sweep width, and electrically noisy contacts which develop sooner or later.

Electronic methods are obviously to be preferred, and in this field there are a number of systems to choose from, the actual choice being dictated primarily by considerations of simplicity and cost.

Variable capacity diodes are particularly attractive for their circuitry is the simplest of all. Nevertheless care is needed in the design of a circuit employing varicap diodes if linear sweep is to be achieved since they are not inherently linear. In addition, due to the relatively small capacity changes given by these devices, they are normally limited to fairly high frequency oscillators. While it is true that such diodes are now available with a capacity swing of the order of 100 pF, they are costly, and this rules them out for amateur use.

A reactor valve can be made to produce more or less any capacity change easily and without undue complication and, of importance in our particular application, with reasonable linearity. For these reasons it is the most commonly employed method. At 25 Mc/s for example, it is possible to obtain up to 7 Mc/s of linear deviation, while on a frequency of 455 kc/s, some 400 kc/s of deviation linear enough for a panadaptor can be secured. Such sweeps are more than adequate for most applications.

The reactance modulator valve is provided with the following controls: (i) SWEEP WIDTH. This is usually a straightforward potential divider on the timebase output capable of reducing the time base voltage being fed to the reactor valve to zero, thus stopping the sweep altogether, (ii) CENTRE FREQUENCY CONTROL. This is necessary as it is difficult to prevent some slight movement of the centre frequency with variations of sweep width, and it allows the signal to which the receiver is tuned to be set in the middle of the trace irrespective of such movements or thermal drift.

The actual frequency band over which the adaptor's oscillator should sweep is determined mainly by the choice of i.f., and the possibility of spurious responses. The broad band r.f. stage, and adaptor pre-amplifier, will give little protection against second-channel interference. Fortunately the recognition of such signals is not difficult, since, as the main receiver tuning is altered, second-channel signals will move in the opposite direction to the normal ones. The effect is unmistakable.

Oscillator Frequency and I.F. Amplifier

Quite standard circuits may be used in the i.f. stages of the adaptor, but the choice of frequency, and the desired bandwidth—which affects the resolving power of the device as has been mentioned earlier—needs careful consideration.

If the panadaptor is to be used mainly as a band activity monitor at v.h.f., selectivity may not be very important, and as a result, one or two stages at a fairly high frequency may suffice. For example if the panadaptor input is to come from the output of a v.h.f. converter, on say 24 Mc/s—26 Mc/s, this could be heterodyned down to 10·7 Mc/s so allowing standard components to be employed. While it would be very difficult to distinguish between signals closer than 50 kc/s, whatever band activity there might be would be quite apparent. There would be no point in attempting signal analysis with such an arrangement, there being insufficient selectivity to give adequate resolution of signal detail. If greater selectivity were required a lower i.f. would be necessary, and if we assume that the v.h.f. converter was on the 144 Mc/s band, and that we needed a full 2 Mc/s scan, then the only solution would be to make the panadaptor a double superhet.

The only alternative to a double superhet adaptor in the foregoing case is to accept a reduction in the maximum deviation and design the adaptor to operate from the first mixer of the receiver, rather than directly from the converter output. The best compromise would probably be arrived at where the receiver i.f. was relatively high—say at least 1·6 Mc/s—since the bandwidth of the signal available at the mixer would be reasonably wide, so permitting a correspondingly wide sweep.

Since the majority of receivers have an i.f. of 460 kc/s or thereabouts, this will be taken as the input frequency under consideration.

The panadaptor's local oscillator should not sweep through any part of the r.f. frequency range to be displayed, and for preference should not sweep through the actual *fixed i.f. frequency* of the receiver to which it is connected. When large sweeps are attempted at low frequencies, this last point is often difficult to satisfy. However, it does not seem to be an essential requirement, for as will be seen in Part 2, the writer's adaptor sweeps through the receiver's i.f. frequency without producing noticeable effect.

Assume the input to the panadaptor to be 450 kc/s—the receiver i.f.—and the i.f. of the adaptor 125 kc/s. The adaptor's local oscillator may be centred on either 450 kc/s minus 125 kc/s or on 450 kc/s plus 125 kc/s, namely 325 kc/s or 575 kc/s. Assume also that a maximum deviation of 250 kc/s is required; that is 125 kc/s either side of the oscillator centre frequency. As it is more difficult to arrange such a deviation on 325 kc/s than 575 kc/s, the higher frequency is chosen. A higher i.f. than 125 kc/s may be used, but since the bandwidth of the input is, in theory anyway, 250 kc/s wide—that is running from 325 kc/s to 575 kc/s with the receiver i.f. central to this at 450 kc/s—using an i.f. higher than 300 kc/s would be likely to produce instability due to its proximity to the low frequency end of the signal input frequency band. The exact choice of adaptor i.f. will probably depend upon the availability of transformers, and considerations of selectivity may well take second place. In any event, sufficient selectivity of the order of 5 kc/s should be obtainable with one stage using high-Q transformers, although in order to secure improved a.g.c. action within the adaptor, two stages are sometimes included.

Considering our particular case in greater detail, we find that since the oscillator is centred on 575 kc/s, when the sweep goes down to cover 325 kc/s the oscillator frequency

becomes 450 kc/s. This is, of course, the fixed intermediate frequency of the receiver under discussion, and if it should be found that the adaptor's oscillator breaks through on the receiver, then the *maximum* deviation may well have to be reduced from 250 kc/s to 200 kc/s. However, this is no particular hardship.

It is clear therefore that some care must be taken in selecting frequencies for a panadaptor, but with the above illustration, values of i.f. and oscillator frequency may be similarly investigated for other receiver i.f.'s.

Detector and A.G.C. Circuits

It is quite possible to take the i.f. signal and display it directly on a c.r.t. without further processing. This will produce a " filled-in " envelope positioned symmetrically about the horizontal axis of the display, and will not give the conventional one-sided detection display. However, such patterns can be useful when very low sweep speeds are used.

It is also possible to omit a.g.c., but if this is done, the dynamic range of the display will be very limited. If, for example, the smallest " blip " which can be seen has an amplitude of 1mm, and the largest extends to 5cm, and assuming amplification to be linear, this change in deflection corresponds to a dynamic range of only 34db whereas in practice ranges of between 80-100db may be expected. Without a.g.c., if the gain is adjusted so that the strongest signals do not go off the screen, many of the weaker ones will be missed, while, if the gain is adjusted for the weaker ones, any reasonably strong signal will send the trace clean through the top of the screen. In addition, the effects of signal fading will be very pronounced.

To be effective, the a.g.c. system in a panadaptor must be very fast acting indeed, and moreover have a particularly short hang time. The a.g.c. has to respond to signals passing through the system at the sweeping speed, and any pronounced overshoot hang could cause de-sensitization to the point where, after passing a strong signal, a weak one could be missed.

If the time constants are adjusted to the fastest sweep speed and maximum sweep width, the a.g.c. will work well at any lower speed and lesser sweep width; the only difficulty being that the rather small values of resistance and capacity needed to give the short time constant may not provide sufficient decoupling between stages. In the initial design stages, the best method of adjusting the time constants is probably by using an oscilloscope to observe actual a.g.c. compared with signal pulses, and then to experiment with different component values.

One difficulty with fast a.g.c. is that it will act on the modulation of a.m. signals and cause apparent distortion. These effects are particularly noted at short sweep widths. For this reason, it is advisable to be able to switch off the a.g.c. circuits in the adaptor.

While on the subject of a.g.c., it is as well to mention that during panoramic reception, better results are obtained if the receiver's a.g.c. is switched off, and its gain controlled manually. With a.g.c. on the receiver, the effect of tuning through signals on the receiver is to cause all the signals displayed on the panadaptor to jump up and down as the r.f. gain of the receiver varies with its a.g.c. action. Ideally, of course, it is only necessary to remove the a.g.c. from the r.f. and mixer stages of the receiver, but very few receivers have this facility.

Post Detection Amplification

If the display of the adaptor unit is to take place on an oscilloscope, rather than on an internal c.r.t. arrangement, amplification after detection would not normally be required, the oscilloscope's own vertical amplifier providing sufficient gain. Even when an internal c.r.t. system is used, there may be no necessity for an amplifier after the detector if the input

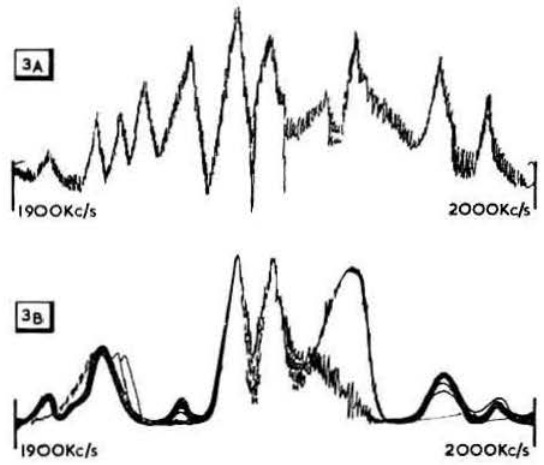


Fig. 3. Horizontal sweep speed vs signal resolution. Fig. 3 (a) employed a sweep speed of 10 c/s, while that of Fig. 3(b) a speed of 50 c/s.

from the receiver is high enough. One could take a chance and work on a " try it and see " basis, but if this course is adopted, it would be prudent to leave sufficient space to fit such an amplifier at a later date should it be found to be required.

Strictly speaking, if sweep speeds below 10 c/s are used, this amplifier should be d.c. coupled in order to maintain the l.f. response. In practice, an ordinary a.f. amplifier will work well enough down to 5 c/s provided that steps are taken to prevent undue attention of the lower frequencies. The h.f. response of such an amplifier will normally be adequate. A gain control fitted to this stage will give all the control needed over the amplitude of the trace, and any tendency to overloading earlier stages of the adaptor can be removed by use of the main controls on the receiver.

If the sweep deviation control of the adaptor is set to zero, then the adaptor can be " tuned " by operation of the centre frequency control. This virtually means that one could listen to two signals at the same time, one on the main receiver, and the other via the adaptor. If such a facility is desired, a phone jack may be fitted to the post detection amplifier output.

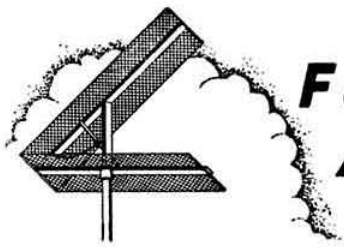
Timebase

As we have seen, the timebase which provides the horizontal scan for the c.r.t., also provides the voltage to operate the oscillator reactance modulator.

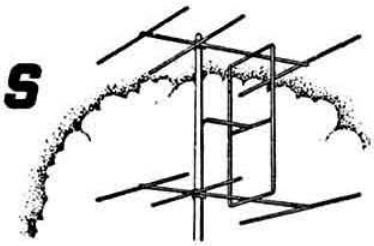
The sweep speeds required are quite low, and most timebase circuits will work well with acceptable linearity. As the i.f. circuits are working with transient signals only, if the sweep speed is too high, the signal voltages will not have sufficient time to build up to their correct values. The sweep speed is in fact related to the bandwidth of the i.f. system in the adaptor. The *maximum* advisable sweep speeds are as follows: selectivity 10 kc/s—maximum speed 50 c/s; selectivity 5 kc/s—maximum speed 25 c/s; etc. The effect of sweep speeds is shown in Figs. 3(a) and 3(b), both of which are tracings of Top Band between 1900 kc/s and 2000 kc/s. In the case of Fig. 3(a) the sweep speed was 10 c/s, while that of Fig. 3(b), was 50 c/s. The lack of detail in Fig. 3(b) is quite evident.

The panadaptor from which these tracings were taken had a 7 kc/s bandwidth at the 60db points, and it was found that full detail was only maintained up to sweep speeds of 15 to 20 c/s.

Experimentally, a crystal filter with a bandpass of only 100 c/s was fitted to the adaptor. The permissible sweep



FOUR METRES AND DOWN



By F. G. LAMBETH, G2AIW*

AN increasing amount of duplex operation is now to be heard on the v.h.f. bands. The non-harmonic relationship of 70 Mc/s to 144 Mc/s helps ensure that no unwanted emissions from one band appear in the other—which makes duplex easy. And many of the new G8 plus threes, short of contacts on 70cm, are opening up new vistas through use of the duplex mode. Many have converters for 2 and 4m, and receivers for lower bands still, enabling crossband QSOs to be had from 432 Mc/s.

Communication is much accelerated by the duplex mode, and far from running out of things to talk about, its exponents find that it stimulates conversation no end.

Herein lies a danger—several dangers, in fact.

In the enthusiasm of a new-found loquacity an operator can all-too-easily forget to announce at regular intervals his own call-sign and that of the person he is working. Just as important: he should leave no doubt in a listener's mind as to which band he is using—and "*listeners*" can be not only the BRS men but the official GPO monitoring stations as well. *They* certainly want to be sure which band you are using!

All that is necessary is to announce every five minutes or so: "This is G8LM on 2m working crossband with G5UM on 4m."

This way no ambiguity can arise.

Another most important thing to remember is: Do not allow your correspondent's call-sign to be heard through your own microphone. The licence forbids the retransmission of another's recorded call-sign over *your* station; this is confusing enough and has to be stopped. It is even more confusing to retransmit another's call-sign *live*.

If this point is not carefully watched the sound of a G8 plus three could easily be heard on Top Band! This would be illegal—yet it would not be in any way the fault of the G8 plus three; it would be the fault of his duplex correspondent for allowing the incoming G8 plus three call-sign to modulate the Top Band transmitter.

Don't be the cause of directing a "pink ticket" to a G8 plus three who has done no wrong!

Play safe when you operate duplex: *wear headphones*!

Meteor Scatter

G3LTF (Galleywood) worked his 25th country on 2m during the Leonids (November 17) by a very satisfactory QSO with EA4AO (Madrid). Hearing on the television programme "Sky at Night" that this shower was expected to be intense, G3LTF arranged skeds for November 15 to 18 with EA4AO. On the 15th and 16th, the shower was not very intense, and only odd call-signs and parts of call-signs were recorded. On the 17th, however, the shower was excellent, with bursts of up to one minute at S9 to S9+. G3LTF has tape of EA4AO's signals, and has received tape of his own signals from Madrid. Signal reports were RS26 from Madrid and 23 from Galleywood. G3LTF also worked F9NL (November 26) at RST 589. The gear used by G3LTF was a 417A converter, 4X250B (300w input) p.a., and an 11 element long Yagi at 50 ft. EA4AO had a 10 element Yagi with a 6CW4 converter.

G3CCH (Scunthorpe) also broke some more new ground (for him) in meteor scatter experiments during the Leonid meteor shower on November 17 when he worked HG2RD from 02.00 to 04.40 GMT, during one of the best showers encountered so far, with bursts up to 15 seconds and many "pings" in between. This brings the country score up to 20, on 2m, by all modes. Tests on the 15th and 16th brought a few bursts from HG2RG, but nothing from HG5KBP. There were also some good bursts on the 17th from HG5KBP between 05.00 and 05.30, but regrettably nothing after, so this possible QSO was not completed.

RSGB V.H.F. Contests

Members are reminded that the first contest in the new year will be the First 144 Mc/s (C.W.) Contest, to be held on January 30 and 31. For full details, see the November issue of the BULLETIN. Of special interest to contestants will be the new system of scoring which has been introduced by the V.H.F. Contests Committee to meet the wishes of a large contingent of v.h.f. contest participants, especially those remote from centres of activity.

QRA Locator for Western Europe

Copies of a QRA Locator map, which covers Europe as far east as the Polish and Yugoslavian borders, and south to the Portuguese and Italian borders, are now available from RSGB Headquarters price 5s. each. These maps are scaled at 25km to 1cm, or 40 miles to 1 inch. These maps are recognized for use in all IARU contests.

Oscar III Project

It is reported that the US satellite, *Oscar III*, is due to go into orbit sometime during the month of January or February 1965. If more precise information becomes available nearer the launching date, it will be announced on the GB2RS News Bulletin service to inform those interested. Suffice it to say, make sure that you will be in a position to take advantage of this wonderful facility, having in mind that this mode of communication is open to everyone no matter how poor the location may be. For more detailed information on the *Oscar III* project, and the suggested method of using the satellite, readers are referred to the article by Peter Blair, G3LTF, on page 509 of the August, 1964, issue of the BULLETIN.

Tropo Opening on November 18 and 19

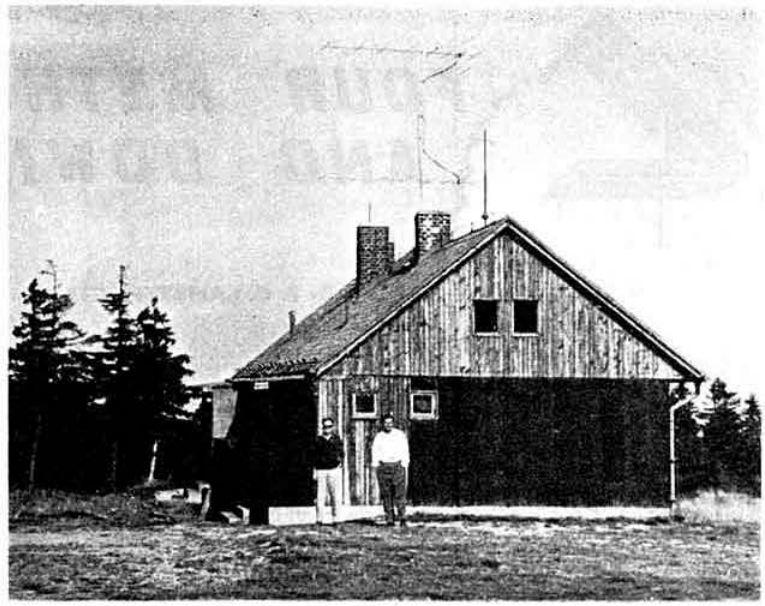
It is probable that the period of good extended tropospheric conditions which prevailed between approximately

* 21 Bridge Way, Whitton, Twickenham, Middlesex.

6.30 p.m. on November 18 and mid-day on November 19 did not affect the north of England. However, **F9NL**, located in the Pyrenees, again provided the ultimate in signal strength and range to many stations in the south of England.

In a contact with **G2JF** on the morning of November 19, he records working many British stations, including GW8NP. A few of his contacts were with G3OBD (Poole), G5NF (Farnham), G3SHK (Ruislip), G8OU (Ashtead), G3GHO (Roade), G3TOZ (near Rye) and G3JXK (near Canterbury). The latter station raised him on his 47th call! G3TOZ, however, raised him on his first call. Other French stations heard and worked during this period, with their locators, were F8RZ (ZF50H), F9RN (ZF29), F8RI (Angers), F9RZ (ZE25F), F3AC (ZH63), F3LM (Tours), F8LP (Tours). Other stations worked, on November 20, included G3MPS, G2JF and G5NF. G5TZ was worked at phenomenal strength on the 24th. On November 25, G5TZ again, with GC2FMV (Jersey) and GC2TR for good measure. On the 26th, G3SHS, G2AQX, G2DQ, G3EDD, G2CDX, G3LTF, G5TZ, G3BHW, GC3KAV, GC2FMV and GC2TR were worked.

The Lerwick transmitter GB3LER was S2 at 07.32 GMT on November 19; otherwise no signals were heard in that direction. During this period barometer pressure was reasonably steady at 76·6cm, 1022 mb.



The station OK1DE/P on Mount Klinovec (GK45d), 1240 m a.s.l., during the September, 1964, IARU Region 1 V.H.F. Contest. 196 QSOs were made, totalling 36,842 points. The roof mounted aerial, a 10-over-10 with a gain of 14db over a dipole, was fed with a GU2G (829B) 130 watt transmitter. The receiver consisted of a 417A/EC86 converter with two double superhets.

Chess Invitation

EI2W will be glad to hear from any 2m station in Northern Ireland or Lancashire who would like to have a chess match on this band on a non-consultative basis—in other words an individual match between the two stations.

Two Metre News and Views

G8ADU/A (Malvern) reports that a local station G3MTI, with a power of 10 watts, worked a DL9 on the afternoon of November 10. This was thought to be by sporadic *E*.

G3TOZ (Peasmarsh, near Rye), a newcomer to the band, experienced his first opening on November 8 and 9 and worked 12 PA0 stations and DJ3ZU, all with 18 watts into his p.a. stage and a 6-over-6 aerial system; a very satisfactory beginning.

G3LLE (Sheffield) reports on the opening, with information gleaned from a PA0 station that DL1FF from the Bremen district worked 18 Russian stations during the first few days of the month of November, and similar information was forthcoming from the OZ stations for the same period—it's nice to know that the high pressure system prevailing at the time was doing someone some good. Incidentally, for the benefit of newer 2m exponents it is worth remembering that although a high pressure system is usually associated with a period of good conditions, there are other factors to take into account, and in this respect the reader is referred to *V.H.F. Weather*, Parts 1 and 2, by R. G. Flavell, F.R.Met.S., GM3LTP, which appeared in the RSGB BULLETINS for March, 1963, page 483, and March 1964, page 161. Part 3, by C. E. Newton, G2FKZ, will be published next month.

G5NF (Farnham, Surrey) found the strain of operating during the opening rather tiring—needless to say the QRM and roaring signals were quite an experience! He comments on the fine signals he gets from the Bridgwater stations G5DW and G3MPS.

G3CHW (near Bristol) had a contact during the opening with DL9GS/M (near Cologne). The remarkable signals which emanated from this station are explained by the fact that he was using a ten element Yagi system: quite an aerial for mobile work! DL9GS/M got the first two letters in his own QRA locator the wrong way round, which indicated to his continental friends that he must have been somewhere in Russia!

F9NJ (Lille) reports having worked 210 different G stations, which indicates how well his signals are received in the United Kingdom. He also reports hearing GB3LER at S2/3 during the opening, and as usual G5YV (Leeds) was one of the outstanding signals from the north. G4LU reports working, amongst other European contacts, DL9GS/M near Cologne at a distance approaching 400 miles, but like other people, heard nothing spectacular in the south of England.

G5MR put in a bit of overtime during the good conditions of November 8, and worked 17 PA0 and eight DL/DJ in a row from one CQ. This was his first extended tropo opening from his new location at Stelling Minnis, near Canterbury, and he looks forward to even bigger and better results on completion of his aerial system. Incidentally, G3BGP has started up operation about one mile from G5MR. G3BGP is welcomed to the band and so is G3FHN (Bethersden). Both stations are using halos, but will shortly be gravitating to something more sophisticated.

G3BJY (Walsall) could only operate during the early morning of November 9, but successfully worked 15 PAs, 4 DL/DJ and 2 ON stations. Signal strengths were from S6 to S8 and there was practically no fading. Two French stations were also heard. No Scandinavians or other countries were heard, despite many CQs, but it was still possible to work PAs up to 20.00 GMT. During this period G-DX was excellent, mainly to the south-east. Two QSOs with G3SZ (Kings Lynn, Norfolk) and G3SUK (Ipswich, Suffolk) during this period were very welcome, as these counties are not easily worked from Walsall.

GM3OWU (Nr. Edinburgh) is now active on 144·8 Mc/s with a 522 and a triple conversion receiver (E88CC and Geloso converter into an SX28). The aerial is an eight element Yagi, but is located at the end of the garden, that is, at the end of 150 ft. of feeder! The QTH is good for all directions except the south, the Pentland Hills being only one mile away.

G5YV (Leeds) reports renewed efforts in the meteor scatter field of communication in December, so we look forward to hearing about the results of his experiments.

G3GDA (York) makes a welcome re-appearance on the band after a lapse of 12 months. He particularly wishes to contact Bill James, G6XM (ex-DL2XM), now living near Christchurch in Hampshire.

G3DY (near Peterborough) is a regular and strong signal on the 2m band, running 90 watts to a QQV06-40A.

G2FO (Stockton-on-Tees) is on the 2m band fairly regularly and can be heard around 7 p.m. on Mondays, Wednesdays and Fridays, on c.w. beaming south on approximately 145·78 Mc/s. He reports that GB3LER is audible quite often, but is never a strong signal.

HB9LN was an S9 signal to G3TOZ and G2JF on Saturday, November 21, but when he re-appeared on November 24 he was much weaker. HB9WB/M was also heard on this date around 144·15 Mc/s, on n.b.f.m., but no contacts were recorded with this station.

G3EDD (Cambridge) was very pleased to have a contact with F9NL, and it is quite possible that this contact was one of the most distant from F9NL. G3EDD hopes to do some meteor scatter work shortly, and preparations are already in hand.

Old-timers on 2m will be sorry to learn that Guy, ON4BZ, has given up 2m, and has revived interest in the h.f. bands. This is rather sad news, but if precedents are any guide to future changes, it is quite possible that there could be a return. This news was passed on from ON4HU.

G3JGJ (Nr. Newton Abbot) recently had a QSO with G2UJ (Tunbridge Wells). Not unusual, you may say, but G3JGJ was using 4 watts to a 6J6 and a 4 element Yagi at about 20 ft.!

Cornish Beacon Station GB3CTC

Measurements of the frequency of GB3CTC on November 30-December 1, 1964, showed it to be nominally 144·107 Mc/s +0−200 c/s. The measurements were carried out by D. V. Newport, G3CHW.

News from Scotland

During the opening of November 9 and 10, GM3FYB, in addition to working OZ on 70cm, also worked a PA and an SM station on 70cm. Many OZs, PAs and ONs were worked on 2m.

GM3HLH (Crail) is reported as having worked about 30 continentals on 2m, and GM3EGW also worked several choice pieces of continental DX. During this opening, the favourable path was largely over water, and the conditions do not appear to have extended far inland on the Scottish side. In fact, well equipped stations in Central and West Scotland heard nothing out of the ordinary.

As regards 4m, GM3OJA, GM3OBG and GM3RZM are all active.

Four Metres

G8ADU/A (Malvern) reports that G3SGR/M and G3PXB/M have had some G-DX successes recently. The best QSOs were with G3SKR (Wembley), at RS57. Both mobiles were on the top of the ridge of the Malvern Hills at about 1100 ft. a.s.l. As the county border also runs along this ridge, G3SGR/M was in Herefordshire, and G3PXB/M in Worcestershire. Both mobiles were running B44s, G3SGR putting 5 watts into a dipole and G3PXB 3 watts into a 3 element Yagi.

G3HBW reports that he and G3MLS went portable to Rutland on November 22, and during about four hours operation in the afternoon they made between 20/30 QSOs. This is believed to be the first time anyone has operated from Rutland on 4m. The conditions were good, and more contacts might have been made, considering the large number of stations now operating this band, but some of them obviously were just not listening at the time. We will try and get advance notice of such expeditions in the future so that they can be given maximum publicity.

Please keep in mind the First 70 Mc/s Open Contest on February 14, rules for which appeared last month. This is a new Contest, with rules favouring fixed stations, and the Contests Committee hope for a bumper entry. From the 1965 4m programme, it seems as if all types of stations and both phone and c.w. are catered for, which should please all operators, at least some of the time. A definite step in the right direction.

EI2W (Dublin) reports that there was exceptional 4m activity in EI-GI on December 6, despite the inclement weather. He worked GI3FNQ/P for a new county (Londonderry) and also EI7D for Co. Dublin. Eight stations were heard in GI, and two in EI. EI7A and EI7D are now on the band in counties Donegal and Dublin respectively.

Seventy-Centimetre Notebook

G3KEF (Coventry) has a very good report for the November 8/9 opening. PA0JMS, PA0AKA, PA0GER, ON4HN, PA0DBQ, DL9LU, DJ7HY, DJ7IF, DL3FL and DL6YL/DL1PS were all worked on the 8th. On the 9th, however, the only two E-DX stations heard were worked: ON4HN and OZ7SP. This opening was the most outstanding one on 70cm for G3KEF, the important thing being that a poor QTH was no hindrance on this occasion. A beacon station, DJ2LFP was heard RST/599 on the 8th.

G3KEF has asked us to let readers know that Thursday night is the Midlands 70cm activity night.

The next Coventry V.H.F. Group meeting will probably be in March, but more information is expected later. The Sausage and Mash Supper was very successful, with 22 present, including G3MCS, who travelled 60 miles to be present.

G2OI has been receiving the beacon station GB3GEC nightly on 431·5 Mc/s. This has been happening for many weeks after 23.00 clock time at strengths ranging from S2 to S7. G2OI is on 70cm each night after 23.00 clock time, and would welcome calls or skeds. The frequency is 433·51 Mc/s. Stations known to be active on this band in the north include G3EKP, G3LEE, G3GMX, G3KMS, G3BAK, G5IG, GW3MDY and G2OI.

G3LHA (Coventry) worked PA0JMS (Leiden), ON4HN (Ghent), PA0GER (The Hague), DL9LU, DL3FL (Solingen),

(Continued on page 41)

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

Call-sign	Location	Nominal Frequency	Emission	Aerial Direction
GB3CTC	Redruth, Cornwall	144·10 Mc/s	A1	North-East
GB3VHF	Wrotham, Kent	144·50 Mc/s	A1	North-West
GB3GEC	Hammersmith, London	431·5 Mc/s	A1	East

RSGB V.H.F. BEACON STATION GB3VHF

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

Date	Time	Error
November 24	11.07 GMT	1220 c/s high
December 1	16.25 GMT	9000 c/s low
December 8	18.15 GMT	9140 c/s low
December 16	10.45 GMT	4000 c/s high

Mobile Column

By E. ARNOLD MATTHEWS, G3FZW *

LOOKING around the RSGB International Communications Exhibition last year we were impressed by the way manufacturers have set out to fill the need for reasonably priced mobile equipment in addition to developing the range of " luxury " transceivers.

T. Withers (Electronics) series of " Communicators " set a logical trend in the design of a.m. rigs, and being based on this firm's well-tried range of transmitters and receivers, should give trouble-free service. It is interesting to note that a 12V d.c. power-pack is built-in, and the maximum d.c. demand is 5A. They are made as single-band designs for 2, 4, and 160m. The Green & Davis Ltd. TVR2 is a transistorized transceiver for 160 and 2m using a 7558 p.a., modular construction, and is so designed that the valve p.a. may easily be replaced by a transistor when suitable low cost v.h.f. types are readily available. Modular construction is also applied to the firm's range of transistor modulators with outputs covering 15 to 20 watts. Codar Radio Company's AT5 transmitter, covering 160 and 80m offers two-band coverage in little space at low cost. A 12V d.c. power-pack is also available. To provide a load for the AT5, Codar have wound a little base-loaded 15 in. whip capable of giving a range of 20 miles.

Multi-band h.f. transceivers continue to proliferate. In addition to the well-known National NCX-3, Ad-Auremia Ltd. were displaying the NCX-5, which covers 80-10m. A transistorized v.f.o. is used with a claimed stability of less than 100 c/s during any 10-minute period. Tuning linearity is accurate enough to enable a digital read-out display, driven by a cyclometer-type mechanism, to be used for frequency indication. Greater use of transistors is made by Sideband Engineers Inc. in the SB33, which appears to be designed primarily for fixed-station operation, as an a.c. pack is built-in, and mobile operation requires a rather expensive d.c. to a.c. inverter. Courier Communications CTR-1 is a robustly built six-band s.s.b. transceiver with a split frequency facility of up to 100 kc/s separation using crystal control or v.f.o., the latter being an optional extra. On this stand there was also a most comfortably fitting boom microphone. KW Electronics Ltd. have produced a higher-powered version of their very successful KW2000 in the KW2000A, which uses two 6146s in the final. For those who wish to " go commercial " on sideband at less cost, Daystrom Ltd. exhibited a range of one-band Heathkit transceivers: the HW12 (80m), HW22 (40m), and HW32 (20m).

Both KW Electronics and Green and Davis exhibitea new Webster aerials, the " Topper " being a more conventional centre-loaded design with interchangeable coils. Partridge Electronics Ltd. have produced a mobile mounting for their " Joystick " aerial.

Operating Notes

G3FZW, who is operating exclusively on 80m at present, now finds that the longer skip conditions prevailing make it easier to make continental QSOs than with Gs. Some of these have provided much information about mobile activity in other countries, which makes one aware that we are very fortunate in the UK. There is no /M licence at all in Italy, for instance, and according to ON4ZA, Belgians have only had the facility for six months—since it was granted to foreign licensees for the Verviers Rally. OZ6AI says that /M licences granted in Denmark are subject to a 10 watt limit.

G2MF, Sheffield, has quite a collection of commercial aerials, which he plans to use for comparative tests. We shall be pleased to hear the results, as there is much discussion as to the performance of the various designs. The writer's feeling is that there is little to choose between many of the similarly priced aerials, and much may depend on the car, rather than on the aerial itself. It is therefore no fair test to compare its performance with another aerial on a different car.

The Society's Mobile Committee was depicted at the RSGB International Radio Communications Exhibition by this amusing model.

Whilst on the subject of aerials, we feel that some mention should be made of aerial mountings; in particular, one method observed during the summer where a 160m whip had been mounted on the off-side window of a car in a similar manner to that used for small broadcast type aerials. This may be safe enough when pressure is applied normal to the longitudinal axis of the car, but should any transverse pressure be applied the danger of a broken window is greatly increased. To offset this the aerial must be made very resilient, and should be so weak that it will break long before the window. Furthermore, the side plates of the mount have to be fairly large to distribute the load, and would thus partly obscure the driver's vision.

Much of the unsightliness of aerials and supports arises from constructors' lack of knowledge of mechanics rather than workshop facilities or practical skill. This was evident in one home-brew aerial which was mounted on a flat strip base which was rather roughly made from 2 in. × $\frac{3}{8}$ in. steel. Because it was not strong enough, a support had been constructed from Perspex sheet and chrome-plated tubing, and it was obvious that the maker had a high degree of manual skill. However, had the base been formed from a piece of metal of equal weight but only $\frac{1}{8}$ in. thick, it could have been made much stronger (and with less effort) by forming it into a channel or box section girder mount.

* * *

May we take this opportunity of wishing all readers a Happy New Year. May all your journeys be made in safety.

* 1 Shortbutts Lane, Lichfield, Staffs.

Four Metres and Down (Continued from page 39)

DL1PS (Dusseldorf) and DL6YL during the opening of November 8. The last QSO was the first one on 70cm with a YL operator. On November 9, OZ7SP was raised but the QSO was not solid, due to fading. G3JQI (Norfolk) was called but not worked.

G3KEF (Coventry) had a "field day" during the opening. From his fairly poor location he worked six DLs, five PAs, one ON and OZ7SP, all at S9. G3LHA has now rectified the aerial relay fault which explained discrepancies between his and G3KEF's results!

G3KFD and **G2CIK/T** in the Birmingham area still appear regularly, although some of the others seem to have hibernated!

Twenty-three Centimetres

G3MCS (Aylesbury) who recently worked ON4ZK for the first G/ON on this band, tells us that he has also worked G3LTF, G3FP, G5DJ, G8AL and G2RD so far, and that he also heard PA0UML on the night of the ON4ZK QSO. The reports were RS55 both ways. The transmitter is a 3CX100A5 tripler, driven by a 4X150 70cm p.d. When working ON4ZK the anode of the tripler was short-circuited to earth, and running about 1 watt output. The aerial is a 4 ft. dish in the loft. G3MCS is also active on 70cm on Thursdays. He is interested in skeds on both 23cm and 70cm.

G3LTF (Galleywood) worked UP2KAB (Vilna), his 26th country on 2m, on December 12. This was again by meteor scatter, during the Geminids Shower. Reports were S3-7 from UP2KAB, and S2-4 from G3LTF. YU1EXY and DL3YBA were also heard.

Panoramic Reception (Continued from page 36)

speed was so low that a long persistance tube had to be fitted, and a rather complicated timebase capable of sweeping linearly once every 10 to 20 seconds adopted. While the panadaptor then became excellent for local signal analysis, its value in more normal use on the amateur bands became questionable.

Cathode Ray Tube

The choice of cathode ray tubes suitable for use in a panadaptor is very wide. While a small 2in. tube would be adequate for band activity indications, it would be rather small for signal analysis. A larger type, such as the VCR97, is a much better proposition.

Summary

It should now be apparent that a panadaptor resolves itself into three basic units:

(i) An r.f. unit which is virtually an ordinary receiver with a broad-band r.f. and mixer stage, the mixer being fed by a frequency modulated oscillator.

(ii) A frequency modulated oscillator—sometimes commonly called a "wobbulator"—feeding into the mixer of the r.f. section, and tied to the operation of the c.r.t. timebase.

(iii) A timebase and c.r.t. display unit; in other words a simple oscilloscope.

If you are lucky enough to have a spare receiver which you do not mind modifying to include a frequency modulated oscillator, and also possess an oscilloscope, a few simple connections between the two will provide an almost ready made panadaptor.

To be continued

Installation of President

Mr. E. W. Yeomanson, G3IIR, will be installed as the 31st President of the Society during the course of a General Meeting and Social Evening to be held at

Kingsley Hotel,

Bloomsbury Way, London, W.C.1

on

Friday, January 15, 1965

Commencing at 7 p.m.

Admission will be by ticket, available on request (with s.a.e.) from Headquarters. (Tickets restricted to two per member.)

QUA Associates

Conducted by "JIX"*

SEASON'S Greetings for 1965. May you achieve your ambitions in the field of Amateur Radio this year. Best of luck to those readers who aspire to obtain their own call; I hope the licence will drop through the letter-box sometime in the next 12 months.

Talking of licences, it is just about the time to start perusing the know-how on the syllabus of the RAE (that is, for those who are doing it by home study). Licence conditions figure very prominently, and there must have been many a failure because of lack of familiarity with these, and with interference—the other subject on part one of the paper. This part must be attempted in full, and a pass obtained. So a good bit of rehearsing before the mirror, so that you don't forget your lines, might pull it off in May!

I believe that the enrolment for the RAE should be made before about the end of February, if you don't want to pay a late fee. Anyway, best wishes to all candidates, including a dig at any who are putting off the Morse—and I know a few, so how about a new year's resolution?

News and Views

A. M. Fletcher, A3994, says he would like to correspond with A3766 on the subject of putting up efficient receiving aerials. A3994 uses an AR88 receiver, and obviously enjoys listening, but in common with other SWLs, he finds a low QSL turnover—only about 12 per cent returns. Also asked (with apologies for ignorance) was the whereabouts of the beacon station, Loran, on Top Band? I couldn't say offhand, and would have to look it up! A3994 and myself—well, we will have to be ignorant together. Other "A" members may like to write to A3994 about aerials, and his address is 60 Cottesloe Road, Aylesbury, Bucks.

Mike, A3969, writes again and apparently the R107 is still (intermittently) OK! Mike is still complaining about lack of time—I wonder what he does with it all? An h.f. band converter ahead of the R107 would really improve things I should think—this would be using the Rx as a tunable i.f. amplifier.

Right on the deadline for this issue, two letters arrived for *QUA Associates*. One was from G3RKK and was tremendously long! The other had comments about contests and certificates . . . but more about both of them in February.

That's the final for this QSO! so 73 and BCNU.

* Ken Smith, G3JIX. 82 Granville Road, London, E.17.

News from Headquarters

Headquarters Fund—List No. 24

The following is a list of those who have contributed to the fund up to December 2, 1964. R. W. Standley, G8RW; H. J. Platt, BRS25243; G. F. Watson, BRS25826; L. W. Miles, GW3IMQ, J. MacIntosh, GM3IAA; J. E. Fox, BRS25239; A. R. Osborne, G4OV. Total amount contributed to date: £2,002 17s. 2d. This amount includes the sum of £40 collected at the RSGB International Radio Communications Exhibition, 1964.

GPO Morse Tests

Provided that there are sufficient applications, Post Office Morse Tests will be held during the week beginning March 8 at the Birmingham, Derby, Manchester, Leeds and Cambridge Head Post Offices. Application forms may be obtained from the Radio Services Department, Radio Branch, GPO Headquarters Building, St. Martins-le-Grand, London, E.C.1. The completed application forms, to which the entrance fee of 10s. should be affixed in stamps, must be posted to the Wireless Telegraphy Section to arrive not later than February 12, 1965.

Radio Amateurs' Examination

Members who have experienced difficulty in persuading their local authorities to run courses in preparation for the RAE or to arrange examination facilities are invited to write to the Society's Education and Training Committee at Headquarters.

Silent Keys

We record with sorrow the passing of the following members:
J. Taylor, ex-GM2DBX, of Buckhaven, Fife.
W. T. Palmer, BRS 14295, of Margate, Kent.

Affiliated Societies

The following are now affiliated to RSGB:
RAF Leeming Amateur Radio Club,
c/o Sgt K. Smethurst, RAF Leeming, Northallerton, Yorkshire.
University of Sheffield Amateur Radio Society,
c/o J. P. Billingham, Dept. of Metallurgy, St. Georges Square, Sheffield 1.

Call Book Corrections

The tenth testimonial in Partridge Electronics Ltd. advertisement on page 92 of the 1965 *Call Book* should be attributed to G3BPE, and not G3PBE as shown. The telephone number of R.T. & I. Electronics Ltd. is shown incorrectly on the inside back cover; it should be LEYtonstone 4986.

The Gerald Marcuse Memorial Award

At the 1962 Reunion of the Radio Amateur Old Timers' Association it was decided to establish an Annual Prize Award in memory of the late Gerald Marcuse, G2NM.

The terms of the award are as follows:

(i) The Award will be made annually in May to the United Kingdom licensed radio amateur under 21 years of age on December 31 previously, who shall have submitted to the Radio Amateur Old Timers' Association the most meritorious article describing a piece of equipment which he shall have constructed and used in his station, or a journey which he shall have made during the previous twelve months to a Commonwealth or foreign country where he met and visited other licensed radio amateurs. Entrants must be Corporate members of the Radio Society of Great Britain.

(ii) The manuscript of the article shall be either typed, using double spacing, or written legibly on lined foolscap.

(iii) All manuscripts will be judged by a panel consisting of three members of the Association.

(iv) The closing date for entries shall be February 28.

(v) The winner of the Award will be invited to attend the Annual Reunion of the Association as a guest of the Association.

(vi) The Award will take the form of books or book tokens to a value of not less than two pounds.

(vii) The winning manuscript will be offered to the Editor of the RSGB Bulletin for publication.

Entries should be sent to reach the Founder-Secretary, RAOTA, 16 Ashridge Gardens, London, N.13, not later than February 28, 1965.

The first winner of the Award was Mr. A. J. Shepherd, G3RKK, whose description of his Amateur Bands receiver in the July 1963 issue of the RSGB Bulletin subsequently earned for him the Ostermeyer Trophy. No entries were received for 1964.

MULLARD AWARD FOR 1964. NOMINATIONS INVITED

In accordance with Rule 5, the Council invites nominations for consideration for the Mullard Award for 1964. Such nominations should be sent in writing to the General Manager at RSGB Headquarters to arrive not later than February 28, 1965.

The terms and conditions governing the Mullard Award, are as follows:

(i) *The Award is offered annually by Mullard Limited during the pleasure of the Directors of that Company.*

(ii) *The Award will take the form of a gift in kind (preferably electronic or electrical apparatus and/or books) to the value of £25, and a plaque.*

(iii) *The Award will be made to the member of the Radio Society of Great Britain resident in the United Kingdom who (in the opinion of a Committee consisting of three representatives of Mullard Limited and three representatives of the Council of the Radio Society of Great Britain, has, through the medium of Amateur Radio during the preceding calendar year, rendered outstanding personal service to the community by his own endeavour or by his own example of fortitude and courage.*

(iv) *The presentation of the Award will take place during the month of April each year on a date and at a place to be decided by the Committee.*

(v) *In January of each year, the Radio Society of Great Britain shall, through its official journal, invite nominations for the Award. Each such nomination shall be supported by at least three Corporate Members of the Society and shall be accompanied by a brief factual account of the personal service rendered by the nominee.*

Obituaries

Alfred Duncan Gay, G6NF

Old-timers will learn with deep regret of the sudden death from a heart attack in August, 1964, of Alfred D. Gay, G6NF. An active amateur for some 38 years, Alfred served the RSGB in a number of fields.

He was the Society's Calibration Manager for some ten years prior to the War, and in this capacity he constructed and operated some of the first precision frequency measuring and calibration equipment. He published a number of articles on these subjects in the BULLETIN, and rendered invaluable assistance to members with standard frequency transmissions long before the days of government-operated world-wide standard frequency services.

He pioneered on all the v.h.f. bands, and was one of those who took part in the memorable early 5 metre transmissions from the old Crystal Palace Tower.

A member of Council for many years, he was also the Honorary Treasurer in the immediate pre-war period. He became President of the Society in 1941, and did invaluable work in maintaining the Society's activities during the difficult war years 1941, 2 and 3.

G6NF was a founder member and past-president of the old South London and District Transmitters' Society, and was a frequent contributor to the discussions at the RSGB meetings held at the IEE. Latterly his activities were concentrated on the 144, 432, and 1215 Mc/s bands, and his signals will be sadly missed by his many friends in the London area.

G2NH

Dennis F. Smyth, G3OYZ

Members of the Cray Valley Radio Society and North Kent Radio Society were deeply shocked to learn that Dennis F. Smyth, G3OYZ, of Sidcup, Kent, had died suddenly on November 14, 1964, at the age of 46.

He was a keen experimenter in many fields of amateur radio and had, in the past two years, become a very successful v.h.f. operator. His enthusiasm and technical skill had provided a solid foundation for contest working and he will be sorely missed, not only in this connection, but for his light-hearted approach to many of the problems of radio and life in general.

Eight amateurs representing both local societies attended the funeral at Sidcup Cemetery on November 20, 1964, to bid Dennis farewell. We offer our sincere sympathy to Mrs. Smyth and Peter Smyth.

S. C.

Joe Campbell, EI4B

It is with deep regret we record the passing, on November 10, 1964, of Joe Campbell, EI4B, one of the oldest licensed radio amateurs in these islands who had reached the ripe old age of 79 and who was active on the bands until a short time ago.

First licensed in 1911 under the call-sign GW1-4B, he was associated with all the early experiments in communication and continued his hobby without a break all down the years. In addition to amateur radio he was an expert photographer and meteorologist; in summer he also engaged in sailing with the local club.

His home, situated on the north shore of Dublin Bay, commanded a magnificent view of the bay and Wicklow mountains to the south. Joe was a kindly, humorous, good-natured soul possessed of that old-world courtesy which endeared him to one and all. A true amateur in every respect, he was always willing to lend a hand to the newcomer; and many were the callers and all were impressed with what they saw and heard—and left the richer by the visit.

His contemporary, and life-long friend, Harry Moss, EI4C, is still, happily, with us and in the BULLETIN for July, 1961 is recorded they had their first solid a.m. QSO on 7 Mc/s fifty years after their first QSO in September, 1912.

EI4B's passing marks the end of an era and had his autobiography been written it would have been a history of Amateur Radio. We could not do better than conclude with his well-known phrase when passing over the transmission for a "final final," "and now OM, I will pass it over to you for the Grand Amen."

To his widow and family we extend our deepest sympathy.

EI8A

T. A. St. Johnston, G6UT

With deep sorrow we report the death on December 19, 1964, of T. A. St. Johnston, G6UT, a Vice-President of the Society.

An appreciation will appear in the next issue of the RSGB BULLETIN.

Area Representatives Badges

Badges for Area Representatives will shortly be available and may be ordered from RSGB Headquarters, price 10s. each including postage.

London Lecture Meeting

There was an attendance of 40 at the London Lecture Meeting held at the Institution of Electrical Engineers on November 27, 1964, when Mr P. K. Blair, G3LTF, lectured on "Moonbounce."

The chair was taken by the President, Mr. G. M. C. Stone, G3FZL, who had the support of the Honorary Treasurer, Mr Norman Caws, G3BVG. A vote of thanks was proposed by Council Member R. C. Hills, G3HRH.

An article based on Mr Blair's lecture is in preparation.

S.S.B. on Two Metres

The Council has accepted a recommendation of the V.H.F. Committee that s.s.b. operation on 2m should take place between 145·1 and 145·2 Mc/s.

Wirral Amateur Radio Society

The 13th Annual Dinner of the Wirral ARS took place on Friday, November 20, at the Eagle and Crown Hotel, Upton, Wirral. The attendance, one of the best for some years, exceeded 100.

After the meal, which had a Christmas flavour, a toast to the ladies and visitors was proposed by Ken Birch, G2FOS, and the response, in traditional humorous fashion, was by Bob Woodroffe, G2DQX, Chairman of the Ainsdale Radio Society. The next toast was to the Radio Society of Great Britain, proposed by Basil O'Brien, G2AMV. This was ably replied to by John Rouse, G2AHL, General Manager of the Society. Mr Rouse was the Guest of Honour and took the opportunity of bringing members of the Wirral Society right up to date with Society activities. He went on to propose the toast to the Wirral Society. Finally the Chairman, Laurie Flint, G3IIH, thanked him for his kind remarks.

For the rest of the evening a very excellent entertainment, including a comedian and a soprano, was well received by the audience. A small draw with prizes, mostly consisting of liquid assets, was also a feature of the evening.

The Wirral Amateur Radio Society records its appreciation to John Rouse for travelling from London and to Bob Taylor and his committee for organizing the event.

G2AMV

Society Affairs

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

THE October meeting of the Council was held on October 12, 1964, and was attended by Messrs G. M. C. Stone, H. A. Bartlett, N. Caws, J. C. Foster, J. C. Graham, R. C. Hills, E. G. Ingram, R. H. James, A. O. Milne, L. E. Newnham, F. K. Parker, R. F. Stevens, J. W. Swinnerton, Louis Varney, E. W. Yeomanson (Members of the Council), John A. Rouse (General Manager and Secretary) and P. C. M. Smee (Minuting Secretary).

Apologies for absence were submitted on behalf of Mr. L. N. Goldsbrough and Mr. A. D. Patterson.

Beacon Stations

It was reported that the Post Office had approved in principle the setting up of beacon stations at Craigowl Hill, Dundee, and in Northern Ireland.

Formal application for a licence for the Northern Ireland station had been made.

Annual Accounts

The Council approved the Income and Expenditure Account and Balance Sheet for the financial year ended June 30, 1964. (A copy of the audited Income and Expenditure Account and Balance Sheet was sent to members with the November issue of the BULLETIN.)

The Honorary Treasurer, Mr Caws, said he had broken down the Income and Expenditure of the Society to give an idea how the Members' money was used.

	s.	d.	£	s.	d.
A Corporate Member pays			1	15	0
and the average profit from the sales of publications etc. is	10	0			
and a proportion of the cost of administration, editorial etc. is	6	0		4	0
Interest on the Society's Investments				1	6
Giving an average income of			£2	0	6
The cost of the general administration of the Society				7	0
QSL Bureau, IARU contribution, Awards etc.				2	0
Meetings of all kinds				5	6
Twelve issues of the BULLETIN cost for Editorial, printing etc. ..				19	6
Posting twelve issues				4	0
Income tax on the profits made by sales					6
			£1	18	6
In the year ended 30th June 1964 we saved				2	0
			£2	0	6

Committee Recommendations

The Council considered recommendations relating to a new operating award and the site for a Scottish 2m beacon station (V.H.F. Committee), a proposed good will mobile trip to Europe in 1965 (Mobile Committee), the production of visual/audio aids for publicity purposes and a Christmas lecture for young people (Education and Training Committee). The Council also accepted recommendations of the Finance and Staff Committee in connection with insurance, technical books, advertising and retirement age of staff.

Annual Report of the Council

The Annual Report of the Council for the year ended June 30, 1964, was approved for publication in the December, 1964, issue of the RSGB BULLETIN.

Membership and Affiliation

The Council approved 165 applications for membership (128 Corporate and 37 Associate). In addition 16 applications for transfer to Corporate grade from Associate were approved.

The Council waived the subscription of a member who suffers from blindness. The Council also waived the subscriptions of two applicants for Corporate membership on the grounds they suffer from blindness.

An application for Life Membership from Mr G. C. Reid, G3OUX, was approved.

Affiliation was granted to the following societies:

Amateur Radio Club, RAF North Luffenham
Moray Firth Amateur Radio Society
Burnage Grammar School Radio Society
Radio Society of Zambia (formerly Northern Rhodesia Amateur Radio Society).

Election of Mr. A. O. Milne as a Vice-President

The Council unanimously elected Mr A. O. Milne, G2MI, a Vice-President of the Society in recognition of his outstanding service to the Society particularly as Manager of the RSGB QSL Bureau for 25 years.

Reception for Overseas Visitors

It was agreed to hold a reception at the Seymour Hall for overseas visitors to the RSGB International Radio Communications Exhibition on October 30, 1964.

Mullard Award

It was reported that the presentation of the Mullard Award for 1963 to Mr James Illingworth, G3EPL, would take place on November 7, 1964. (A report was published in the December issue of the BULLETIN.—EDITOR).

International Amateur Radio Club

The President reported that he had received a letter from Mr John Gayer, President of IARC, thanking the Society for its support of its recent Convention and stating that plans for the 1965 event are well advanced.

V.H.F./U.H.F. Listeners' Championship

The Council accepted with thanks a generous offer made by Mr D. A. S. Drybrough, BRS22550, to donate a cup in memory of Jack Hanson, G6YU, for award in connection with the V.H.F./U.H.F. Listeners' Championship.

* * *

The Council was in session for almost five hours

NEWS . . .

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

Faraday Lecturer for 1965 is Francis McLean, C.B.E., Director of Engineering, BBC. The lecture, "Colour Television," is being given in Birmingham (January 19), Leicester (January 21), Manchester (January 26), Stoke-on-Trent (January 28), Portsmouth (February 9), London, Central Hall, Westminster (February 17/18), Bradford (February 24), Sheffield (March 2), Durham (March 16), Belfast (March 18), Edinburgh (April 1) and Newcastle (April 6). Tickets for any of the above dates can be obtained free, on application to the Secretary, Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London, W.C.2.

Reciprocal Operating Privileges. The United States Department of State has taken the initiative in the matter of reciprocal operating privileges for amateurs by asking their Embassies abroad to investigate the possibilities of formal agreements being drawn up. Discussions are under way with 30 or 40 administrations around the world but the names of the countries concerned are not known for certain although one is thought to be the United Kingdom. SRAL have asked the Finnish authorities to start negotiations with the United States Government.

In Region II an agreement was recently signed between Costa Rica and the United States. As far as the US is concerned, the only thing holding up further agreements appears to be concurrence on the part of other administrations. The US is prepared to move quickly when a favourable response is received from another country.

Radio & Electronic Components Show. The 1965 show will be the largest of its kind ever held in the United Kingdom. Sponsored by the Radio & Electronics Component Manufacturers' Federation, the show will be held at Olympia, London, from May 18 to 21. Organizers are Industrial Exhibitions Ltd.

Science Exhibits. Poster sets entitled "Education in the United States—Study Science" are available to schools and colleges in the United Kingdom on application to Exhibits Section, United States Information Services, American Embassy, London, W.1.

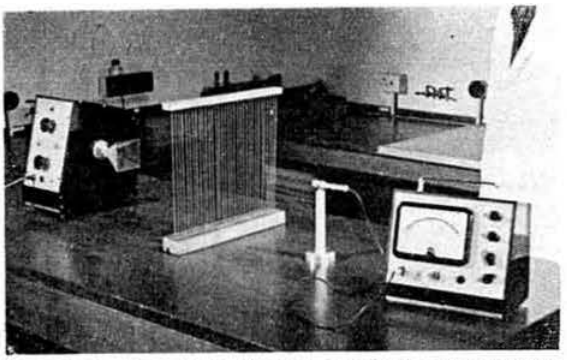
Plenipotentiary Conference. A Plenipotentiary Conference of the International Telecommunication Union is to be held in Montreaux, Switzerland, from September 14 to November 12, 1965. No information is yet available about the scope of the Conference but it is likely to deal only with the Convention. It will not deal with the Radio Regulations.

ITU Centenary and Stampex. Theme of the National Stamp Exhibition (STAMPEX) to be held at the Central Hall, Westminster, from March 19 to 27, 1965, will be the Centenary of the International Telecommunication Union and the new Post Office Tower due to come into service during the early part of 1965.

Australia and St Helena are the latest countries to announce that a special stamp will be issued to commemorate the centenary of the International Telecommunication Union in 1965.

Comsat Agreement. Fourteen nations have reached agreement on the establishment of a global communication satellite system by 1967. They are Australia, Belgium, Canada, Denmark, the Federal Republic of Germany, France, Ireland, Italy, Japan, the Netherlands, Switzerland, the United Kingdom, the United States and the Vatican City State. Austria, Norway, Portugal, Spain and Sweden are prospective original members. The agreements are open for signature up to February 19, 1965, by any country which is a Member of the ITU.

Comsat Launching. *Early Bird*, the first satellite designed for use in the International Communications Satellite Corporation System, is due for launching in March, 1965. Designed to transmit telephone and message traffic on a regular commercial basis between Europe and North America it may be used for occasional TV programmes. *Early Bird* will have 2½ times the band-width of Syncom C, the experimental satellite which relayed pictures of the Olympic Games from Tokyo to the United States.



Apparatus to demonstrate the plane polarization of microwaves. A still from the new Mullard/EFVA film "Electromagnetic Waves."

Electromagnetic Waves is the title of a new two-part film in the advanced science series produced by Realistic Unit Ltd. for the Educational Foundation for Visual Aids in collaboration with Mullard Ltd. Part I is entitled Discovery and Generation and Part II Properties and Behaviour. Part I opens with the early history of the radiation of heat and light and goes on to explain the range of radiations which make up the e.m. spectrum. Many historical events are highlighted. The generation and detection of e.m. waves are explained and demonstrated. Part 2 establishes the range of the e.m. spectrum, in the order of wavelengths and frequencies, from radio waves to aerial arrays. Radiation of radio waves is described as are polar diagrams and aerial arrays. Lasers and masers are introduced. Distribution by EFVA, 33 Queen Anne Street, London, W.1.

QRO for NATO. To augment the communications facilities of the North Atlantic Treaty Organization, the GPO has been responsible for building a high power v.l.f. radio telegraph station at Anthorn on the coast of Cumberland. The use of high power and a very low frequency ensures that the transmission will be as immune as possible from the effects of ionospheric disturbances. The aerial consists of six rhombic-shaped sections arranged in radial formation and suspended from 13 masts 618-748 ft. high. It is tunable over the frequency range 16-20 kc/s by variometers in series with a fixed helical inductor. The transmitter and aerial system is capable of operating at signal speeds up to 50 bands with frequency-shift (F1) and amplitude (A1) modulation.

Industrial and Trade Fairs to run Radio Show

Industrial and Trade Fairs Limited have taken over the promotion and organization of the annual exhibitions at Earls Court devoted to radio, television and other forms of home entertainment. These events will now be international in scope, and will replace the National Radio Shows formerly run by the British Radio Equipment Manufacturers' Association. The first of the new series of Radio Shows will be open from August 25 to September 4, 1965.

Valve Tester

A new valve tester, which supersedes the model 45C, is being produced by Taylor Electrical Instruments, Montrose Avenue, Slough, Bucks. It is designated the 45D, and incorporates 10 valve bases, including Nuvistor and compactron bases, so that tests can be carried out on the latest types of valve. The appearance of the instrument has been improved by using a case with a sloping front and a clarity meter. A chart is included which gives testing data for over 7000 British, American, Continental and Russian valves.

Field Strength Indicator

The "Telecomm" Portable Field Strength Indicator FS8/T is a new product of the V.H.F./U.H.F. Communications Co., 16 Abbey Street, Crewkerne, Somerset. The standard production model covers all channels in Bands 1 and 3, although special models can be produced to cover the v.h.f. communications bands between 70 and 175 Mc/s. The three ranges of 0·1, 1 and 10mV are displayed on a moving coil meter, and a plug-in attenuator is available which extends the range to 100mV f.s.d. The input impedance is 75 ohms. A superhet using 11 transistors and two diodes is employed, and includes an audio amplifier for driving headphones.

Hammarlund Receiver

The latest product from Hammarlund is the HQ145AX receiver; a modified version of the HQ145A. The HQ145AX offers coverage between 540 kc/s and 30 Mc/s in four bands, with calibrated bandspread on the 3·5, 7, 14, 21 and 28 Mc/s amateur bands, and 11 crystal controlled channels selectable from the front panel. Six of the plug-in crystals are actually mounted on the panel for easy access. Other features are dual conversion above 10 Mc/s; six position crystal filter plus adjustable slot filter with up to 60db attenuation; and an adjustable high stability b.f.o. for s.s.b. or c.w. It is described as a moderately priced communications receiver.

Silicon Planar Devices

A new process developed by Fairchild Semiconductor (U.S.A.) and SGS Fairchild (Europe) which gives an improved surface stability in silicon and silicon oxide planar devices, has enabled an increased component packing density to be achieved in integrated circuits. The photomicrograph shows a single chip containing 456 active components, which are interconnected and functioning as a complete set of 64 bi-stable memory bits plus all input decoding circuitry. The whole "unit" measures less than one-fiftieth of a square inch. With development of the Planar II technique, it is anticipated that within the next few months several types of bipolar transistor, field effect devices, metal-oxide silicon structures which will have eliminated temperature and stability problems, and a new generation of integrated circuits will be announced.

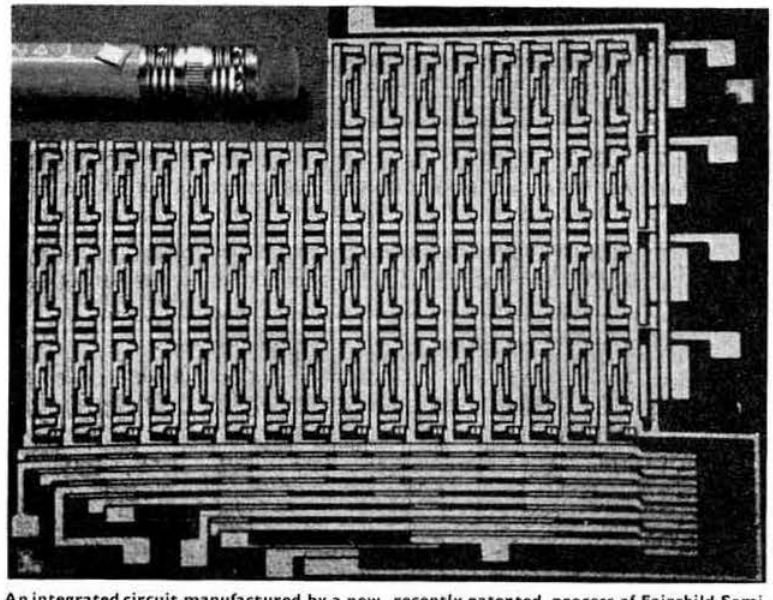
Receiver Converters

Two new products by Electroniques (Felixtowe) Ltd., Pathfinder Works, Penfold Road, Felixtowe, Suffolk, which are expected to become available early this year, are a fully transistorized Qoilpax, and a combined preselector/converter Qoilheart. Two versions of the Qoilpax will be offered, one covering the amateur bands from 160m to 10m in six ranges, and a general coverage model providing a range of 200m to 10m. Three r.f. transistors are used in both models: a 2G102 r.f. stage, a further 2G102 mixer, and a 2G414 oscillator. The first i.f. transformer is included on the chassis, and has a low impedance tap for matching the aerial input to a following receiver. Both units are designed to suit the Eddystone dial type 898, and the Electroniques SMD2 dial.

The Qoilheart can be used either as a complete receiver front end, as a tunable first i.f., or as a straight r.f. preamplifier. A *Q*-multiplier/notch filter is also incorporated, and these functions are selected by a pushbutton unit on the front panel. The Electroniques SMD2 6/1 and 36/1 two speed dial is fitted. Two versions will be available: one covering the six h.f. amateur bands, and the other will be a six band general coverage type. The standard i.f. output is 1·62 Mc/s, although an alternative i.f. of 1·5 Mc/s can be supplied.

Stabilized Power Unit

Coutant Electronics Ltd., 3 Trafford Road, Richfield Estate, Reading, Berks, have designed a stabilized power unit intended specifically for supplying tunnel diodes, which require relatively high currents at moderately low voltages. The output voltage is continuously variable between 0 and 100mV at 8A, and two auxiliary supplies of +5V and −5V at 6A are provided for associated transistor circuits. The response time of the stabilizer to step changes of load current is claimed to approach the theoretical minimum attainable, depending mainly on the length of strip line employed between the power unit and sensing point. The power supply utilizes an all silicon semiconductor line-up, and can operate at up to 60°C. It is mounted on a 19 in. × 5¼ in. rack panel.



An integrated circuit manufactured by a new, recently patented, process of Fairchild Semiconductor and SGS Fairchild. How long before s.s.b. exciters look like this?

Letters to the Editor

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

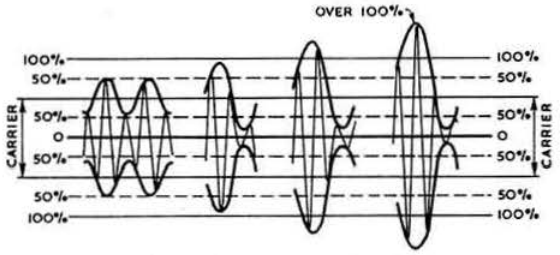
Overmodulation

DEAR SIR,—I applaud the sentiment in the article " Overmodulated! Who me? " in the RSGB BULLETIN for October, 1964, as I assume it is an effort, in the best of faith, to assist people in adjusting their transmitter for a " clean " signal.

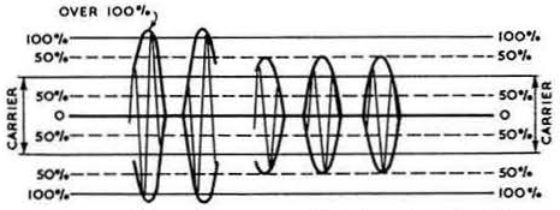
I see little evidence, however, of a clear definition of " overmodulation." It is a common fallacy to assume that if a carrier is modulated more than (i.e. over) 100 per cent in the positive direction it will radiate spurious sidebands—and note that it cannot be modulated over 100 per cent in the negative direction because the carrier cannot be reduced to less than zero!

The truth of the matter is, of course, that the shape of the modulated envelope is of greater importance than its amplitude relative to the amplitude of the unmodulated carrier.

It is also true to say that the shape can be, and indeed should be, a replica of the modulating wave. Consequently, if the modulating wave is distorted and therefore contains spurious signals itself, then these spurious signals will be radiated if they fall within the audio pass band, even if the percentage modulation is well below 100 per cent.



These patterns are quite in order.



These waveforms, being overmodulated, are inadmissible.

In this sense a transmitter can be said to be overmodulated at even 50 per cent, i.e. it is being modulated over its linear limit. Hence we must not assume all is well just because the modulation is less than 100 per cent.

Conversely, there is no need to panic if the positive swing is in excess of 100 per cent. There is nothing to worry about if the positive crests rise to, say, 150 per cent provided they remain *the same shape* as the input—after all, we don't deliberately apply spurious signals to the input to the p.a. The trouble here is the negative cycle when the carrier is at its lowest level and if the instantaneous modulation level is allowed to drop to zero it can go no lower. Hence the carrier must cease entirely for a while, and what greater change can one have than from " nothing to something "? It is rather ironical to realize that although trouble can occur if the carrier level goes above 100 per cent positive it is not inevitable, whereas if the instantaneous level goes down, trouble is certain if the change tends to exceed 100 per cent (impossible).

The foregoing may encourage us to modulate more than 100 per cent positive, and to good effect too! There are dangers, of course, in practice but why not face them and avoid them?

There are, in fact, means of modulating more than 100 per cent positive without distortion and spurious radiation which are in wide use, sometimes accidentally to be true but sometimes quite deliberately. I suppose I shall be accused of cheating if I quote TV.

In conclusion, what is overmodulation in the dirty signal sense? It certainly is not simply " over 100 per cent " if we measure the positive swing only. It is " more than 100 per cent negative "—if such were possible, which it is not. The best (or the least bad) I can do is the statement " A transmitter is overmodulated when the modulated r.f. envelope differs in shape from that of the modulating wave applied."

I have tried to point out that a simple 100 per cent rule is not a true safeguard and that the subject is not so simple as it appears at first sight.

All credit to the motives of your article.

Yours faithfully,
BRUCE HACKNEY, G6YP

Orpington, Kent.

The Exhibition

DEAR SIR,—Whilst the many kind remarks of G3JIX and others regarding the mechanical models on the RSGB stand are very much appreciated, full credit should be given to the hard work of Mr Stephen Jones, BRS23442. As the caption on the stand said, I " hindered " him with odd ideas, bits and pieces, lots of criticism, and a third hand, but Mr Jones did the worrying, sawed the wood, filed the metal, raced against time, and used up much of his limited spare time most of which anyway, he gives gladly in service to others, as is the same with " JIX " and his merry men of Roding.

Has anyone any ideas for the next show?

Yours faithfully,
LEN NEWNHAM, G6NZ

V.H.F. Time Plan

DEAR SIR,—Reading through the letters in recent issues of the BULLETIN it is obvious that much effort and thought has been directed towards increasing activity on the v.h.f. bands, the latest efforts being towards a calling frequency on the 4m band since widening the frequency allocation. As the resultant frequency grinding seems to present such a problem, may I suggest another factor which can be more easily fixed, and yet seems to have been forgotten, i.e., time.

My suggestion is therefore on all v.h.f. bands to concentrate all calling activity into four 2-3 minute periods per hour centred around the quarter hours. Several short calls followed by listen throughs (over the whole band for visiting mobiles out of zone) could be made in this time, thus reducing time wasted on lengthy CQs and even longer listening periods.

Yours faithfully,
R. TAYLOR, G3LDY

Wolverhampton.

Sea Cadet Corps

DEAR SIR,—This Sea Cadet Unit has recently acquired a fair amount of modern, working radio equipment but, as nobody among the staff is qualified to set it up and teach the boys how to operate it, I was wondering whether any of your members would be prepared to undertake this task. It would probably be necessary to spend some time in setting up the equipment, with the help of the boys, and, from then onwards, instructing them in its use about once or twice a week.

If any members are willing to help us, I shall be glad to hear from them.

Yours truly,
A. DESMOND PETTY,
Chairman.
St. Clement Danes Sea Cadet Corps.
c/o Wm. France, Fenwick & Co. Ltd.,
23 Rood Lane,
London, E.C.3.

Band Occupancy During Contests

DEAR SIR,—I am in full agreement with the main complaint in the letter by D. David Davies, G3SJQ ex-ZD8RN, published in the October edition of the BULLETIN.

There must be many hundreds of radio amateurs like myself who are ageing, and who have no interest in Contests.

The joy of operating the key is still with us; perhaps DX is not so important in our lives as putting out a clear signal together with immaculate styling. Many of us can date back our radio operating to 1919 when we were sea-going operators using the unsurpassed GPO standards of efficiency which we still attempt to carry out, together with all the rules and courtesy that go with it.

I switch on my receiver (no longer a 31.B Crystal) and the background is sufficient to warn me I have little chance of using my key.

What can be done about it I cannot suggest, but the endless contests, which I feel is a method of trying to gain just another status symbol in this rat race, is not part of my life, therefore I must choose those odd weekends when there is a slight lull wherein I can enjoy my busman's holiday.

Yours faithfully,

H. S. NAYLOR, G3AKO

ex sea-going operator 1919-1935

Castle Street, Tiverton.

High Stability Variable Frequency Oscillators

DEAR SIR,—I would like to refer to the articles on " High Stability Variable Frequency Oscillators " by Mr. Paul Harris, G3GFN, in the February and March 1964 issues of the BULLETIN.

I constructed an oscillator using the Vackar circuit but was disappointed at its performance which was marred by slight random variations in frequency and a high harmonic output. As my model was not built in accordance with Mr. Harris's very careful instructions as to layout, I decided to rebuild with fresh components and to the recommended configuration, but before doing so it occurred to me that it might be interesting to see what the effect would be of reducing the value of the grid capacitor (C2 in the diagram which is taken from the article in question).

By doing this it was thought that two advantages might be obtained:

(*a*) The grid of the valve would be effectively tapped down the tuned circuit by the potentiometer formed by C2 and C3 which should result in less drive and a reduction in harmonic output;

(*b*) The large parallel capacitance of C2 in series with C3 would no longer appear across C4 which would then require less change in capacitance for a given frequency variation.

The original values of C1, C2 and C3 in my circuit were 460 pF, 2500 pF and 460 pF respectively and the frequency 3 to 4 Mc/s.

C2 was replaced by a 25 pF air-spaced trimmer which was adjusted so that the valve (a Z77) just remained in a state of oscillation. The value required was approximately 8 pF. The frequency was higher, due to the removal of most of the effect of C3 from the tuned circuit, but I was pleased to discover that the stability was much improved and the harmonic output considerably lower than before. A rough assessment with the aid of a signal generator, at a fundamental frequency of 4 Mc/s, indicated a second harmonic of approximately 0·2 per cent of the fundamental, the third considerably below this but not accurately measurable with the means available. Difficulty was experienced in finding the fourth, while the fifth harmonic could not be detected. Previously harmonics up to the tenth had been in evidence.

Time has not permitted a more thorough investigation of the circuit with a view to ascertaining an optimum *LC* ratio, for instance, or the effect of larger capacitances at C1 and C3.

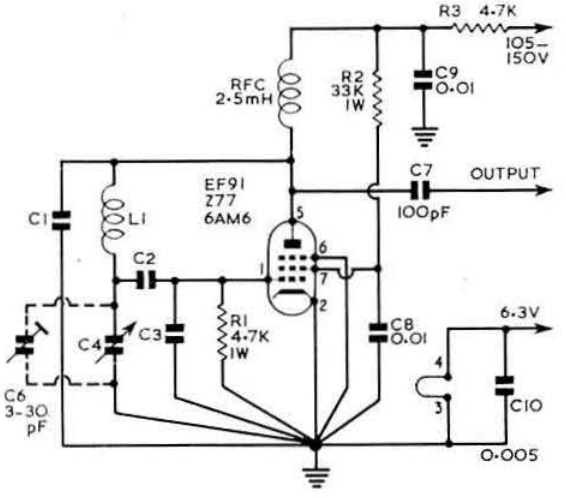
My attention has subsequently been drawn to the article by J. K. Clapp in the *Proceedings of the IRE* for August 1954 which refers, among others, to the circuit due to Jiri Vackar in " LC oscillators and their frequency stability " from the Tesla Technical Reports of December 1949. Although no values are discussed, Clapp does mention that in the Vackar circuit both the tuning and additional grid to cathode capacitances should be considerably higher than what corresponds to C2 in my diagram.

Other members interested in stable oscillators might care to try this modification and let you know their findings.

Yours faithfully,

W. H. ALLEN, G2UJ

Tunbridge Wells, Kent.



The Vackar oscillator described in the March 1964 issue of the Bulletin.

The author replies:

DEAR SIR,—I am indebted to Mr. Allen for his comments on the Vackar oscillator, which, being based on practice, are most constructive and of unusual interest.

Prior to dealing with the main point raised, may I say that my attention was first drawn to this oscillator by an article by G3BCM carried in the March, 1956 BULLETIN. In substance this article was carried forward into the Handbook, and up to the time of my own experiments, the values quoted formed the basis of those used in practical oscillators. It was my conviction that this oscillator had a superior performance to that of the Clapp—an opinion formed through exprience with both types—which led to the work which formed the basis of the articles carried in the February and March 1964 BULLETINS. I have no reason to modify this opinion.

Like Mr Allen, my attention has recently been drawn to the article by J. K. Clapp in the *Proceedings of the IRE* for August, 1954. It now seems to me that the already excellent performance of the Vackar Oscillator can be further improved by attention to the values indicated by Mr Allen and verified by him in a sample oscillator.

It is unfortunate that, when I conducted my experiments, I was unaware of this particular paper. Had this been so, then I would most certainly have undertaken investigations into the whole aspect of the grid coupling capacity along with C3 and C1. It is now apparent that further work would be well worthwhile. However, even as it stands, and with the values available to date, it is an excellent oscillator.

Like Mr Allen, I also have experienced slight random variations in frequency. In each of the two instances where this arose, it has been traced to the tuning capacitor itself, and seems to be related to the earthing of the rotor. Replacing the capacitor by a type which has earthing springs at each end removed all trace of these random variations. I used one of the " faulty " tuners in a Hartley circuit to try and prove the point to my own satisfaction. Sure enough, it too suffered the same random variations.

With regard to harmonic content, my experience has not been the same as that of Mr Allen. Using an AR88, the 2nd harmonic appeared to be 15db down, the 3rd harmonic only just detectable, and the 4th " missing."

The prime object of the articles was to draw attention to this particular oscillator. In this it seems to have succeeded, and I have been particularly gratified by those members who have taken the trouble to write and say how pleased they have been with the Vackar oscillators which they have constructed. In the same way, I feel that Mr Allen's comments are most valuable, for, in the last analysis, we are all concerned with making our variable oscillators as stable as possible.

Yours truly,

PAUL HARRIS, G3GFN

CONTEST NEWS

RESULTS — REPORTS — RULES

Low Power Field Day 1964

The Low Power Field Day, held on September 20, attracted a disappointing entry of only nine stations. The honours this year again go to a transistorized transmitter entry, that of R. J. Parsons, G3RBP, who was assisted by last year's winner, G3KLH, and BRS21008. They had over twice as many contacts and a wide margin of 52 points over the runner-up, M. Byars, G3PIF, assisted by G3OGF. This station had a lead of only three points over contest regular A. J. Gould, G3JKY, in third place.

G3RBP's transmitter had four stages, and used three 2N2887s in the p.a. to give an input of 20 watts, which, as he comments, is not really low power. His receiver was a five valve superhet and the aerial a half-wave dipole. The weight of his equipment was as follows: transmitter, 1 lb. 5 oz.; receiver, 2 lb. 9 oz.; 36 volt transmitter batteries, 7 lb. 8 oz.; receiver batteries, 1 lb. 9 oz.; aerial plus feeder, 2 lb. 4 oz., two pairs phones, 1 lb. 10 oz.; key, 2 lb. 2 oz.; and meter, 14 oz., which makes a total of 19 lb. 13 oz.

All the other competitors used 1·4 volt heater valve rigs, with 132 ft. end-fed or centre-fed aerials.

The use of transistors by G3KLH and G3RBP to obtain high power in this contest has obviously provoked some thought amongst the entrants, and G3CGD and GW3GHC have transistor gear in the offing. G8NN and G3BZM tried kite born aerials for part of the contest, but with apparently disastrous results at G3BZM/P. He comments that the answer to 15 watt transistors could well have been a really super sky-wire. On this theme, G3PIF threatens 30 watts to an 807 next time; details in 12 months time! It should perhaps be pointed out that, although it obviously helps, obtaining high power is not the only criterion for success in this event, since G3KLH was the winner for several years, prior to the use of transistors.

Position	Call-sign	Power	Contacts	Points
1	G3RBP/P	20w	65	142
2	G3PIF/P	9w	29	90
3	G3JKY/P	4w	27	87
4	G3CGD/P	1·5w	37	83
5	GW3GHC/P	1·5w	28	79
6	G3BZM/P	3w	20	75
7	G3LHJ/P	1w	21	65
8	G8NN/P	3w	13	52
9	G3GDW/P	1·2w	11	42

The contest seems to have been enjoyed by all concerned although it is a pity that activity was not higher. G3CGD suggests that more transistorized receivers and transmitter articles in the BULLETIN would boost interest. Perhaps G3RBP or G3KLH could be persuaded to divulge some of their knowledge in this way.

The following are thanked for their check logs: G3BY, G3HTI/P, G3SEN/A, GW3ROG and BRS24733.

1965 V.H.F. Listeners' Championships

The 1965 V.H.F. Listeners' Championship starts with the First 144 Mc/s Contest (C.W.) on January 31. As a result of comments received about these rules, some points need clarification, and a number of amendments made.

(i) The rules originally excluded all transmitting members from the championship, but this is unfair to a listener who may enter the event only to be disqualified when he obtains his licence later in the year. Entries will now be accepted from newly licensed members, provided the contestant was unlicensed at the time of his first entry for the championship and that no transmitter was used during any period for which he submits a log.

(ii) Since the rules were prepared there have been changes in the 1965 Contests Calendar. Logs may be submitted for any of the RSGB Contests above 30 Mc/s.

(iii) Points can only be claimed once in any log in respect of any station heard. For example, if a station is heard on c.w. and also on phone, points can only be claimed for one of these occasions (obviously the c.w.). In the case of multi-band events, separate logs are required for each band and the same station can be logged on different bands.

General Rules for RSGB Contests 1965

The following rules apply to all RSGB Contests except where modified in individual events and are to be read in conjunction with the details for each contest published in the RSGB BULLETIN.

Rule 1. **Entrants** must operate in accordance with the terms of their licences.

Rule 2. **Unlicensed Stations.** Contacts with unlicensed stations will not count for points.

Rule 3. **Contacts.** Only one contact on each band may be made with a specific station, whether fixed, portable, mobile or alternative address. Mobile stations are stations installed in motor vehicles or vessels on inland waterways and so equipped that they are capable of operation in motion without any alteration. Duplicate contacts must be logged and clearly marked as duplicates without claim for points. Cross-band contacts may not be claimed. Proof of contact may be required.

Rule 4. **Entries** must be clearly written or typed ON ONE SIDE ONLY of RSGB contest log forms or on foolscap or quarto paper and must be set out in the form prescribed in the published details for the contest concerned. The **cover sheet** of an entry must be made out in the following form:

Contest.....Date.....Claimed Score.....
Section (if any)..... Call-sign.....
Name .....
Home Address.....
.....
Address of station or Portable Location.....
(if other than home address above)
.....
QTH as transmitted .....
National Grid Six Figure Reference, QRA Locator County Code Letters
or other co-ordinates (see contest details).....
Transmitter(s).....Input Power.....
Receiver(s) .....
Aerial(s) .....

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

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

Failure to complete the cover sheet or sign the declaration may involve disqualification of the entry.

Rule 5. **Entries.** All entries become the property of the Radio Society of Great Britain. In the event of any dispute the ruling of the Council of the RSGB shall be final.

Rule 6. **Multiple Operator Entries.** Unless otherwise stated, single operator entries only will be accepted. A single operator station is one manned by an individual operator who receives no assistance from other persons during the contest periods. A multi-operator station is one which does not conform to this definition. In those contests where multiple operator entries are allowed, such entries will only be accepted provided that:

(*a*) The call-sign of the operator concerned is indicated for each contact.
(*b*) The declaration is signed by only one operator who will be regarded as the entrant.
(*c*) The names and call-signs of all operators are listed on the cover sheet.

Rule 7. **Portable stations** must operate from the same site for the duration of a contest and may not be located in a permanent building. Power must not be derived directly from public or private supply mains. No apparatus may be erected on the site prior to the day of the event.

Rule 8. The details relating to specific contests published in the RSGB BULLETIN shall be regarded together with these general rules as the rules of the contest.

* * *

Printed log sheets and cover sheets are available from RSGB Headquarters on request.

List of United Kingdom Counties for RSGB Contests

County Code Letters	County	Code Letters of Adjacent Counties
AD	Alderney	
AG	Anglesey	CV
AL	Argyllshire	AY, BU, DU, IS, PH, RW
AM	Antrim	DW, LY
AN	Aberdeen	AS, BF, IS, KE, PH
AR	Armagh	DW, TE
AS	Angus	AN, KE, PH
AY	Ayrshire	AL, BU, DF, KB, LK, RW, WG
BD	Bedfordshire	BS, CE, HF, HN, NR
BE	Berkshire	BS, GR, HE, OX, SY, WE
BF	Banff	AN, IS, MY
BR	Brecknock	CA, CR, GN, HD, MH, RN
BS	Buckingham	BD, BE, HF, MX, NR, OX, SY
BU	Bute	AL, AY
BW	Berwick	EL, MN, ND, RH
CA	Cardigan	BR, CR, MG, MR, PK, RN
CD	Cumberland	DF, DH, LE, ND, RH, WD
CE	Cambridge	BD, EX, HF, HN, LN, NK, NR, SF
CH	Cheshire	DB, DY, FT, LE, SD, SE, YS
CL	Cornwall	DN
CN	Clackmannan	FE, KS, PH, SG
CR	Carmarthen	BR, CA, GN, PK
CT	Caithness	SU
CV	Caernarvon	AG, DB, MR
DB	Denbighshire	CH, CV, FT, MG, MR, SE
DF	Dumfries	AY, CD, KB, LK, PB, RH, SK
DH	Durham	CD, ND, WD, YS
DN	Devon	CL, DT, ST
DT	Dorset	DN, HE, ST, WE
DU	Dunbarton	AL, LK, PH, RW, SG
DW	Down	AM, AR
DY	Derby	CH, LR, NM, SD, YS
EL	East Lothian	BW, MN
EX	Essex	CE, HF, KT, LD, MX, SF
FE	Fife	CN, KS, PH
FH	Fermanagh	TE
FT	Flintshire	CH, DB, SE
GN	Glamorgan	BR, CR, MH
GR	Gloucester	BE, HD, MH, OX, ST, WE, WK, WR
GY	Guernsey	
HD	Hereford	BR, GR, MH, SE, WR, RN
HE	Hampshire	BE, DT, SX, SY, WE
HF	Hertford	BD, BS, CE, EX, LD, MX
HN	Huntingdon	BD, CE, NR
IM	Isle of Man	
IS	Inverness	AL, AN, BF, MY, NN, PH, RY
JY	Jersey	
KB	Kirkcudbright	AY, DF, WG
KE	Kincardine	AN, AS
KS	Kinross	CN, FE, PH
KT	Kent	EX, LD, SX, SY

County Code Letters	County	Code Letters of Adjacent Counties
LD	London (Postal District)	EX, HF, KT, MX, SY
LE	Lancashire	CD, CH, WD, YS
LK	Lanark	AY, DF, DU, MN, PB, RW, SG, WN
LN	Lincoln	CE, LR, NK, NM, NR, RD, YS
LR	Leicester	DY, LN, NM, NR, RD, SD, WK
LY	Londonderry	AM, TE
MG	Montgomery	CA, DB, MR, RN, SE
MH	Monmouth	BR, GN, GR, HD
MN	Midlothian	BW, EL, LK, PB, RH, SK, WN
MR	Merioneth	CA, CV, DB, MG
MX	Middlesex	BS, EX, HF, LD, SY
MY	Moray	BF, IS, NN
ND	Northumberland	BW, CD, DH, RH
NK	Norfolk	CE, LN, SF
NM	Nottingham	DY, LN, LR, YS
NN	Nairn	IS, MY
NR	Northants	BD, BS, CE, HN, LN, LR, OX, RD, WK
OX	Oxford	BE, BS, GR, NR, WK
OY	Orkney	
PB	Peebles	DF, LK, MN, SK
PH	Perth	AL, AN, AS, CN, DU, FE, IS, KS, SG
PK	Pembroke	CA, CR
RD	Rutland	LN, LR, NR
RH	Roxburgh	BW, CD, DF, MN, ND, SK
RN	Radnor	BR, CA, HD, MG, SE
RW	Renfrew	AL, AY, DU, LK
RY	Ross & Cromarty	IS, SU
SD	Stafford	CH, DY, LR, SE, WK, WR
SE	Shropshire	CH, DB, FT, HD, MG, RN, SD, WR
SF	Suffolk	CE, EX, NK
SG	Stirling	CN, DU, LK, PH, WN
SK	Selkirk	DF, MN, PB, RH
SL	Shetland	
SR	Sark	
ST	Somerset	DN, DT, GR, WE
SU	Sutherland	CT, RY
SX	Sussex	HE, KT, SY
SY	Surrey	BE, BS, HE, KT, LD, MX, SX
TE	Tyrone	AR, FH, LY
WD	Westmorland	CD, DH, LE, YS
WE	Wiltshire	BE, DT, GR, HE, ST
WG	Wigtown	AY, KB
WK	Warwick	GR, LR, NR, OX, SD, WR
WN	West Lothian	LK, MN, SG
WR	Worcester	GR, HD, SD, SE, WK
YS	Yorkshire	CH, DH, DY, LE, LN, NM, WD

Can You Help?

● D. M. Howarth, A4254, 92 Waddington Road, Bolton, Lancs., who wishes to borrow or purchase the circuits and manuals for the Pye and Philips PCR3 communications receivers, for a 240 volt d.c. supply? He would also like to hear from anyone who has used the Eddystone EA12 receiver.

● G. Stokes, BRS21136, "The Cottage," Week Green, Week St. Mary, Holsworthy, Devon, who requires information or the loan of the manual for the Army receiver 109A?

● J. Morris-Casey, G8JC, 4 Kennels Road, Fernhill Heath, Worcester, who wishes to borrow the manual for the R103A (ZA11053) receiver?

● W. E. Gates, G3ENB, 12 Mount Avenue, Wrenthorpe, Wakefield, Yorkshire, who wishes to obtain the circuits or manual for the ex-RAF equipment TR1986?

● J. H. Gooday, BRS24769, 10 Waveney Drive, Chelmsford, Essex, who requires the loan of the manual for the crystal calibrator type 10?

● G. Wylie, A3699, 82 Glenpatrick Road, Elderslie, Renfrewshire, Scotland, who would like to buy or borrow the manual for the Q Max Q5/10 receiver?

● R. Hart, G3SHM, 2 Braddon Avenue, Urmston, Nr. Manchester, Lancs., who wishes to obtain information on the Frequency Adaptor, Range No. IT. ZA28638, which covers, in three switched ranges, 50 to 600 Mc/s?

● J. M. Cann, GM3LOM, 10 Southfield Crescent, Coatbridge, who requires the circuit of the "Starlite" two transistor reflex receiver manufactured by the Boyd Co. of Japan?

BOUND

RSGB BULLETIN

COPIES

A limited number of bound copies of Volume 40 of the RSGB BULLETIN will be available to members shortly. The price, including postage and packing, will be 25/-. In view of the limited number available, all orders will be dealt with in strict rotation.

Members who will require bound copies of Volume 41 (1965) are requested to place orders immediately.

CLUBROOM

A Monthly Survey of Group and Club Activities

The **Ainsdale Radio Club** will be holding its AGM on January 6, and at subsequent meetings lectures on aerials, TVI, and aerial coupling and tuning will be heard. Several other activities are planned, including a club social event, and mystery mobile tour which will probably be a joint effort with several other local clubs, and portable tests for spring Sundays.

Barnsley and District ARC. On November 19, G. Billington, G3EAE, gave members a talk on a fully transistorized Top Band transmitter, and later demonstrated that it did work. There was a hectic debate at the following meeting, when the relative merits of valves, transistors and tunnel diodes were argued out. The annual dinner will be held on January 16 at the King George Hotel, Barnsley. Honorary Secretary: J. A. Ward, G4JJ, 44 Northgate, Barnsley, Yorks.

Basingstoke ARC. The next monthly meeting will be held in the Immanuel Hall, Wote Street, Basingstoke, at 7 p.m. on January 9. Mr. P. Horne, G3JRH, will give a talk on oscilloscopes and their uses.

Bedford and District ARC. This newly formed club now boasts 25 members; not a bad start. Morse classes are a feature of the meetings, with, of course, the normal club activities. Plans for the New Year include lectures on a home brewed transmitter and transistors, a film show, the construction of club apparatus, and a visit to a local electronics firm. Members even anticipate a two-station entry in NFD this year.

Birmingham University RS. At a recent Special General Meeting, the following members were elected to the committee: M. F. Docker, G3OOW, Chairman; B. Rose, c/o The Union, The University, Edgbaston, Birmingham 15, Honorary Secretary; S. W. Walbridge, G3PQN, Treasurer. The club is particularly interested in schedules with other college and university stations.

The Lothians Radio Society stand at the Hobbies Exhibition in Edinburgh. GM3BDA is standing in the background, and GM3AKM and Jim Stark are at the controls of the h.f. station. The society's secretary comments that the really worthwhile aspect of this venture was that members of the club were doing something together, which undoubtedly fosters the corporate spirit and makes membership of a club enjoyable. He recommends this kind of effort to any club which is finding it hard to attract and keep members.

but so far the only other participant is the Bristol University Radio Society which maintains a sked on Wednesday afternoons. There must be plenty of other similar clubs, so, secretaries, how about getting in touch with Mr. Rose to arrange some skeds. The activity of G3IUB, the society's station, is at present limited to the h.f. bands, but equipment for 2m is under construction.

Cambridge and District ARC. The most important venture since the last report has been the production of an ambitious club magazine entitled the *Cambeam*, which we understand has earned favourable comment all round; and no wonder, it is quite spectacular, especially with its bound-in, illustrated feature on the amateur television station G3NOX/T. Highlights of activities during November were an amateur TV demonstration, with G3NOX/T and G6PGF/T at the transmitting end, and G5BQ and G3IIT at the receiving station. Interest in amateur TV is growing rapidly in the Cambridge area, and the regular transmissions from G3NOX/T and G6PFG/T, together with expert advice, are very much appreciated. Members had a most instructive and pleasant evening recently when they visited the local headquarters of British Relay.

Chiltern ARC. This club meets on the last Thursday in each month at the British Legion Club, High Wycombe, and technical lectures are given every two months. A project is under way for a 1965 club station. Honorary Secretary: G. Lacey, BRS25784, Moat Lane, Prestwood, Gt. Missenden, Bucks.

Cornish RAC. Thirty-one members attended the December meeting, at which C. Bowden, G3OCB, gave another talk in his series on receivers. A visit to Lands End Coastal Radio station is being arranged for early January, and a new series of lectures is being prepared for the coming months. Meetings are held on the first Thursday in each month at the SWEB Recreation Room, Poole, Cambourne. Honorary Secretary: W. J. Gilbert, 7 Poltair Road, Penryn, Cornwall.

A new club called the **Crewe and District RSGB Group** has been formed, and the nomination of Mr. B. Randell, G3ALE, as area representative has been approved.

East London Group. At the November meeting, R. F. Stevens, G2BVN (compiler of *The Month on the Air*), gave a talk entitled "Why S.S.B.?" His approach was novel in that he hardly mentioned any of the normal arguments, but instead he focused attention on the international aspect. He emphasized amateurs' need to keep abreast, if not ahead, of the current trends, so that at future conferences when frequency allocations are being reviewed, it can be shown that the amateur is making maximum use of his meagre allotments, and so present a strong case for their retention.

Grafton RS. At the recent AGM, society members unanimously agreed to appoint Bob Morgan, G3KGC, as Vice-President. Recent meetings have included a series of interesting talks given by visiting amateurs including G2MQ (Valve Design), G2UV (Radio in the '20s) and a very welcome return visit by Arthur Milne, G2MI, who talked about the RSGB QSL Bureau. The new licence was explained in detail by visitors from the GPO. A programme of practical work on the station rig was begun some while ago, and has restricted other activities; this explains the scarcity of reports in this column about the society. However, visiting amateurs and SWLs are always welcome to take part in the meetings on Friday evenings. The first meeting after the Christmas recess will be on January 8 at 7.30 p.m., in Room 35 on the top floor of Montem School, Hornsey Road, London, N.7. Honorary Secretary: A. E. Bristow, BRS25779, 37 Tyndale Mansions, Upper Street, London, N.1.

Lothians RS. Members had a very enjoyable November, particularly during the Hobbies Exhibition at the Waverley Market, when their stand attracted a lot of attention and a number of new members. The visitors' night on November 26 brought a large crowd from neighbouring clubs, and a good time was had by all.

Keith Hallam, G3KKB, a blind operator and a member of the Midland Amateur Radio Society, with his bride, formerly Mary Hannon. The wedding was held at West Hartlepool on October 10, 1964.
(Photo by G6SN)

Loughborough ARC. Morse classes are being held every Monday at 7.30 p.m., but so far only five people are making use of this facility, and the organizers will therefore welcome greater support. The instructor is a professional Morse teacher. Further details are available from the Honorary Secretary: G. P. Bateman, G3LCG, Bleach Yard, Wards End, Loughborough, Leics.

Loughton and District RS. The past year has been one of the busiest periods in the society's short history, with a season of interesting lectures, participation in five contests, three field days, two exhibitions, and a trial mobile rally. The Television Viewers Council CCTV experiment, which was reported in *Clubroom* in December, also fully employed the time, interest and enthusiasm of members. Meetings in January will include a talk by Mr. Warriner on sound and television, and a re-statement of operating procedure by Martin Railton, G8AB. Honorary Secretary: A. W. Sheppard, G3JBS, 11 Barfields, Loughton, Essex.

Mid-Warwickshire ARS. The New Year activities will begin on Monday, January 11, at 7.45 p.m., at Harrington House, with an open meeting. The meeting on January 25 will be a film show, followed by the AGM on February 8.

Northern Heights ARS. With the permission of W1BB, his illustrated recorded lecture on "Top Band DXing" has been duplicated, and the copy is available to any other club that would like to borrow it, provided that the club concerned agrees to paying all postal registration costs. Recent events have included the Mullard Film show in Bradford, and talks by three young members about their activities and how they were introduced to Amateur Radio. A fortnight later, Mr. L. M. Dougherty, B.Sc., FRAS, assisted by Mrs. M. I. Shaw, G3OMM, talked about transmitter alignment. On January 20 there will be a ragchew, on February 3 a film show, and on February 10 there will be a visit to Bradford GPO.

Peterborough ARS. In December, members of the March ARS joined Peterborough in a discussion on RAEN, after Leslie Critchley, G3EEL, had spoken on the aims and objects of the network. "Operation Eastfields" showed the value of RAEN, the mobile outstations being manned by Martin Vaughan, G3RLV, David Newbold, G3TSN, and Michael Grierson, G3TSO. G3EEL was assisted at the HQ station by Henry Neale, G3REH. Honorary Secretary: D. Byrne, G3KPO, Jersey House, Eye, Peterborough.

Reigate ATS. A full attendance is hoped for at the sixth AGM which will be held at 7.30 p.m. on January 16 at the George and Dragon, Cromwell Road, Redhill. The Annual Dinner will follow on February 12 at the Reigate Hill Hotel, and tickets are available price 25s. each. Mr. Thom, the Secretary, notes that it is not always easy to find the closing date for *Clubroom* copy, and suggests that perhaps this could be included somewhere in the column. We normally try to include the large announcement somewhere in the issue, but the closing date for copy is always printed at the foot of the contents page.

Royal Naval ARS. Members of the HQ club station will be holding an informal meeting at HMS *Mercury*, Leydene, Petersfield, Hants., at 19.30 on Thursday, January 28. It is hoped that there will be a good attendance of members of other local radio groups. Talk-in facilities on 70·26 Mc/s from G3BZU will be available, and any amateurs wanting talk-in facilities on the h.f. bands are requested to notify G3BZU.

Surrey Radio Contact Club. Members, and visitors, had a full evening on December 8, when there was a lecture by Tony Naylor G3GHI, on current progress with *Oscar III*, and how to track it; a talk on poor man's mobile; an analysis of propagation conditions during V.H.F. NFD, and a film show. It was unfortunate that Mr. Pawling of Mullard Ltd., who was to have given a lecture on modern electronic components, was unable to be present owing to illness, but the club expects to be able to rope him in to giving his lecture before long. Honorary Secretary: S. A. Morley, G3FWR, 22 Old Farleigh Road, Selsdon, South Croydon, Surrey.

University College of North Wales ARS. When the special event station GB2SFW was run during the University Science Festival week in the beginning of December, there were some rather disappointing results. The long wire aerial system left much to be desired, and operation was restricted for two days when two Z match units failed in succession. However, the station was a source of much interest to all members of the university. An amateur TV station, GW3JGA/T, located in the Electronic Engineering Department, radiated excellent pictures to other parts of the university.

Yet another new society, the **West Park Grammar School Radio and Electronics Society (St. Helens).** This group consists of 15 interested members, all actively engaged in their hobby, and is divided into two sections: a constructional group, and a general and amateur radio group. The constructional group is at present concerned with making pieces of test equipment, including an oscilloscope double beam simulator. Printed circuits are also in the offing. The latter group concerns itself with virtually everything except construction, e.g., electronic music, Morse practice, and radio astronomy. Amongst the proposed activities are a visit to a local Police radio relay station, and the radio laboratory (G3PII) at St. Helen's technical college. Any offers of equipment for a proposed junk sale will be greatly appreciated, and anyone who has any suitable bits and pieces is welcome to get in touch with the Honorary Secretary, P. Gaskell, A4035, 131 Granfield Road, St. Helens, Lancs.

Wimbledon and District RS. At the November meeting, John Whitney, G3MFB, gave his second talk on radar. He spoke without the aid of notes, and reduced a complex subject to simple terms. The society would like to thank him for his services, and congratulate him on the way he tackled the lectures. Honorary Secretary: E. N. Hurle, 156 Monkleigh Road, Morden, Surrey.

Worcester and District ARC. We are glad to see that the club is now settled in its new headquarters after considerable work during the summer. On December 12, the club treasurer, B. A. Jones, gave a talk on landline operation of teleprinters and facsimile apparatus. On January 30 there will be a junk sale, and in addition to the normal meetings held on Saturdays, meetings are also held on alternate Wednesdays at 7.30 p.m. in the club HQ at 35 Perdiswell Park, Droitwich Road, Worcester.

Items of news for the February issue should reach RSGB Headquarters not later than January 8.

Forthcoming Events

Details for inclusion in this feature should be sent to the appropriate Regional Representatives by the first of the month preceding publication. A.R.s and club secretaries are reminded that the information submitted must include the date, time and venue of the meeting and, whenever possible, details of the lecture or other event being arranged. Regional Representatives are requested to set out the copy, preferably typed double spaced, in the style used below. Standing instructions for more than three months ahead cannot be accepted.

REGION 1

Ainsdale (ARS).—January 6 (AGM), January 20, February 3, 8 p.m., 77 Clifton Road, Southport.
Blackburn.—Fridays, 8 p.m., West View Hotel, Revidge Road.
Blackpool (B & FARS).—January 4 (Open Night), January 11 (Tape "Electronic Music and Musique Concrete"), January 18 (Open Night), January 25 ("Receiver Demonstration," by H. Fenton, G8GG), February 1 (Open Night), 8 p.m., Pontins Holiday Camp, Squires Gate.
Bury (BRS).—January 12, 8 p.m., Knowsley Hotel, Kay Gardens.
Chester.—Tuesdays, 8 p.m., YMCA, except January 5.
Eccles (E & DAC).—No meetings at present owing to having to vacate Clubroom.
Liverpool (L & DARS).—Tuesdays, 8 p.m., Conservative Association Rooms, Church Road, Wavertree.
Macclesfield.—January 5, 19, February 2, The George Hotel, Jordongate.
Manchester (M & DARS).—Wednesdays, 7.30 p.m., 203 Droylsden Road, Newton Heath, Manchester 10.
(SMRC).—Fridays, 7.45 p.m., Rackhouse Community Centre, Daine Avenue, Northenden.
Morecambe.—January 6, February 3, 125 Regent Road.
Preston.—January 12, 26, (All meetings start with a Morse practice at 7.30 p.m.), St. Paul's School, Pole Street.
Southport (SRS).—Wednesdays, 8.30 p.m., Sea Cadets Camp, The Esplanade.
Stockport.—January 13, 27, The Blossoms Hotel, Buxton Road, Stockport.
Wirral.—January 6, 20, February 3, 7.45 p.m., Harding House, Park Road West, Claughton, Birkenhead.

REGION 2

Bradford.—February 2 ("Mobile Gimmicks", by D. Millard, G3OGV), February 16, 7.30 p.m., 66 Little Horton Lane.
Catterick.—Tuesdays and Thurdays, 7.30 p.m., Club Room, Vimy Road.
Northern Heights.—February 3 (Film Show), February 10 (Visit to Bradford GPO), February 17 (Ragchew), 7.30 p.m., Sportsman Inn, Ogden.
Scarborough.—Thursdays, 7.30 p.m., rear of 3 Trinity Road.
Spen Valley.—February 4 (Model Control), February 18 ("Radio Active Isotopes in Every Day Life"), 7.30 p.m., Heckmondwike Grammar School.

REGION 3

Birmingham (MARS).—January 19, 7.30 p.m., Midland Institute, Paradise Street, Birmingham.
(Slade).—January 8, 22, 7 45 p.m., The Church House, High Street, Erdington.
Coventry (CARS).—January 11 (Club Transmitter Construction), January 18 (Frequency Measurement), January 25 (For the SWL), 8 p.m., Westfield House, Radford Road, Coventry.

LOOKING AHEAD

January 14.—Social Evening at Kingsley Hotel, London. For details, see page 41.
April 10.—International V.H.F. Convention.
May 30, 1965.—RNARS Mobile Rally at RN Signal School, HMS Mercury.
June 27.—Longleat Mobile Rally.
July 10-11—Oxford and District ARS—10th Anniversary Mobile Rally.
October 2.—N.W. V.H.F. Convention.
October 16-17—Eighth Jamboree-on-the-Air.

Leamington Spa (MWARS).—January 11 (Open Meeting), January 25 (Film Show by Mullard Ltd.), February 8 (AGM), 7.45 p.m., Civil Defence Training School, Harrington House, Newbold Terrace, Leamington Spa.
Redditch (EWARG).—January 14, 7.30 p.m., Old People's Centre, Park Road, Redditch.
Stourbridge (S & DARS).—January 12 ("Transistorized Equipment," by E. L. Gardiner, G6GR), February 2 ("V.H.F. Techniques," by R. Thomas, G3KMT), 7.45 p.m., Foley College, Stourbridge.
Stratford-upon-Avon (S-u-AARC).—January 8 (Tape Lecture), other meetings on Fridays, Mason's Arms, Sanctus Road, Stratford-on-Avon.
Wolverhampton (WARS).—January 11 ("Ross Spur Motorway," and "The Moving Spirit"—Mobile), 8 p.m., Neachells Cottage, Stockwell Road, Tettenhall.

REGION 4

Burton on Trent (B-o-TARS).— January 13 (Ladies' Night), 7.30 p.m., Club Room, Stapenhill Institute, Burton-on-Trent.
Derby (D & DARS).—January 6 (Surplus Sale), January 13 ("Digital Counters, Part I," by D. Stanners, G3HEJ), January 20 ("Digital Counters, Part II," by D. Stanners, G3HEJ), January 27 (Open Evening—Committee Meeting), February 3 (AGM), 7.30 p.m., Room 4, 119 Green Lane, Derby.
Heanor (H & DARS).—January 12 (Social Evening), January 19 (Surplus Sale), January 26 (Film Show), February 2 (AGM), 7.30 p.m., Room 14, Heanor Technical College, Ilkeston Road, Heanor, Derbyshire.
Leicester (LRS).—Mondays, 7.30 p.m., Sundays, 10.30 a.m., Club Room, Old Hall Farm, Braunstone Lane, Leicester.
Lincoln (ARC).—First Wednesday in each month, 7.30 p.m., Lincoln Technical College, Cathedral Street, Lincoln.
Loughborough (ARC).—January 8 (Film Show by G3FYV), January 9 (Annual Dinner), January 15 ("Two Metres" by G3BNL), January 22 (NFD Discussion), January 29 (Tape Lecture "DXpedition to St. Pierre and Miquelon," illustrated with slides), 7.30 p.m., Club Room, Bleach Yard, Wards End, Loughborough.
Mansfield (MRS).—Fridays, 7.30 p.m., ATC Headquarters, Sutton Road, Mansfield.
Melton Mowbray (ARS).—January 18 ("Flat Line Equipment for 23cm," by J. L. Warrington, G2FNV), 7.30 p.m., St. John Ambulance Hall, Asfordby Hill, Melton Mowbray.
Nottingham (ARCN).—Tuesdays, Thursdays, Room 3, Sherwood Community Centre, Woodthorpe House, Sherwood, Nottingham.
Northampton (NSWC).—Thursdays, 7 p.m., Allen's Pram Works, 8 Duke Street, Northampton.
Peterborough (PARS).—January 8, February 5, 7.30 p.m., The Lecture Hall, Electronics Block, Peterborough Technical College, Eastfield Road, Peterborough. Other Fridays, 7.30 p.m., The Old Mill Clubroom (behind the Peacock Inn), London Road, Peterborough.
Worksop (NNARS).—Tuesdays (RAE Classes), Thursdays (Lectures), 7.30 p.m., Club Rooms, 13 Gateford Road, Worksop, Notts.

REGION 5

Bedford (B & DARC).—January 12 (Morse Training), January 28 (Morse Training), Harpur Secondary Modern School, Horne Lane, Bedford.
Cambridge (C & DARC).—January 8 (Informal), January 15 (Arranged by G3NOX/T), January 22 (Annual Dinner at University Arms Hotel. Guest of Honour: President of RSGB), January 29 (Activity Evening), February 5 (Junk Sale), 7.30 p.m., Club Headquarters, Corporation Yard Victoria Road, Cambridge.
Cambridge University (CUWS).—Tuesdays during Term, 8.15 p.m., Psychology Department, Downing Site, Downing Street.
Luton (L & DARS).—Tuesdays, 8 p.m., ATC Headquarters, Crescent Road, Luton, Beds.
March (M & DRAS).—Tuesdays, 7.30 p.m., rear of Police Headquarters, High Street, March, Cambs.
Royston (R & DARC).—Wednesdays, 8 p.m., Manor House Social Club, Melbourn Street, Royston, Herts.
Shefford (S & DARS).—Thursdays, 7.45 p.m., Town Recreation Centre, Hitchin Road, Shefford, Beds.

REGION 6

Cheltenham.—First Thursday in each month, 8 p.m., Great Western Hotel, Clarence Street, Cheltenham.
Oxford (O & DARS).—Second and Fourth Wednesdays in each month, 7.30 p.m., Cherwell Hotel, Water Eaton Road, N. Oxford.

REGION 7

Acton, Brentford & Chiswick (ABCRC).—January 12, 7.30 p.m., AEU Club, 66 High Road, Chiswick.
Ashford (Middx.) Echelford ARS.—January 27, 7.30 p.m., Ashford Grammar School.
Bexley Heath (NKRS).— January 14, 28, 7.30 p.m., Congregational Hall, Chapel Road, Bexley Heath.
Barnet (BRC).—January 26, 8 p.m., Red Lion Hotel, Barnet.
Chingford (Group).—January 8. Details from the Hon. Secretary, Loughton 2397. January 29, at G3FDS.
Chingford (SRC).—Fridays (except first), 8 p.m., Friday Hill House, Simmons Lane.
Croydon (SRCC).—January 12, 7.30 p.m., Blacksmiths Arms, South End, Croydon.
Dorking (D & DRS).—January 12 (Informal), 8 p.m., the Wheatsheaf, Dorking.
East Ham.—Tuesdays fortnightly, 7.30 p.m., 12 Leigh High Road, East Ham
East London District.—January 17 (Lecture by Mr Smith of the GPO on "GPO and the Amateur"), 3 p.m., Lambourne Rooms, Ilford Town Hall.
East Molesey (TVARTS).—January 6, at New Meeting Place, Prince of Wales, East Molesey.
Edgware & Hendon (EARDS).—January 11 (AGM), 8 p.m., January 25 (Film Show), 8 p.m., John Keble Hall, Church Close, Deans Lane, Edgware.
Enfield.—January 21, 7.30 p.m., George Spicer School, Southbury Road, Enfield.
Gravesend (GRS).—January 20, 7.30 p.m., RAFTA Club, 17 Overcliffe, Gravesend.
Guildford (G & DRS).—January 18, 8 p.m., Guildford Model Engineering Society Hall, Stoke Park.
Harlow (DRS).—Tuesdays, 7.30 p.m., rear of 11 High Street.
Harrow (RSH).—Fridays, 8 p.m., Roxeth Manor County School, Eastcote Lane, Harrow.
Holloway (GRS).—Mondays and Wednesdays (RAE and Morse), 7 p.m., Fridays (Club), 7.30 p.m., Montem School, London, N.7.
Hounslow (HADRS).—January 11, 25, Canteen, Mogden Main Drainage Dept., Mogden Works, Isleworth.
Ilford.—Thursdays, 8 p.m., 579 High Road, Ilford (Nr. Seven Kings Stn.).
Kingston.—December 10, 8 p.m., YMCA, Eden Street, Kingston. Fridays (Weekly Morse Classes), 2 Sunray Avenue, Tolworth.
Leyton & Walthamstow.—January 26, 7.30 p.m., Leyton Senior Institute, Essex Road, London, E.10.
Loughton.—January 8, 7.30 p.m., Loughton Hall (Nr. Debden Stn.).
Mitcham (M & DRS).—December 11, 7 p.m., "The Cannons," Madeira Road, Mitcham.

New Cross (CARS).—Wednesdays & Fridays, 8 p.m., 225 New Cross Road, London, S.E.14.
Norwood & South London (CP & DRS).—January 16, CD Training Centre, Catford, London, S.E.6.
Paddington (P & DARS).—Wednesdays, 7.30 p.m., Beauchamp Lodge, 2 Warwick Crescent, London, W.2.
Purley (P & DRC).—January 15, 8 p.m., Railwaymen's Hall (Side Entrance), Whytecliffe Road, Purley.
Reigate (RATS).—January 16, 7.30 p.m., Constructional Contest at George & Dragon, Cromwell Road, Redhill.
Romford (R & DARS).—Tuesdays, 8.15 p.m., RAFTA House, 18 Carlton Road, Romford.
Scout ARS.—January 21, 7.15 p.m., Baden Powell House, Queens Gate, South Kensington.
Sidcup (CVRS).—January 7, 7.30 p.m., Congregational Church Hall, Court Road, Eltham.
Slough (SARS).—First Wednesday in each month, 8 p.m., United Services Club, Wellington Street, Slough.
Southgate & District.—January 14, 7.30 p.m., Atlasta Lodge, Tottenhall Road, Palmers Green, London, N.13.
St. Albans (Verulam ARC).—January 20, 8 p.m., Hedley Road.
Sutton & Cheam (SCRS).—January 20, 8 p.m., The Harrow Inn, High Street, Cheam.
Uxbridge.—January 18, 8 p.m., Railway Arms, Vine Street.
Welwyn Garden City.—January 14. Tour of the Environmental Test Laboratory by L. Salter, Engineer-in-Charge, at Murphy Radio, Bessemer Road.
Wimbledon (W & DRS).—January 8, 8 p.m., Community Centre, St. Georges Road, Wimbledon, London, S.W.19.

REGION 8

Worthing (W & DARC).—Second Monday in each month, 7.30 p.m., Adult Education Centre, Union Place, Worthing.

REGION 9

Bath.—January 15, 7.30 p.m., Room 248, Fourth Floor, Main Building, Bath Technical College.
Bristol.—January 9, 7.30 p.m., Annual Dinner, Grand Spa Hotel, Clifton, Bristol 8. January 22, 7.15 p.m., Small Physics Theatre, Royal Fort, Bristol University, Woodland Road, Bristol 8.
Burnham-on-Sea (B-o-SARS).—Second Tuesday in each month, 8 p.m., Crown Hotel, Oxford Street, Burnham-on-Sea.
Camborne (CRAC).—First Thursday in each month, Staff Recreation Hall, SWEB Headquarters Pool, near Camborne.
Exeter.—First Tuesday in each month, 7.30 p.m., George and Dragon Inn, Blackboy Road, Exeter.
Plymouth (PRC).—Tuesdays, 7.30 p.m., Virginia House, Bretonside, Plymouth.
South Dorset (SDRS).—First Friday in each month, 7.30 p.m., Labour Rooms, West Walks, Dorchester.
Torquay (TARS).—Last Saturday in each month, Club HQ, Belgrave Road, Torquay.
Weston-super-Mare.—First Tuesday in each month, 7.15 p.m., Technical College, Lower Church Road.
Yeovil (YARC).—Wednesdays, 7.30 p.m., Park Lodge, The Park, Yeovil.

REGION 10

Cardiff.—January 11 (" Simple Receivers," by F. J. Church, GW3HCH), 7.30 p.m., TA Centre, Park Street, Cardiff.
Port Talbot.—January 12 (Lecture on " RAEN "), Workmen's Institute, 8-10 Jersey Street, Velindre, Port Talbot.

REGION 11

Bangor (UCNWARS).—Meetings fortnightly. Details from the Honorary Secretary, c/o The Department of Electronic Engineering, University College of North Wales, Dean Street, Bangor.
Llandudno (CVARC).—January 14 (Junk Sale), January 28 (" Receivers," talk and demonstration by L. P. Jones, GW3GWX), 7.30 p.m., Cross Keys, Madoc Street, Llandudno.
Prestatyn (FRS).—January 12 (RAE Discussion), January 26 (AGM), 8 p.m., Railway Hotel, Prestatyn.

REGION 13

Edinburgh (LRS).—January 14 (" All Nautical Night," by Alf Coutts, GM3KPD), January 28 (TVI), 7.30 p.m., YMCA, South St. Andrew Street, Edinburgh.

REGION 14

Glasgow.—First and third Wednesdays in each month, Christian Institute, 70 Bothwell Street, Glasgow, C.2.

REGION 16

Basildon (BDARS).—January 18 (" The Advantage of S.S.B., " Talk and Demonstration by A. W. Thomas, G3ORT), February 2, Social Evening at the Bullseye. Details from G3IJB.
Chelmsford (CARS).—February 2 (" Lasers ", Talk by Jan Turner, G3DGN), 7.30 p.m., Marconi College, Arbour Lane, Chelmsford.
Great Yarmouth (GYRC).—Fridays, 7.30 p.m., The Manager's Office, The Old Power Station, South Quay, Swanston's Road, Great Yarmouth. Details from G3HPR.
Southend (SDARS).—January 15 (AGM), Executives' Canteen, E. K. Cole Ltd., Priory Crescent, Southend-on-Sea.

REGION 17

Portsmouth (PDRS).—Wednesdays, 7.30 p.m., Twyford Avenue Community Centre.
Southampton.—January 9 (Annual Film Show), 7 p.m., Engineering Lecture Theatre, Lanchester Building, Southampton University.

LONDON MEMBERS' LUNCHEON CLUB

will meet at the White Hall Hotel, Bloomsbury Square, London, W.C.1
at 12.30 p.m. on Fridays, January 15, and February 19, 1965.

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

NEW BOOKS

GUIDE TO BROADCASTING STATIONS, 14th edition. By the staff of *Wireless World*. Published by Iliffe Books Ltd. 127 pages. 7¼ in. × 4¾ in. Price 5s. net (by post from RSGB Publications 5s. 6d.)

The information given in this 14th edition of *Guide to Broadcasting Stations* has been completely revised and brought up to date. All authorized long- and medium-wave stations operating in the European Broadcasting Area, which includes the western part of the USSR and territories bordering the Mediterranean Sea, are listed both in order of frequency and geographically. The details have been checked against the latest information available from the European Broadcasting Union.

More than two-thirds of this edition is devoted to details of the world's short-wave broadcasting stations. There are nearly 4,000 entries in the list giving frequencies, wavelengths and power of the stations operating in the short-wave bands, for all the frequencies that have been used, or have been notified for use, at all seasons of the year, have been included. Stations are also listed geographically.

A map of the Broadcasting Regions and a list showing the international allocation of call-signs are included.

SIMPLIFIED MODERN FILTER DESIGN. By Phillip R. Geffe. Published by Iliffe Books Ltd., November 19, 1964. 182 pages, including 206 diagrams in the text. Price 50s. net Size 8¾ in. × 5¼ in.

Normally the synthesis of any except the most simple networks requires an extensive knowledge of higher mathematics and the carrying out of long and tedious calculations.

In this book the difficult part of filter design—the calculations—has already been performed by specialists, the results of whose work is embodied in an extensive series of tables and graphs. To design filters as sophisticated as the present state of the art allows, and industry requires, it is only necessary to use the tables of designs and the modifications which are appropriate to them. The design of highpass, bandpass and bandstop filters can be carried out by transforming the tabulated lowpass networks.

The text, which is unchanged from that of the original American edition, reflects the author's extensive experience in this field. After studying modern network synthesis under Professor E. Guillemin, he had 11 years' practical design experience.

Avalanche Power Rectifiers

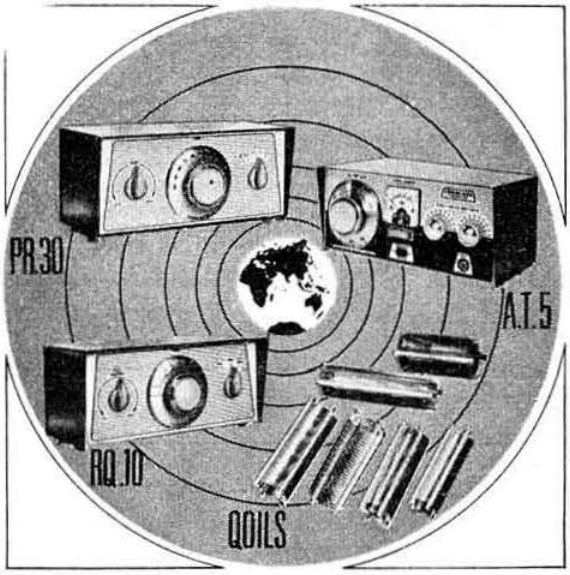
Standard Telephones and Cables Ltd. have two types of silicon avalanche rectifier in quantity production. These have the advantage over normal silicon diodes of not requiring, in most applications, any transient suppression components which tend to become bulky and expensive where high currents and voltages are concerned.

The avalanche effect is a sharp turnover of reverse characteristic above the normal working voltage. In the reverse direction, avalanche rectifiers behave as high voltage Zener diodes, having a clearly defined avalanche breakdown voltage, a low leakage even at high temperatures, a dynamic slope resistance which is a function of the surface area, and a positive temperature coefficient of avalanche voltage. The RAS310AF is a wire terminated diode that has a maximum continuous direct reverse voltage of 1000V, a maximum recurrent reverse voltage of 1200V, and a minimum avalanche voltage of 1250V. The rated mean forward current with a resistive or inductive load at 25°C is 1·25A, and it can withstand a repetitive peak forward current of 5A. The reverse surge absorption capability extends from 60 watts for 10mS to 4kW for 10μS. The RAS508AF is a stud-mounted device with a maximum direct reverse voltage of 800V, a rated mean forward current of 5A, and a minimum avalanche voltage of 1000V. Both rectifiers are available from the Electronic Services Division, Standard Telephones and Cables Ltd., Edinburgh Way, Harlow, Essex.

FOR PEAK PERFORMANCE AT LOW COST—PICK CODAR

AMATEUR RADIO EQUIPMENT

Advanced design and craftsmanship plus an unequalled reputation proved by the many hundreds of testimonials received from CODAR users is your guarantee of complete satisfaction. Only the best is good enough for CODAR—Mullard, Brimar, Jackson, Denco, Electroniques, Thorn, A.E.I. are just some of the famous names built into CODAR equipment. Illustrated leaflets available on request.



CODAR R.F. PRE-SELECTOR Will considerably improve the performance of any superhet receiver. "Results are amazing" "Well worth the money". MODEL P.R.30. uses KF183 Frame Grid tuned R.F. Amplifier and provides up to 20 dB gain plus substantial image rejection, improved signal/noise ratio and selectivity. Selector switch for either dipole or single wire antenna. Power requirements 180-250 volts 12mA H.T. 6.3 volts 0.3 amp L.T. Size 8¼in. x 5in. x 4in. Ready built, complete with cables, plugs and instructions **£4.17.6** carr. 3/-. MODEL P.R.30X. Self powered version for 200-250 v. A.C. and also provides 25mA at 200 v. H.T. and 6.3 v. 1 amp L.T. for other accessories. **£7.2.0** carr. 3/-.

CODAR "Q" MULTIPLIER MODEL R.Q.10 for use with any superhet receiver with an I.F. between 450 and 470 Kc/s. Provides considerable increase in selectivity for either peaking or rejecting a signal on AM, CW or SSB. Both PEAK and NULL functions tunable over receiver I.F. passband. B.F.O. facility included. Size 8¼in. x 5in. x 4in. Power requirements 180-250 v. H.T. at 5mA 6.3 v. 0.3 amp L.T. Ready built complete with cables, plugs and instructions **£6.15.0** carr. 3/-. MODEL R.Q.10X. Self powered version for 200-250 v. A.C. and also provides 25 mA at 200 v. H.T. and 6.3 v. 1 amp L.T. for other accessories. **£8.8.0** carr. 3/-.

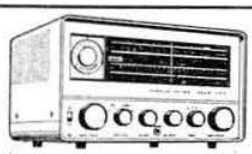
CODAR A.T.5 12 WATT 2 BAND TRANSMITTER The newest, most compact transmitter for fixed or mobile use on 160/80 metres. "The tiny TX with the BIG voice." Size only 8¼in. x 5in. x 4in. (**Base area is less than two-thirds of this page.**) High stability new type calibrated V.F.O. 1.8-2.0 Mc/s and 3.5-3.8 Mc/s (up to 4 Mc/s export). Air-spaced CODAR-QOIL Pi-net output. P.A. Plate current meter, plus neon indicator. Plate/screen modulator. AM/CW switch and Panel Key Jack. Plug changeover for 6 or 12 volt heater supply. **£16.10.0** carr. 4/-.

A.T.5 POWER SUPPLY UNITS Type 250/S. For 200/250 v. A.C. with Standby/Net/Transmit and aerial changeover switching, stabilised V.F.O. supply, neon standby/transmit indicator. **£8.0.0** carr 5/-. Type 12/MS 12 v. Transistor power supply unit available shortly.

CODAR QOILS AIR-SPACED INDUCTORS A complete range of low loss air-spaced inductors developed by CODAR. Over 40 different sizes from ¼in. to 3in. diameter suitable for all types of circuit application including V.F.O. P.A. Tank, Pi-network, A.T.U., aerial loading etc. Full data and prices on request. *Codar-Qoil U.K. Distributors: ELECTRONIQUES LTD., Penfold Road, Felixstowe, Suffolk.*

CODAR RADIO COMPANY
BANK HOUSE, SOUTHWICK SQUARE,
Southwick, Sussex. Tel. 3149

Canada: Codar Radio of Canada, Tweed, Ontario.



A SUPERB RECEIVER FOR ONLY 24 GNS.
Carriage Paid

NEW LAFAYETTE COMMUNICATION RECEIVER

MODEL HA-63

7 VALVES

Plus Selenium Rectifier

4 BANDS

Covering 550 Kc/s - 31 Mc/s

● Illuminated 'S' Meter ● 1.5 Microvolt Sensitivity ● Electrical Bandspread ● Aerial trimmer ● Noise limiter ● B.F.O. ● R.F. stage ● Big slide rule dial ● Output for headphones or 4/8Ω speaker ● Modern steel cabinet size 13in. x 7 4/5in. x 10in. ● Operation 220/240 volt A.C. Supplied Brand New and Guaranteed with instruction Manual. Matching speaker in Cabinet 55/- S.A.E. for full details.

Full Range of other Lafayette Receivers in Stock.

MODEL HE-40, 4 Bands, 550Kc/s-30Mc/s ... ... **19 Gns.**
MODEL HE-30, 9 Valves, 4 Bands, 550Kc/s-30Mc/s. Semi-kit ... **25 Gns.**
Each receiver supplied brand new and fully guaranteed complete with manual. Carriage 10/-. All models for operation on 220/240V. AC.
S.A.E. for illustrated leaflet—generous part exchange allowances.

LAFAYETTE "PRECON" AMATEUR PRESELECTOR CONVERTER

* Crystal Controlled * For 80-40-20-15-10 Metre Bands * As a Converter—Converts Receiver to Dual Conversion Operation * Improves Selectivity * Widens Band Spread. 3 crystals are included for 20, 15 and 10 metre bands. Operates on 230v 50/60 cycles A.C. 2 stages of RF assures a high signal to noise ratio. S.A.E. for full details. **19 GNS. P. & P. 3/6.**

CLEAR PLASTIC PANEL METERS

First grade quality, Moving Coil panel meters, available ex-stock. S.A.E. for illustrated leaflet. Discounts for quantity. Available as follows Type MR. 38P. 1 21/32in. square fronts.

2mA	..	22/6	10V. DC		22/6
5mA	..	22/6	20V. DC	..	22/6
10mA	..	22/6	50V. DC		22/6
50mA	..	22/6	100V. DC	..	22/6
100mA	..	22/6	150V. DC	..	22/6
150mA	..	22/6	300V. DC	..	22/6
200mA	..	22/6	500V. DC	..	22/6
300mA	..	22/6	750V. DC	..	22/6
500mA	..	22/6	15V. AC	..	22/6
750mA	..	22/6	50V. AC	..	22/6
1-0-1mA	..	22/6	150V. AC	..	22/6
1A. DC	..	22/6	300V. AC	..	22/6
5A. DC	..	22/6	500V AC		22/6
3V. DC	..	22/6	"S" Meter 1mA		29/6

50μA	..	32/6			
100μA	..	29/6			
200μA	..	27/6			
500μA	..	25/-			
50-0-50μA	..	29/6			
100-0-100μA	..	27/6			
500-0-500μA	..	29/6			
1mA	..	22/6			

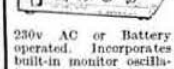
POST EXTRA Larger sizes available — send for lists.
ILLUMINATED "S" METER. 1¾in. square front. Cal. in 8 units. 6V. lamp, **29/6.** P.P. 1/-. Ditto 2 5/16in. square **39/6.** P.P. 1/-.

MODEL TE-18 GRID DIP METER

Complete with all coils for all Frequency ranges from 360 kc/s to 220 mc/s

● Compact—True one handed operation ● Covers 360Kc/s to 220Mc/s ● Functions as a Grid Dip Oscillator. Absorption wave meter and Oscillating Detector ● Completely wired—not a kit. The TE-18 can determine the resonant frequencies of tuned circuits, detect stray resonances in transmitters, check neutralization, etc. Frequency range 360Kc/s to 220Mc/s in eight accurately calibrated ranges. Grid current meter has a 500μA movement. Uses a 6AF4A valve powered by a built-in transformer-operated power supply with selenium rectifier. For 220/240v A.C. 50-60c/s. Size 7¼in. H. x 2¾in. W. x 2in. D. **£12.10.0** Carr. 3/6.

MODEL DA-1 TRANSISTORISED FULLY AUTOMATIC ELECTRONIC KEYER



230v AC or Battery operated. Incorporates built-in monitor oscillator, speaker and keying lever. Fully adjustable speeds giving either auto, semi-auto or hold. 7 transistors, 4 diodes. **£16.10.0.** P. & P. 4/6.

350 MA R.F. METERS

2in. Round. Plug-in type. **8/6.** P.P. 1/6.

R.C.A. AR88 RECEIVERS

"L.F." Excellent condition **£35.** "D" As new **£65.** Carr. 30/- each

LONDON STOCKISTS OF CODAR EQUIPMENT

G. W. SMITH & CO. (RADIO) LTD

3-34, LISLE STREET, LONDON, W.C.2

Phone: GERRARD 8204/9155 *Cables: SMITHEX, LESQUARE*

OPEN 9 a.m.-6 p.m. EVERY DAY MONDAY TO SATURDAY

Send 1/- P.O. for full catalogue and lists.

PRIVATE ADVERTISEMENT ORDER FORM

Please send advertisement to SAWELL & SONS LTD., 4 LUDGATE CIRCUS, LONDON, E.C.4

3d. per word (minimum 5/-), Box Nos. 1/6 (including forwarding replies)

Please insert above advertisement in RSGB BULLETIN

NAME .....
(in BLOCK CAPITALS)
Address .....
.....
.....

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

CLASSIFIED ADVERTISEMENTS

ADVERTISEMENT RATES. Members' Private Advertisements 3d. per word, minimum charge **5s. Trade Advertisements 9d. per word,** minimum charge **12s.** All capitals **1s.** per word, minimum charge **18s.** Write clearly. No responsibility accepted for errors. Use of Box number **1s. 6d.** extra. Send copy to **Sawell & Sons Ltd., 4 Ludgate Circus, London, E.C.4.**

OFFICIAL APPOINTMENTS

MECHANICAL
ELECTRICAL
ELECTRONIC
INSPECTORS/EXAMINERS

MINISTRY of AVIATION

Skilled men required as Inspectors and Examiners of a wide range of equipment for the Armed Forces. There are vacancies (1) at Contractors' works in: LONDON and THE HOME COUNTIES and many other provincial locations in ENGLAND and WALES. (2) In laboratories at:— BROMLEY (KENT) and HAREFIELD (MIDDX.) and WOOLWICH.

ELECTRICAL INSPECTION DIRECTORATE — Is responsible for the inspection of RADIO, RADAR, NAVIGATIONAL and similar ELECTRONIC/ELECTRICAL equipment and components.

AERONAUTICAL INSPECTION DIRECTORATE — Is responsible for the inspection of AIRCRAFT, ENGINES, GUIDED WEAPONS and associated equipment.

QUALIFICATIONS To have served a recognised apprenticeship or have equivalent experience or training.

PAY (London Area) £16.0.0 rising by annual increments of 10/- to £17.10.0.
(Provincial) £15.10.0 to £17.0.0 for a 42-hour (5 day) week.

HOLIDAYS Two weeks (84 hrs.) rising to three weeks (126 hrs.) after five years' service in the grade—8½ days public holidays in addition.

PROSPECTS Excellent prospects for promotion to the Technical Class within a salary scale £913-£1,244 for suitable candidates who possess or obtain the necessary qualifications.

OTHER INFORMATION After serving a qualifying period there is a paid sick leave scheme in operation.

APPLICATION To be made in writing giving:—
(a) Brief details of apprenticeship and/or experience.
(b) Whether E.I.D. or A.I.D. is preferred and for what type of work.
(c) Location(s) preferred, stating alternatives, if possible.

MINISTRY OF AVIATION, E.I.D. (A.O./P.2)
"AQUILA", GOLF ROAD, BROMLEY, KENT.

OFFICIAL APPOINTMENTS (contd.)

MINISTRY OF DEFENCE
(AIR FORCE DEPARTMENT)

have vacancies for

CIVILIAN RADIO TECHNICIANS

at R.A.F. Sealand, Cheshire; R.A.F. Cosford, Staffordshire; and other R.A.F. stations throughout the United Kingdom for the servicing, repair, modification, and testing of air and ground radio and radar equipment. Commencing salary according to age is £722 to £929 p.a., maximum salary £1,067 p.a. Houses may be available for renting at West Kirby, some 15 miles from Sealand. Apply to

Ministry of Defence
(CE3h (Air))
Sentinel House
Southampton Row, W.C.1
or to any Employment Exchange

UNIVERSITY OF GLASGOW

DEPARTMENT OF ELECTRICAL ENGINEERING

RESEARCH ASSISTANT

(SENIOR ELECTRONICS DESIGN ENGINEER)

Applications are invited for the above post from graduates with a wide experience in electronic instrumentation. Knowledge of transistor and valve circuitry is essential and some familiarity with the electronics of control systems and microwave devices is desirable.

The successful applicant will be required to guide the work of all electronics technicians in the Department of Electrical Engineering. He will have direct responsibility for the electronics workshop of the Department and for the organisation and ordering of components. His main function will be to advise on the design of electronic apparatus, both for teaching and research in the Electrical Engineering Department and in the other Engineering Departments of the University.

This is a senior post carrying F.S.S.U. benefits and staff status. Salary within the range £1,400 x £75 to £2,150 per annum with an efficiency bar at £1,775; commencing salary according to qualifications and experience.

Applications (3 copies) giving full details and the names of two persons to whom reference can be made, should be sent as soon as possible to the Secretary of the University Court, The University, Glasgow, W.2.

ROBT. T. HUTCHESON

Secretary of the University Court

OFFICIAL APPOINTMENTS (contd.)

UNIVERSITY OF GLASGOW

DEPARTMENT OF ELECTRICAL ENGINEERING

RESEARCH ASSISTANT (ELECTRONICS)

Applications are invited for the above post in connection with the development of a programme of research relating to improved methods of control of large synchronous machines with special reference to power system stability. Experience in one or more of the following fields is desirable: Semiconductor circuitry, electronic analogue equipment, d.c. amplifiers, pulse circuitry and digital techniques.

Applicants should preferably have a degree or equivalent qualification. Salary in the range £1,200 to £1,400 per annum.

Applications, including the names of two persons to whom reference can be made, should be sent to the Secretary of the University Court, The University, Glasgow, W.2.

ROBT. T. HUTCHESON

Secretary of the University Court

SITUATIONS VACANT

1. **A PROJECT LEADER** is required for engineering communications equipment to batch production standards. Resourcefulness and ability to get things done quickly are more important than theoretical qualifications although sound practical experience in building H.F. equipment is essential.

2. **A VERSATILE ENGINEER** is required for servicing a variety of electronic products. Reasonable familiarity with circuits used in communications engineering is necessary.

Please send details of past experience, and state for which post you wish to apply to Labgear Limited, Cromwell Road, Cambridge. Tel. Cambridge 47301.

DEVELOPMENT ENGINEERS required, experienced in development and design of transistorised H.F., V.H.F. and U.H.F. receivers and low power transmitters for commercial communication systems. Excellent prospects with small but expanding concern in ideal West Country locality. Please write giving fullest possible details to Staff Officer, Radio Communications Co., 16 Abbey Street, Crewkerne, Somerset.

LABGEAR LTD. have vacancies for Test Engineers and Fault Diagnosticians for S.S.B. Transmitting and Receiving equipment. Applicants should preferably have had some practical experience with transistor circuits. Excellent pay and prospects with first-class working conditions. Applications, which will be treated confidentially, should give full details of past experience.—LABGEAR LIMITED, CROMWELL ROAD, CAMBRIDGE.

FIRST CLASS ELECTRONICS SERVICE ENGINEER required for Marine and Industrial Electronics. Interesting job for young man with initiative and common sense. Must have a driving licence. Evening interviews can be arranged. Write or phone Mr. Turner, Bartronics, 38 Magpie Hall Road, Chatham, Kent. Telephone No.: Chatham 44395.

SITUATIONS VACANT (contd.)

AMATEUR OR PROFESSIONAL? The difference is smaller, perhaps than you think. We are an expanding section embarking on a new project, as well as testing conventional things like valve circuits and instruments. If *you* have a basic knowledge of electronics and are interested, we shall be pleased to hear from you. We need people, for all levels, from routine Testers to qualified Development Engineers. Ring our Mr. Quaddy at THO 5556 for further details. Norbury Instruments, 91 Beddington Lane, Croydon.

PERSONAL

QSL CARDS. G.P.O. approved log books, cheapest, best prompt delivery. Samples.—Atkinson Bros., Printers, Looe, Cornwall.

SERVICES OFFERED

CASES, chassis, panels. ANYTHING in metal; send your drawings, for quote. Stove enamelled, hammertone, or plain, in any colour.—Moss Watson, 40 Mount Pleasant Street, Oldham, Lancs. (Main 9400).

THE LATEST CONSTRUCTION BOARDS: Eyeletboard, Veroboard, mailed. Samples s.a.e. please.—Eyeletboard Electronics, 17 Queens Road, Leytonstone, London, E.11.

HOUSE FOR SALE

MODERN HOUSE, 5 years old, 3 bedrooms, lounge, kitchen/diner. Kitchen fully equipped. Large garage. Large garden, shack and contents—55ft tower complete with Mosley TA33Snr. 4m-2m-70cm beams. Local shops. London 40 min. by rail. Dartford Tunnel 10 min. Price £4,650.—A. E. Williams, 51 Poley Road, Stanford-le-Hope, Essex.

FOR SALE

HEATHKIT MOHICAN, case slightly scratched, professionally built, handbook, £25 o.n.o. UHF valves, EIMAC 4W3OOB(2), RCA 5876(3), TD1-100A(1). Offers. Box No. G.7170, c/o RSGB BULLETIN, 4 Ludgate Circus, London, E.C.4.

BEAM ANTENNA TA33Jr on 40ft winch up lattice tower CDR rotator transformer cable and 52 ohm feeder; inspection and trial, £35.—G3MLP. Tel.: Rushden 2469.

HAMMARLUND Super Pro SPR 200X, S meter, power pack, rack mount, instruction manual 1160kc/s-20Mc/s, £12. Salkeld, 814, Manchester Road, Rochdale, Lancs. Phone 57369.

SALE. Dow-Key coaxial relays, brand new, boxed. DK60 £4. DK60-2C £5. DK60G £5. DK60G2C £5 10s. 220V. AC coils. Other Dow-Key relays available various voltages. Sae with your requirements. Box No. G.7167, c/o R.S.G.B. BULLETIN, 4 Ludgate Circus, London, E.C.4.

FOR SALE. Marconi CR100 60 kc/s-30 Mc/s. Mint condition £20 o.n.o.—D. Seymour, 89 Fulbridge Road, Peterborough, buyer collects.

19 SETS for spares from 12/6 each. Sets complete 35/-. Sets complete with Power Pack, Control Unit and Aerial Tuner £3. Mk II and Mk III 38 sets 15/- each. Sets for spares 5/- each. Spares Valves for all above sets 2/6 each. Vibrator Units new and unpacked 25/- each,—Main Road Garage, Billericay 297, Essex.

SPECIAL QUALITY versions of the following types of valves: ECC81, ECC82, ECC83, ECC91, all at 5/- each, post free. Also many ordinary types including: EF86, 6BR7, EL90 at 3/- each. S.a.e. for list.—G3RHF, 88 Village Way, Ashford, Middlesex.

METALWORK.—All types of cabinets, chassis, racks, etc., to your own specifications.—Philpott's Metalworks Ltd. (G4BI), Chapman Street, Loughborough.

FOR SALE—contd.

COLLINS T.C.S. (1·4-12 Mc/s) receivers, in working order with mains power packs. One: original condition, £5 o.n.o. Other: slightly modified, repainted, £4 o.n.o.—Ash, 6 Palmerston Road, London, N.22. MUL 1316 (evenings).

PANDA PR120V, £45. KW77, £90. Heathkit VFO, £7. CT53 Sig. Gen. £10. All excellent condition.—34 Birch Avenue, Romiley, Cheshire.

DX100 Tx, £35. Heathkit RA-1 Rx with xtal cal. £30. Both factory built. Going UHF. Glos.—Box No. G.7168, c/o RSGB BULLETIN, 4 Ludgate Circus, London, E.C.4.

DX4OU Tx. Owner no further use. No reasonable offer refused. Buyer collects.—23 The Greswoldes, Radford Semele, Nr. Leamington Spa.

NORTH-WESTERN AGENTS for all Green & Davis, Codar, Lafayette and Partridge Electronics equipment. Eddystone 888A, speaker, "S" meter, £70. AR88IF £40.—James-Stephens, 70 Priory Road, Liverpool. (Anfield 3602).

MODULATION TRANSFORMER, multiratio, 50w. 30/-. All 1964 QST's, 30/-. P.S.U. primary switching, Parmeko transformer and choke, 750v. 250ma., 300v. 250ma., 6·3v. 6a., 6·3v. 4a., professional metalwork, 135/-. Enclosed cabinet, 28 in. high, takes 19 in. panels, 30/-. All carriage paid. G3GVV, R. J. Hughes, Farleigh, 65 Harlands Road, Haywards Heath, Sussex. (Telephone 50961.)

RTTY. New W2PAT type terminal units £8. Also two 7.B. page printers, good condition. Details s.a.e. Box No. G.7169, c/o RSGB BULLETIN, 4 Ludgate Circus, London, E.C.4.

NEW AND UNUSED Taylor 127A multimeter with handbook, prods and guarantee; in original packing, £9/10/-. —G3RIX, 18 Alexandra Park, Scarborough.

AR88D with S-meter, speaker, trimming tools and handbook £50. Eddystone S.640 with speaker, handbook, some spare valves £20. ECC88 2m. converter £4. A2599/2521 2m. converter £6. 6CW4 2m. preamp £3. Hallicrafters SX42 speaker £3. HMV car radio RX PSU £2. Vibrator PSU 6v. and 12v. 15/- each. 12v. rotary converter 7/-. 832A valve 15/-. 829B valve 30/-. 5in. Goodmans speaker 10/-. Large oscilloscope case 10/-. FB5 multiband aerial with coax feeder £3. All subject near offer. Carriage extra.—Belcher, 7 Savill Road, Lindfield, Sussex. (Lindfield 2050.)

CLUB disposing of: 100 watt Phone/CW all band TX, professionally made, little used, £45. Write: 7 Cholderton Lodge Cottages, Nr. Salisbury, Wilts.

R 107 with accessories, including variometer, etc., £13. Also R 1392e needing alignment, with home made PSU £6. Both together for £18. Highest offer secures. Buyer collects.—A3195, 14 Herbert Gardens, Chadwell Heath, Romford, Essex.

FOR SALE—contd.

SCR522 2 meter TX/RX complete, unmodified £6.—Glazier, 24 Kensington Park Road, W.11.

CR66 RECEIVER with matching speaker and cabinet also "S" meter factory built six months old. Offers please: P. Coull, Avenue Garage, Littlestone, New Romney, Kent.

HAMMARLUND HQ 170A for sale. Good condition £75 o.n.o. Buyer collects please.—H. G. Cavill, G3SBH.

WIDE range of transformers and rectifiers, 12·5-0-12·5 volt 70 amp. to 3000 volt 1 amp. Write or call G3EBV, 6 Fairspear Road, Leafield, Oxfordshire.

COMPLETE mobile rig comprising welded steel rack fitment for car, with field strength meter. 160 metre Command receiver, AVC, BFO, extra LF stage; 160 metre Command transmitter, metered. 80 metre Command receiver, some mods. 80 metre command transmitter, metered. All units pluggable into rack. Command modulator. Extra rotary converter giving 45 watts on 80 metres. Separate vibrator powerpack for receivers. All cabling, transmit/receive switch, microphone, loudspeaker. As pictured in August S.W.M. Together with Minimitter 160 metre whip and car roof clamps, and 80 metre coil and top section, £28. Also Command transmitters, 4-5·3 and 5·3-7, mint, 50/- each. Command receivers, 6-9·1, 50/-, 26-41 Mc/s with valves, 70/-, PCR 12v d.c. vibrator powerpack 30/-. SCR 522 transmitter, complete, 30/-.—G3RDG, 40 The Vale, London, N.W.11. SPEedwell 8831.

HRO-MX £13. Transistor bug £5. Balun Coil (Daystrom) 75 or 300 ohm £4. G3SJM (as Call Book).

VICEROY TRANSMITTER MK 111, telescopic mast, Minimitter Multi Q, TVI filter, oscilloscope, etc. Send for details, 23 Elmshurst Gardens, Tonbridge, Kent. Tel.: Tonbridge 2969.

BAMBOO POLES FOR CUBICAL QUAD ANTENNAS, ETC. ALL SIZES. S.A.E. BRINGS LIST.—WHINES & EDGELER, BAMBOO PEOPLE, GODMANSTON, DORCHESTER, DORSET.

BC.453.A £5/5/0, RF. 26.B 35/-, Avo Signal Generator 95 Kc/s-80 Mc/s £10. All brand new. 13A Oscilloscope chassis for spares, £3. M/W Command Receiver £6. Manuals for 62 Set, BC.221,AF., BC.221.M., 20/- each. AR.88.D., HRO/MX/5T 25/- each. AR.88.LF., SX.28.A., S.27.D., 35/- each. A J. Reynolds, 139 Waller Road, New Cross, London, S.E.14. Telephone: New Cross 1443 (after 7.30 p.m.).

EXHIBITION draw receiver HQ170A. Offers over £100 for this excellent receiver considered within 14 days of issue of this advertisement. Original price £140 (now 15% dearer). Offers to P. A. Thorogood, G4KD, Exhibition Organiser, c/o RSGB or direct. (Tel.: Museum 2706.)

2 METRE OMNI-V J-Beam won by K6ODG, unable to accept. Offers over £3 considered to G4KD as above.

CLEARING STOCK—Electrical, Electronic, Radio, Tools, Television, Radar, Office, Test and Miscellaneous Equipment, Components and Appliances. S.a.e. 6d., list. Everything must go. Consider offers/exchanges W.H.Y. Albatross Engineering Company, Dept. RSGB2, 78-80 High Street, Gosberton, Spalding, Lincs.

OFFERS: 80 *Practical Television*, 85 *Practical Wireless*, 88 *Radio Constructor*, 108 *Shortwave Magazines*, all up-to-date. ARRL Antenna handbook. Radio Designers Handbook, Langford Smith. Radio Engineering, Terman. Buyer arranges transport, Oxfordshire. Box No. F.7162, c/o RSGB BULLETIN, 4 Ludgate Circus, London, E.C.4.

EQUIPMENT surplus our requirements for sale including AR88, Hammerlund and Eddystone Receivers. Number pieces ancillary equipment: RB150 recording bridges, trigger-amplifiers, magnetic and cylinder recorders, hellschreibers, etc. No reasonable offer refused. Tel.: Dane End 226 for appointment to view.

WANTED

WANTED.—All types of communications receivers, test equipment, tape recorders, amplifiers, etc. Prompt cash payment.—Details to R. T. & I. Electronics Ltd., Ashville Old Hall, Ashville Road, London E.11 (LEYton 4986).

WANTED urgently DX-40U and VF-1U or similar transmitter, anything considered. Sell or exchange working BC221 with charts. G3SPN, 3 St. Anselms Road, Worthing, Sussex.

KEEN SWL requires HRO or R1155 in good working order and condition.—A4035, 131 Greenfield Road, St Helens, Lancs.

INSTRUCTION MANUAL and circuit diagram for handy talkie BC611C.—Allen, Justices Farm Cottage, Finchingfield, Braintree, Essex.

INDEX TO ADVERTISERS

Printed in Great Britain for the RADIO SOCIETY OF GREAT BRITAIN, New Ruskin House, Little Russell Street, London, W.C.1
by Loxley Brothers Limited, Letchworth, Hertfordshire

IF UNDELIVERED Return to:— RSGB, NEW RUSKIN HOUSE, LITTLE RUSSELL STREET, W.C.1

IF UNDELIVERED Return to:— RSGB, NEW RUSKIN HOUSE, LITTLE RUSSELL STREET W.C.1