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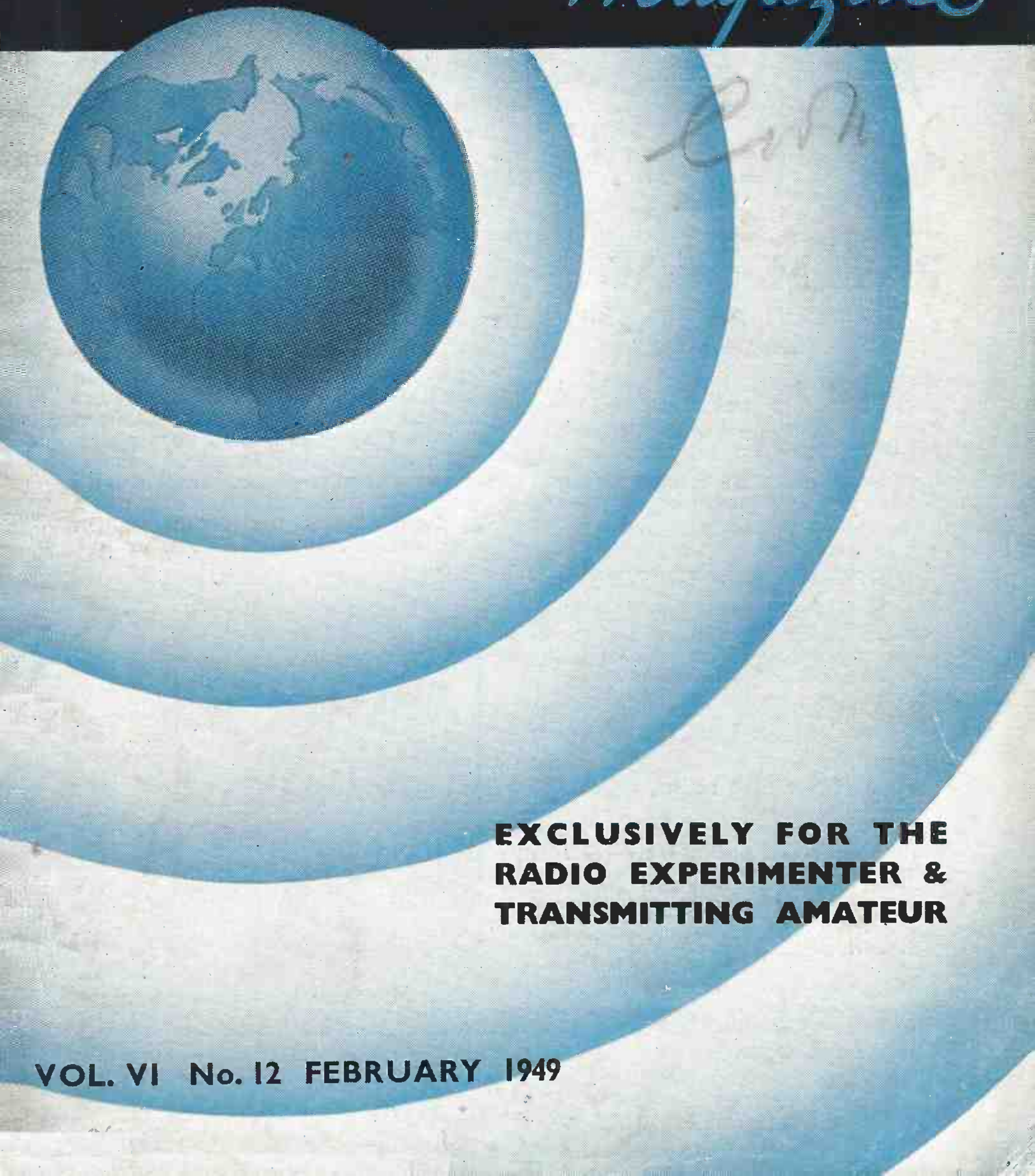

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VOL. VI No. 12 FEBRUARY 1949

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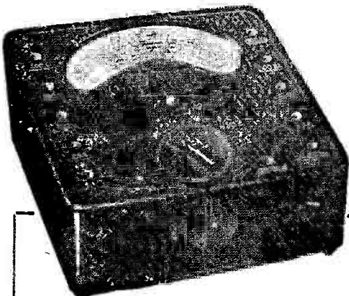

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0—100 ,,	0—250 ,,
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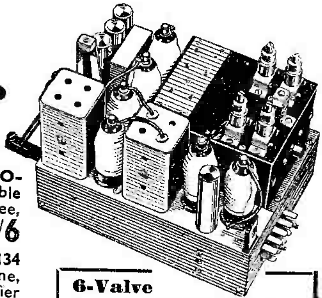

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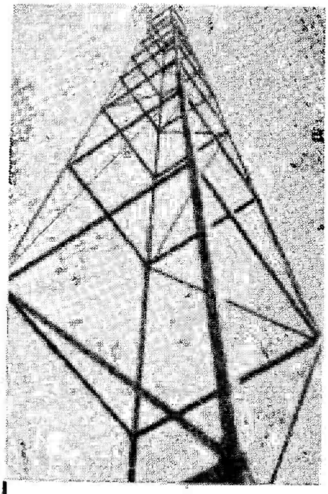

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55	250-0-250v 100mA, 5v 2a, 6·3v 3·5a	17/6
56	330-0-330v 70mA, 5v 2a, 6·3v 2-3a	17/6
57	300-0-300v 70mA, 4v 2a, 4v 3-5a	17/6

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1mA	0—1	2¼"×2¼"	M/C	7/6
5mA	0—5	2¼"	M/C	5/-
30mA	0—30	3¼"	M/C	10/6
50mA	0—50	2¼"×2¼"	M/C	8/6
150mA	0—150	2¼"	M/C	6/-
250mA	0—250	3¼"	M/C	10/-
2·5 amp.	0—2·5	2¼"	Thermo.	5/-
15v	0—15	3¼"	M/I	7/6
20v	0—20	2¼"×2¼"	M/C	5/9
40v	0—40	2¼"×2¼"	M/C	5/9
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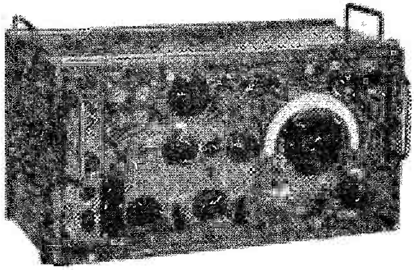
UNIT TYPE A3562A. Brand new, contains two ceramic base 807, one 5U4G, one EF50, one EA50. A large quantity of condensers, chokes, resistors, etc. 30/-.



R107. ONE OF THE ARMY'S FINEST COMMUNICATIONS RECEIVERS. (See "W.W.," August, 1945), 9 valves, R.F. amp. osc. Frequency Changer, 2 I.F.'s (465 kc), 2nd Detector, AVC. Af. amp. A.C. mains, 100-250v or 12v accum. Frequency range 17·5 to 7 mc/s, 7·25 mc/s to 2·9 mc/s, 3·0 to 1·2 mc/s. Monitor L.S. built in. Complete. Write for full details. £16/16/-. Carriage paid.

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SHORT WAVE MAGAZINE

FOR THE RADIO AMATEUR & AMATEUR RADIO

Vol. VI **FEBRUARY 1949** **No. 67**

CONTENTS

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THE *SHORT WAVE LISTENER* ASSOCIATED WITH THIS MAGAZINE IS SPECIALLY FOR THE RECEIVING ENTHUSIAST

EDITORIAL

Facts

The time has now come when we should be expecting the Atlantic City decisions still outstanding to be implemented—in particular, the release of the promised 21 mc band, which has apparently already been made available in some countries.

When 15 metres is opened to us, British amateurs in particular may feel that they are well provided for in the useful part of the spectrum. Broadly, we have coverage from one to ten thousand megacycles. It is true that frequencies above about 500 mc, though of considerable interest to the pure experimenter, are of little present use for amateur *communication*—and it is upon the essential factor of two-way communication that the whole structure of international Amateur Radio rests.

In this matter of frequency allocations, there are a few plain truths which all amateurs should bear in mind. We do not get our bands because the authorities think we deserve them, nor because we are expected to make new discoveries, nor even because the amateur organisations are strong enough or sufficiently influential to compel an allocation. We get our bands because they are reserve frequency areas of vital importance in time of war ; amateur occupancy of these bands ensures that they are kept open for immediate taking over should the need ever arise. And by the same token, amateurs themselves comprise an important, not to say indispensable, reserve of technical man-power for the communications branches of the Services.

So we see that it is a fair assumption that Amateur Radio, to the present general pattern, will always be allowed to continue so long as the frequencies we occupy in peace can be used to advantage in war. This solemn thought may serve to dispel certain widely-held and carefully fostered misconceptions as to how and why Amateur Radio is able to continue to expand and develop in its own way.

Austin Forsyth G6FO.

Broad-Band Exciter

Using Labgear Couplers

By V. J. COPLEY-MAY (G3AAG)

A very desirable feature of any good exciter is that while being one-knob control on the VFO, it should provide full drive over a wide band of frequencies without inter-stage tuning adjustment in the exciter itself. The unit here described meets this requirement by the use of Labgear wide-band couplers, which eliminate tuning operations between stages. This exciter can also be used as it stands as a QRP transmitter.—Ed.

THE appearance of a design for an exciter unit within these pages can by no stretch of the imagination be heralded as a novelty ; however, the author hopes that the "broad band" exciter described here brings out a few unusual features that will warrant the attention of readers.

On looking through past *Magazine* articles on exciters one gets the impression that the designs are all very similar and any individuality they possess is achieved mainly in the method of layout and construction.

Having built an exciter of conventional type some two years ago and persevered with its inadequacies, an attempt to design and build a new unit eliminating the snags of the old one looked like being time well spent, even if it only served to discontinue temporarily the author's contribution to the local QRM !

To tabulate the failings of earlier exciters will show the advantages of this BB exciter, as each one of the obstacles has either been overcome or reduced to insignificance in the design now presented.

(1) The requirement for retuning when changing from one end of a band to the other, or band changing. In some designs a succession of stages has to be retuned and—horror of horrors —*coil changing* is necessary.

(2) Too high a power consumption considering what the unit is doing. Unnecessarily large valves used for doubling.

(3) Lack of flexibility.

(4) Tendency for the generation of undesired harmonics.

(5) Too many knobs.

(6) Inaccessibility.

To suggest that earlier designs possess *all* these faults would of course be a gross injustice ; many of them are excellent, but as the writer sees it, all have at least one of these snags.

Design

Employment of Labgear Broad-Band Couplers eliminated the first failing and the use of wafer switches in band changing looked after the fifth point.

The examination of the complete circuit in Fig. 1 shows that a single 807 is employed as a straight-through amplifier for driving the PA and provides adequate drive for almost any PA encountered in normal amateur practice.

The straight-through use of the 807 allows the exciter unit to be operated by itself as reasonably efficient QRP transmitter. The tank circuit of this valve is of turret construction and home manufacture ; full details are given herewith. Output is provided on 3·5, 7, 14, 21 or 28 mc with either internal or external VFO.

It must be admitted that the inclusion of the VFO was rather an afterthought, as one VFO is already available at this station ; however, space being available and the possibility existing that the unit may some day be required for Field Day or self-contained QRP operation encouraged the incorporation of a good VFO. In addition, it was desired to experiment with the Clapp version of the Colpitts oscillator. Little need be said of the Clapp circuit except that it is a considerable advance on the conventional ECO and even shows a marked improvement on the triode-connected Colpitts from the point of view of stability and keying characteristics. In this last feature, the Clapp scores heavily in that the keying characteristics are almost unaffected by the inclusion of keying lag circuits. BK is thus possible.

V1 and V2 (*see* circuit) are oscillator and isolator respectively. Note that a valve of low *cga* and high effective stage gain characteristics is used in the V2 position. V3, V4, V5 and V6 are cathode-follower, 3·5 to 7, 7 to 14 and 14 to 28 mc doublers ; 21 mc output is obtained by tripling in the driver from the 7 mc doubler.

The use of a cathode-follower is one way to present a reasonable match to the co-axial input from the VFO without using an input tuned circuit with the possibility of undesired feedback. The screen and grid are effectively earthed, and oscillation becomes a virtual impossibility.

The Labgear units are really band-pass

couplers with link coupling between tanks; the "pay off" (as the W's might say) being that one has a large number of tuned circuits to get to a desired frequency and the consequent discouragement to the amplification of TV harmonics.

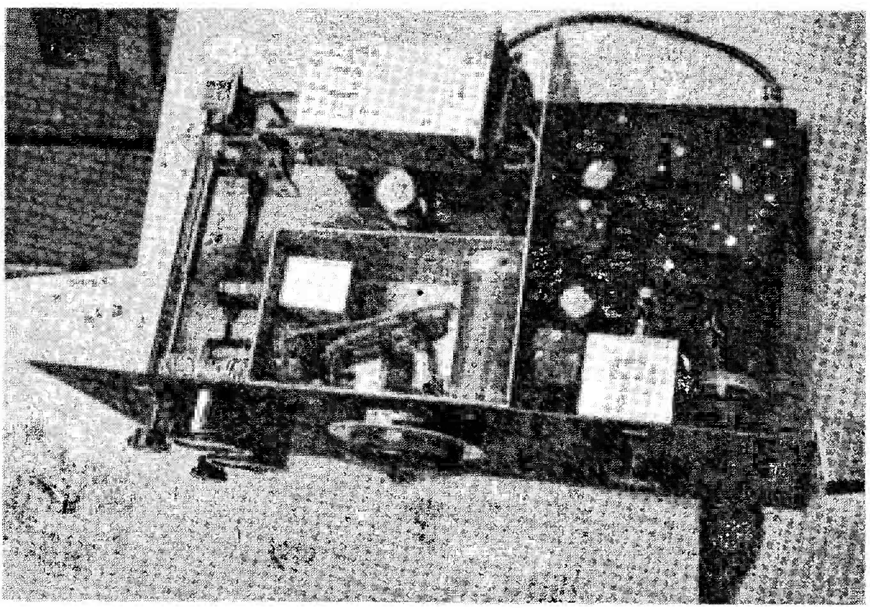
The output tank is neither of high Q nor highly efficient design but is quite adequate for the purpose. Examination of the photograph showing the under-side of the chassis illustrates how all decoupling leads associated with the doublers are taken to one earthing point, made possible by the arrangement of valves and tuned circuits. No leads are more than half-an-inch long and parasitics are thereby considerably discouraged.

The photographs and circuit give the whole story and naturally considerable tolerance is acceptable in the choice of individual components. Components that that should be within + or — 10 per cent. are starred, and some additional information governing the reason for the selection of components is given in the list.

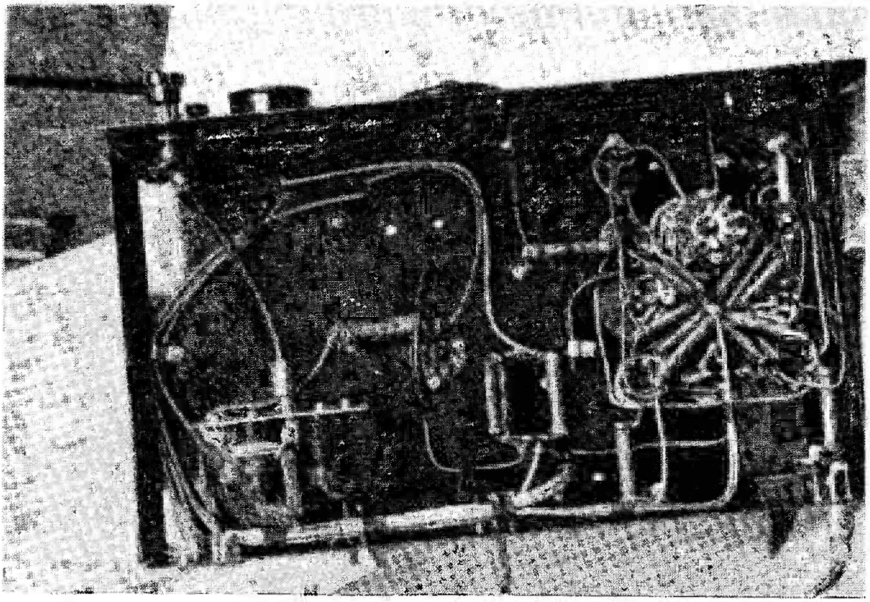
Operation

At G3AAG no unit works the first time it is installed in the rack—there are always initial teething troubles. However, with this unit the only set-back on switching on was a DC arc from one of the tank circuits to the link, a fault remedied in the design of Fig. 1. Once corrected, the unit performed as anticipated and was entirely free from any parasitics or snags. One of the first contacts with a local confirmed that the signal was clean and free from "whiskers."

Operation and adjustment are fairly obvious, but a few hints may help to get the best out of the unit. Power supplies being connected, and assuming that wiring is correct, connect excitation or key the VFO, setting the frequency to the middle of the band. The trimmers of the band-pass couplers (not the cores) should be adjusted for maximum urge to the driver grid (about 1 mA) on all ranges. Swinging the VFO from one end of the band to the other (PA off, *please* !) should not affect the drive very much. With the unit as used at G3AAG the change is 0·1 mA (0·9 mA at edges, 1 mA in the middle of the band). The appropriate tank coil should be selected and tuned for minimum dip in the plate meter. The plate current dips from about 70 mA to only 20 mA, indicating a pretty poor tank circuit, *but* also indicating that re-



Topside view of the Broad-Band Exciter chassis with the lid of the VFO removed; V1, V2, are mounted on the side of the VFO box. The driver is in the horizontal screening can at the back of the chassis.



Underneath the chassis ; the band change switch is operated from the front panel through gearing. The common earth point for the decoupling capacities is clearly visible.

adjustment over a wide frequency change is a waste of time—and not required—which is the essence of the whole unit ; in any case, as stated before, the drive is sufficient for most needs. R1 is the drive control and permits direct control of the PA grid current without further exciter adjustments.

Table of Values

Broad-Band Exciter Unit

C1, C2, C3, C5, C9, C12, C14, C24, C26, C27, = ·01 μF mica
C4, C6, C7, C8 = ·005 μF mica
C10, C11, C13, C16 = ·001 μF mica
*C17, C22 = 160 $\mu\mu$F variable. Eddystone (*see circuit caption*)
*C18 = 60 $\mu\mu$F mica
C19 = ·002 μF, 1,500 volt DC
C20, C25, C28 = 100 $\mu\mu$F, silver mica
C21 = 830 $\mu\mu$F, silver mica
C23 = 3-30 $\mu\mu$F concentric trimmer. (*For setting edge of band*)

R1 = 100,000 ohms, ww, variable
*R2 = 47,000 ohms, 1 watt
R3 = 1,200 ohms, ½ watt
R4 = 6,200 ohms, ½ watt
*R5, R7, R11, R19 = 3,300 ohms, ½ watt
*R6, R8, R10, R12 = 350 ohms, 2 watt
*R13 = 27,000 ohms, 1 watt
*R14 = 100,000 ohms, ½ watt
*R15 = 10,000 ohms, 5 watt
R16 = 47,000 ohms, ½ watt
R17 = 350 ohms, 1 watt
R18 = Meter shunt

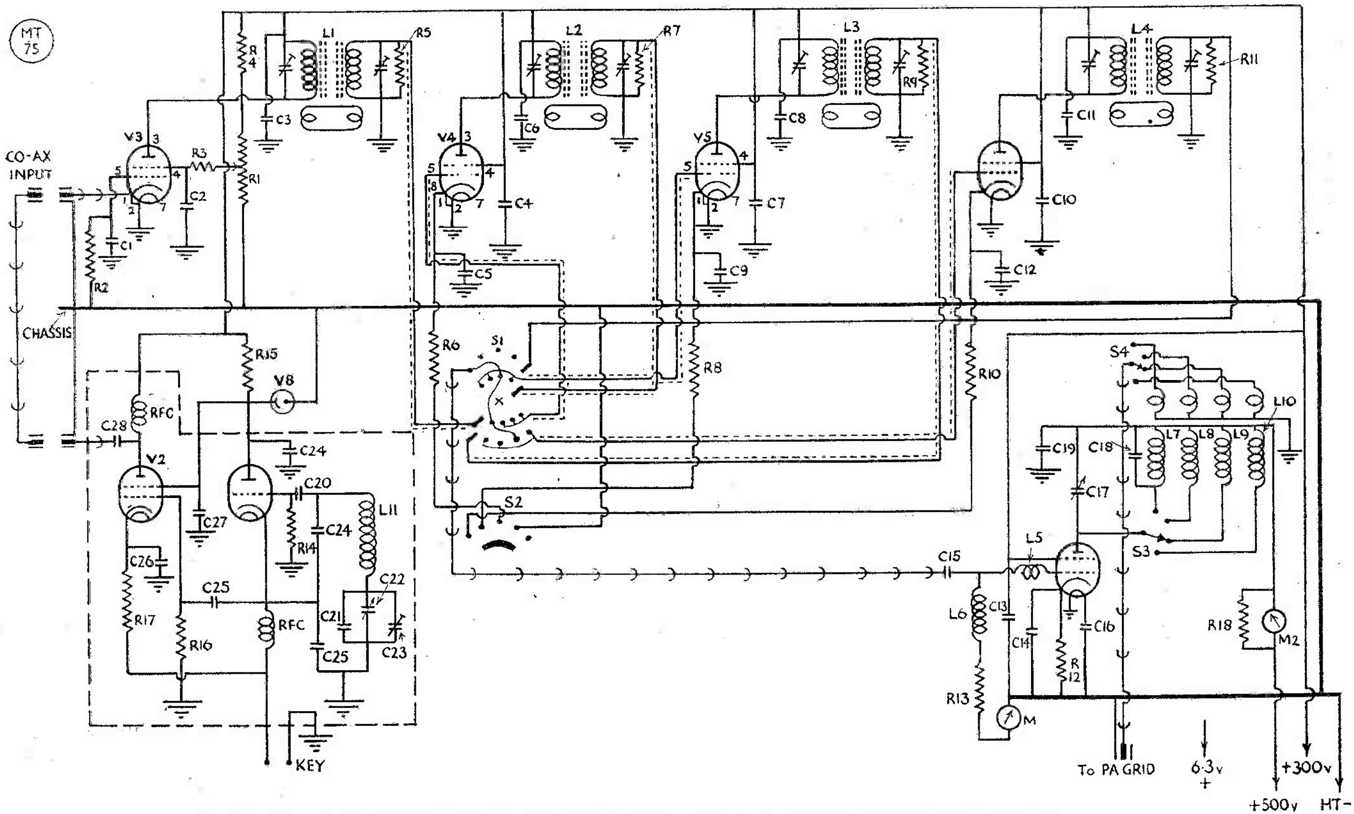
L1 = 3·5-3·8 mc Labgear coupler
L2 = 7-7·5 mc Labgear coupler
L3 = 14-14·85 mc Labgear coupler
L4 = 28-29·7 Labgear coupler
L5 = 9T ⅜ in. O.D. 18 SWG, 1 in. long
L6 = 2·5 mH RFC
L7 = 38T 24 DSC close wound, 3 turn link
L8 = 21T 24 DSC close wound, 3 turn link
L9 = 12T 18 SWG enamel, spaced 1 in. 3 turn link
L10 = 6T 14 SWG enamel, spaced 1 in. 3 turn link

All coils L5, L7, L8, L9, L10, wound on ⅞" dia. paxolin formers. Links 24 SWG PVC covered bell wire.

L11 = 65 μH. Tension wound Invar on ceramic form. From oscillator 145.
RFC = 2·5 mH

S1 = 2 wafer, 4 bank, 4-way each bank
S2 = 1 wafer, 1 bank, 4-way with shorting slide
S3 = 1 wafer ceramic, 1 bank 4-way
S4 = 1-wafer, 1-bank, 4-way
S1, S2 = ganged
S3, S4 = ganged

V1 = 6J6
V2, V3 = 6SK7
V4, V5, V6 = 6V6
V7 = 807
V8 = VR150/30



Circuit complete of the broad-band exciter. Note that all earth leads go to the *common* earthing point; leads with a dotted line are screened, and those circled at intervals are run in 80-ohm coaxial cable. The VFO unit is in a separate screening box; values specified for C21 and C22 will give VFO output in the CW areas only of the bands covered, but increasing C22 and a small reduction of C21 will allow full coverage.

Backyard Skywire

Some Simple Multi-Band Aerial Systems

By L. H. THOMAS, M.B.E. (G6QB)

He has a taste for playing with aerials and as he works from a site no larger than the average suburban plot, G6QB's solutions for the aerial problem are essentially practical and will be of great interest to a large number of readers. This article is based upon aerial experiments and results obtained during the last three years.—Ed.

DURING the past few months the writer, in his guise of DX Commentator, has received at least a dozen letters suggesting that "anyone can work DX with a spacious garden full of Sterba Curtains, Rhombics or even Vee Beams." The implication, obviously, is that without these little aids to success the working of DX is a difficult matter.

Now it happens to be a fact that many of the outstanding figures in the DX world (at any rate in Great Britain) are not by any means so equipped. Many of them have only the simplest types of aerial, and some of them work under great difficulties in this matter.

It seems, therefore, an opportune moment to come to the defence of the modest aerial, or what one correspondent calls the "Backyard Skywire" and to try to indicate that if your garden is no more than 70-ft. long (including the space taken up by the house) there is still hope. Of course it is realised that there are many to whom even a straight run of 70 ft. would be a great luxury, but we happen to know something about 67-ft. aerials from personal experience, and propose to write of *them.*

The location is shown roughly in Fig. 1 ; there are two somewhat wobbly trees, both 35 to 40 ft. high, and about 75 ft. apart. The station window happens to come almost half-way between them, and the whole house is underneath the direct run between the trees. On one chimney-stack is a television aerial some 6 ft. from the transmitting aerial and *above* it. The line between the two trees is almost exactly East-West.

When licences were restored in early 1946, some considerable head-scratching resulted in the erection of a 33-ft. Windom (full-wave for 28 mc), which was thought to be the most convenient and most useful aerial for that time, when we had only the 28 mc band to use for DX purposes. This looked like Fig. 2 and worked beautifully. DX was easy in those days, and a pair of 807's putting about 70 watts into that Windom got around the world in fine style on both 'phone and CW. In fact that original pair worked 100 countries on 28 mc ! The full-wave aerial, of course, gave the characteristic "four-leaf clover" polar diagram with the lobes roughly NW NE, SE and SW, which is by far the prettiest pattern that can be derived from a stationary East-West run.

Twenty-Metre Operation

When the 14 mc band was about to be released, however, it became obvious that the 33-ft. Windom would not be a very useful two-band aerial, because it was desired to work in directions other than North and South on 14 mc. So, with much trepidation (because the old aerial was so good on 28 mc) it was changed to a 67-ft. Windom—by the simple expedient of adding some 33 ft. 6 in. of wire and leaving the tap where it was ! The tap, originally, was about 4 ft. 8 in. off centre, so it now became roughly 12 ft. off centre.

Tests on 28 mc showed that the new length (now looking like Fig. 3) did everything that the old one had done. True, the lobes were theoretically now only 36 deg. off the line of the aerial instead of 54 deg., but this naturally didn't matter very much. And when the 14 mc band came into use the new aerial performed more or less as hoped for and was a very faithful servant for quite a long time. It was also used on Top Band by the simple expedient of series-tuning it against a direct earth, and one of the first contacts was G6ZO/I in Caserta (with 10 watts, naturally), so it appeared to be doing us proud on 1·7 mc, too.

When 7 mc was released it worked as an ordinary Windom, but on 3·5 mc there was always considerable difficulty in loading this particular aerial. Nothing seemed to make it "draw" properly, although it went so unexpectedly well on 1·7 mc. So, after quite a lot of use on all five bands, it was hauled down and another aerial tried.

This one (see Fig. 4) retained the same 67-ft. top, but had another 67 ft. tacked on to the east end. Of this some 45 ft. sloped down at about 60 deg. to the horizontal,

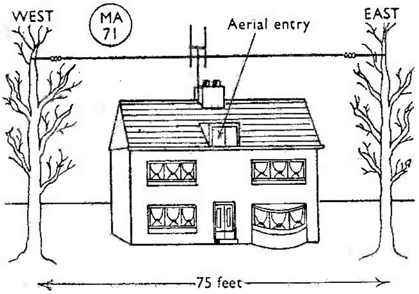


Fig. 1. Location diagram for any aerial system at G6QB.

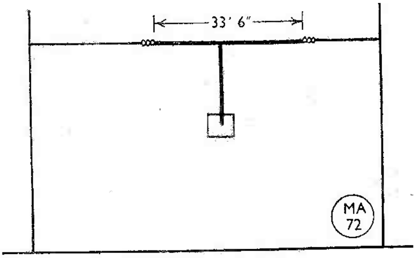


Fig. 2. The 1946 33-ft. Windom, for full-wave operation on 28 mc, the only communication band then open.

but at right-angles to the main run, and the remaining 22 ft. or so doubled back to the window. (The little post shown in these drawings is about 20 ft. south of the trees and the main aerial.) We rather hoped that by end-feeding this 134-ft. aerial we should be able to retain the good characteristics of the 67-ft. top on the higher frequency bands, and thought that the radiation from the "feeder," being vertically polarised, would not interfere with the top too much.

Five-Band Solution

This was more or less how it seemed to work out. On 14 mc it appeared to be as good in all parts of the world as the 67-ft. Windom ; on 28 mc, if anything, it was slightly down, particularly for Africa. On 3·5 mc, being an end-fed half-wave (albeit of curious shape) it went exceedingly well and succeeded in putting signals into VE, VO, W and ZL with no trouble at all. On 1·7 mc it was now a quarter-wave Marconi, tuned against earth, and signals at distances up to 100 miles in daylight were definitely better than before.

So here we had a tolerably efficient five-band aerial, although restricted to a 67-ft. top ; and it is, even now, the only five-band aerial we can think of for a "plot" of the size at G6QB.

But, of course, no amateur will ever be content to keep what he has—even if it seems to be working well—so something had to be done. In this case it was that radiating vertical portion that caused the worry, and it was therefore replaced by 67-ft. of 600-ohm feeder. It was argued that this should improve matters on 28 and 14 (and probably 7), and that in any case for the two LF bands the "live" feeder could be end-fed and the transmitter would, in fact, think it was still end-feeding the old 134-ft. run.

Zepp Feeding

This is where we were wrong, and we still have not found out why. The "Zepp" (Fig. 5) simply did not pay dividends. True, it seemed to work moderately well on 14 and 28 mc, but it did not take long to find that better reports were received from practically all parts if the two feeders were connected together at the bottom and end-fed, just as the aerial before it was !

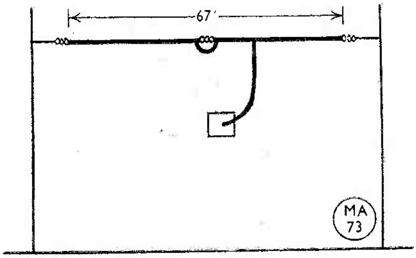


Fig. 3. The 33-ft. Windom modified to work full-wave on 14 mc, by the addition of 33 ft. 6 in. of wire—see text.

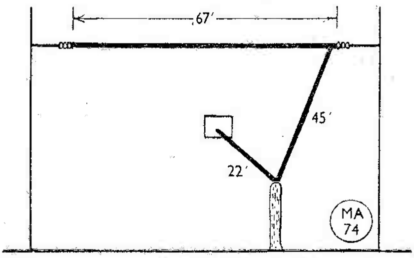


Fig. 4. An end-fed 134-ft. "wavy long-wire" for all-band operation.

There was apparently no catch in this; yet the Zepp tuned perfectly, with nearly equal currents in the feeders, and the transmitter loading was right. Tuning was sharp, and everything worked normally. But that Zepp simply did not do its stuff.

So before scrapping the 600-ohm line for good, we did some thinking and decided to try the so-called "centre-fed Zepp." In other words a 67-ft. top, fed in the middle with 600-ohm line. This would give us two dipoles in phase on 14 mc and two "full-waves in phase" on 28 mc. On 7 mc it would be a normal doublet and on the two top bands it would just have to take its chance. Further, it would be possible to change the characteristics on 14 and 28 mc by connecting the feeders together and running the affair as a "T" aerial. In fact, the behaviour on 14 mc in this condition ought to be that of a 14 mc full-wave aerial with a radiating vertical feeder. It has more or less worked out in that way, and looks like Fig. 6. The only stations on 14 mc that definitely prefer the dipoles to be fed in phase are KL7's, KH6's and ZS's, which seems about right. The rest of the world comes back when the two feeders are connected together and tapped on the *same* end of the coupling coil.

The only puzzling thing is that with this latter condition (which is a complete waste of a 600-ohm line) the aerial is quite the best of the whole series for 14 mc work. We cannot find any sign of a "preferred direction," but the percentage of calls answered went up at once, and even CQ's began to bring in nice pieces of DX, which they had never done with the end-fed Zepp. There was no change in the general level of conditions at the time of making the alteration, and it just seems that this aerial, with 33 ft. 6 in. of vertical (or rather "upwards") and two 33 ft. 6 in. runs at the top, seems to be ideal for all-round 14 mc work.

Throughout all the tests the PA has remained the same (a single-ended 813 running at 1,000 volts and 125 mA), although all sorts of exciter units and VFO's have been injected into it.

Obviously other variants are possible, but it is thought that this proof of the ability to use five different kinds of aerial in a 70-ft. space may possibly put ideas into the heads of those who have been inclined to despair.

It should, in fairness, be admitted that we have now secured the services of another tree in a different direction, but the long wire (167-ft.) which runs to this is used only for the top bands and the faithful 67-ft. run remains the mainstay of the station on the DX bands. Yet another arrangement has been tried on it, in fact, with a 72-ohm line feeding the top at a point a quarter of the way along, but this confines operation to 14 mc. On this band it works excellently, but the arrangement is not flexible enough for continued use in a five-band station.

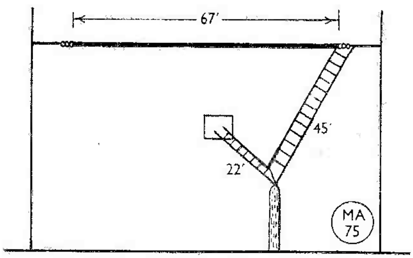


Fig. 5. The Zepp-fed 67-ft. roof, found disappointing at this location.

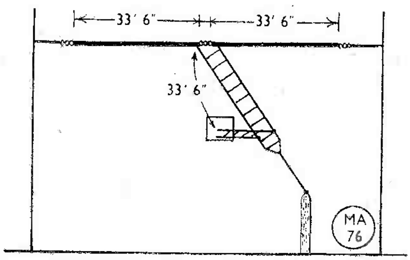


Fig. 6. Another variation on the 600-ohm feeder theme, discussed in the text.

"COIL INDUCTANCE TABLES"

This is the second edition of an extremely useful and most comprehensive booklet from which can be obtained coil design data for given parallel capacities from 5 to 500 $\mu\mu$F over a frequency range of 1·8 to 60 mc, in various wire gauges from 10 to 28 S.W.G. *Coil Inductance Tables*, 5s. 3d. post free (overseas 6s.) of Technical Inspection, 14 Silverston Way, Stanmore, Middlesex.

Full-Power Modulator

This is a complete speech amplifier-modulator arrangement, with 807's in Class-AB2, to give enough audio output to modulate a 150-watt carrier. It employs a high-gain pentode for the input stage, to work with a crystal microphone.—Ed.

Design to Give 80 Watts of Audio

By F. H. LANE (G3GW)

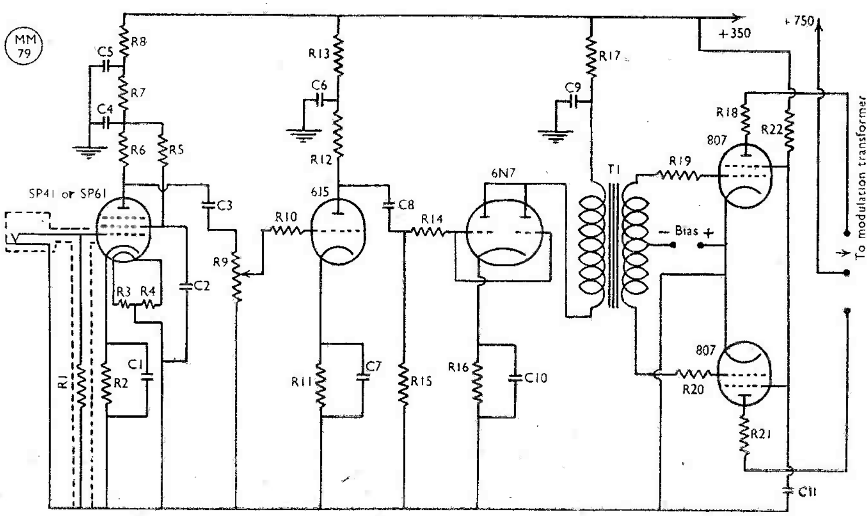
THE modulator described here has been in use at this station for the past two years and has given yeoman service. It successfully modulates a 150-watt transmitter. The writer is averse to "microphone hugging" and likes to work comfortably, leaning back in the operating chair and talking naturally with the microphone about 2 ft. away. Using a D104 crystal microphone full modulation is easily obtained (at 150 watts) with the instrument 5 ft. away and the gain 50 per cent. advanced. All reports give the speech quality as "excellent."

The high gain is due to the use of an SP61 (VR65), or the equivalent in the 4-volt range SP41 (VR65a), for V1. This stage is stabilised by thorough decoupling in anode and screen circuits. Hum is kept down to negligible proportions by very

Table of Values

Speech Amplifier-Modulator

C1, C7, C10	= 50 μF, 12-volt electrolytic
C2	= 0·25 μF, 350-volt working
C3, C8	= 0·1 μF, 350-volt working
C4	= 2 μF, 350-volt working
C5	= 4 μF, 350-volt working
C6, C9, C11	= 8 μF, 350-volt working
R1	= 5 megohm, ½ watt
R2, R11	= 1,000 ohms, ½ watt
R3, R4	= 100 ohms, 1 watt
R5	= 500,000 ohms, ½ watt
R6	= 100,000 ohms, ½ watt
R7, R8	= 40,000 ohms, ½ watt
R9	= 1 megohm potentiometer
R10, R14	= 1,000 ohms, ½ watt
R12	= 250,000 ohms, ½ watt
R13	= 15,000 ohms, ½ watt
R15	= 500,000 ohms, ½ watt
R16	= 500 ohms, ½ watt
R17	= 5,000 ohms, 1 watt
R18-R21	= 30 ohms, ½ watt
R22	= 2,500 ohms, 1 watt
T1	= Suitable driver transformer
V1	= SP41 (VR65a-4 volt) or SP61 (VR65-6 volt)
V2	= 6J5 or 6J5G
V3	= 6N7
V4, V5	= 807



Circuit of the speech amplifier-modulator ; it will provide full control for a 150-watt carrier.

thorough screening of the input circuit and the use of a "hum-dinger" in the filament supply. It is essential to use screened connections right from the grid cap of the SP61 and also to fit a fully screened input socket.

The following stage, V2, is conventional with a 6J5 ; if a 6J5G is employed it is desirable to use a screening can. V3 is also quite usual, with a 6N7 having both sections strapped to form a single triode. V2 and V3 employ thorough anode decoupling and grid stoppers. V1, V2 and V3 utilise an HT supply of 350 volts.

Modulator

The 6N7 driver stage is transformer coupled to the modulators—two 807's in Class-AB2. When fully driven, the output is in the region of 80 watts. A bias of 30 volts is applied to the grids, being derived from ordinary 9-volt bias batteries in series. Resistors are included in grid and anode circuits to prevent generation of parasitics. It is very desirable to maintain the screen voltage as stable as possible. As the 807 anode current varies over a wide range, it was considered advisable to obtain the screen voltage from the 350-volt supply and also to tie the screen to ground with an 8 μF condenser. It is also desirable to obtain the plate voltage (700 v.) from a power pack incorporating a choke input filter ; but at this station, owing to lack of volts, condenser input is employed to good effect. As the current drain from the power supply varies from 50-200 mA with drive, a transformer rated at 250 mA should be fitted.

Construction

A chassis 8 in. × 12 in. × 2½ in. is employed. This is ample if, as in the case of the writer, the output modulation transformer is mounted elsewhere, *i.e.* in the PA power pack. Care is needed in wiring the filament side—keep the leads as far as possible from grid connections, and screened wire should be used. Remember the essential point—*screen the SP61 input circuit from and including the top grid cap right down to and including the input socket and grid leak.*

Finally, the writer emphasises that for a circuit of this simple nature, the sensitivity, quality and output combined with stable operation that can be obtained is remarkable.

TU5B on Top Band

Another Conversion Design

By **A. P. KERFORD-BYRNES (G6AB)**

The TU5B, still one of the most popular surplus items, is well worth the price as a Top Band foundation unit. This is not the first of such designs to appear in these pages, and it will probably not be the last !—Ed.

EXAMINATION of the TU5B showed that it was an extremely well-made piece of apparatus built for rugged service during the war. There are various TU serial numbers, and they formed the tuning unit for the Type BC375 transmitter, into which they were plugged, similar to the manner in which the coils are plugged into an HRO receiver.

Tracing out the circuit of the unit gave the connections as shown in Figs. 1 and 4. As a result it was decided that here was the best part of a transmitter suitable for 160 metres, which only needed the addition of a couple of valves, meter and a few condensers and resistances to complete. Another point which decided the writer to adapt the tuning unit in this manner was the rugged nature of its construction ; it seemed a pity to strip down such a well-made piece of equipment only to build it up again in a different form.

Circuit for 1·7 mc

The circuit adopted is shown above the dotted line in Figs. 2 and 3 ; this makes clear the relationship of the various components to the socket holes on the insulated strip of the TU5B. The numbers given are those of the sockets reading from right to left when looking at the back of the panel of the tuning unit. The only modification made to the unit itself is the cutting of the two wires leading from the small variable condenser, and one wire from each of the ·0004-μF mica condensers. The variable condenser can be left in place or removed—in the author's case it was left in place, this being the easier of the two alternatives !

Two pieces of angle-iron, ½ in. × ½ in. ×

$\frac{1}{16}$ in., were found in the junk box and cut to a length of 14 in. The four conical securing studs were removed from the crackle-finished cabinet in which the tuning unit was housed and the angle-irons were drilled to marry up with the four holes on the panel. The securing studs were then bolted through the four holes in the angle-irons and the unit was secured to these by means of the slide fasteners, thus holding the two angle-irons upright.

A piece of paxolin, $16\frac{3}{4}$ in. × $6\frac{1}{2}$ in., was obtained and four holes were drilled in it, two at each end so that it could be bolted to the two vertical angle-irons above the front panel of the tuning unit. A circular hole was cut in the centre of this with a fretsaw, for fitting a 0/100 mA meter, and two wafer-type octal holders were mounted on the back of the panel in the positions shown, spaced out by means of $\frac{3}{4}$-in. pillars. A key jack was also fitted.

The angle-irons and top panel can now be removed temporarily from the unit ; the next step in construction is the removal of the screws along the top of the tuning unit panel which secure the insulated strip containing ten sockets. When these four screws are taken out, the insulated strip is carefully pushed back-

CALIBRATION CHART

kc	A	B	C
1720	2	877	31
1730	2	969	34
1740	2	1041	37
1750	2	1128	40
1760	2	1205	43
1770	2	1287	44
1780	2	1369	46
1790	2	1447	50
1800	2	1517	51
1810	2	1593	54
1820	2	1662	56
1830	2	1732	58
1840	2	1798	61
1850	2	1872	63
1860	2	1936	65
1870	2	2005	67
1880	2	2069	69
1890	2	2137	71
1900	2	2199	72
1910	2	2270	74
1920	2	2337	76
1930	2	2458	78
1940	3	357	17
1950	3	418	18
1960	3	469	20
1970	3	535	21
1980	3	591	23
1990	3	648	24
2000	3	702	26

wards and a $1\frac{1}{4}$-in. 4 BA cheese-headed bolt is put through each socket with the head towards the panel. A nut is then threaded on each bolt and securely tightened. After all the ten bolts have been fixed in the socket holes the insulated strip is replaced on the back of the panel. Great care will have to be exercised when moving the insulated strip as it is liable to fracture.

The panel is then wired-up with 14-gauge tinned copper wire for rigidity. When all the panel wiring is complete with the exception of the connections to the ten 4 BA bolts, replace the panel on the angle-irons and refix the angle-irons to the

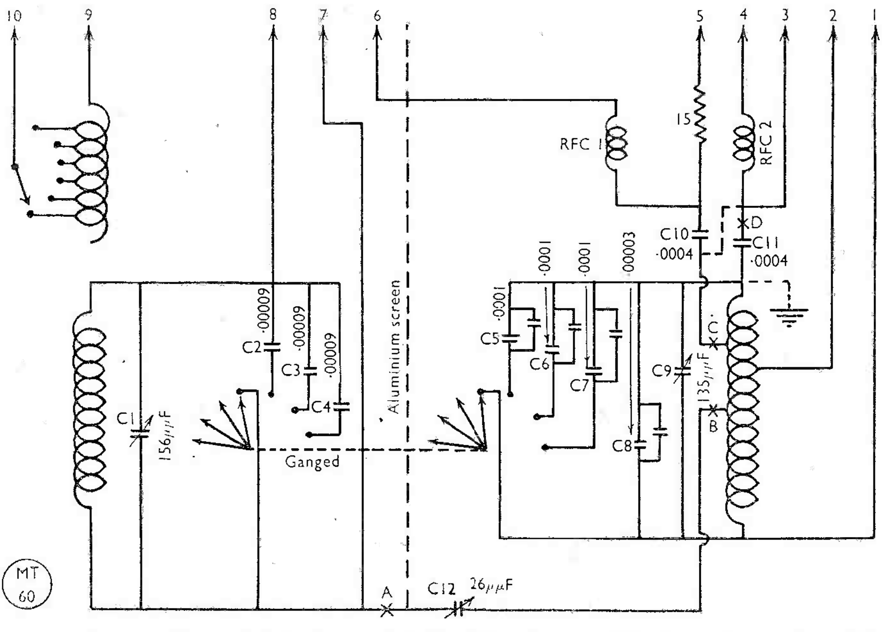


Fig. 1. Cut wires where marked X, at points A, B, C and D. Make two additional connections as shown dotted.

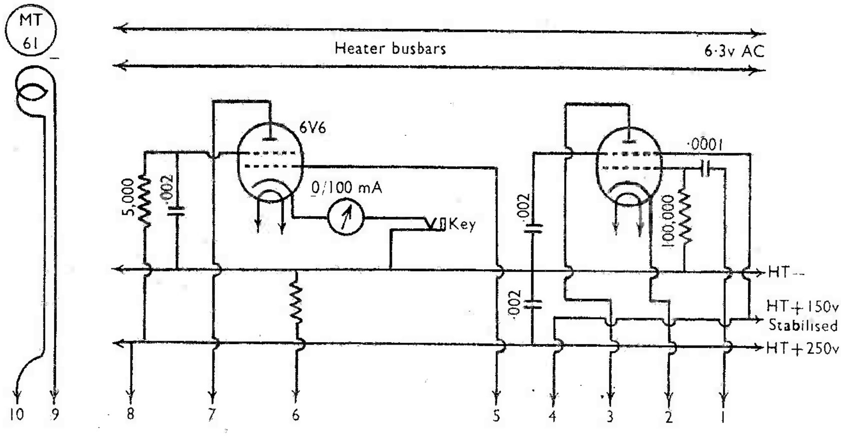


Fig. 2. Circuit of the additional panel for the TU5B to obtain operation on 1·7 mc.

tuning unit. When the panel is eventually in place the final connections can be made to the 4 BA bolts. Constructors will find it much easier when fixing the 6·3-volt and HT busbars to mount them on 4 BA bolts, so that they are at different distances from the back of the panel; this will enable wires to cross them in safety.

Modulator Connection

A separate stabilised 150-volt HT feed is run to the plate and screen of the first 6V6 and by-passed by a ·002 μF condenser, so that the plate and screen of the PA can be modulated by running the 250-volt HT through the secondary of a modulation transformer before it is connected to the HT positive busbar. A four-core cable is used to connect the busbars to the power supply. The PA stage takes 40 mA when off resonance and 13 mA when tuned to maximum dip. Connecting the aerial

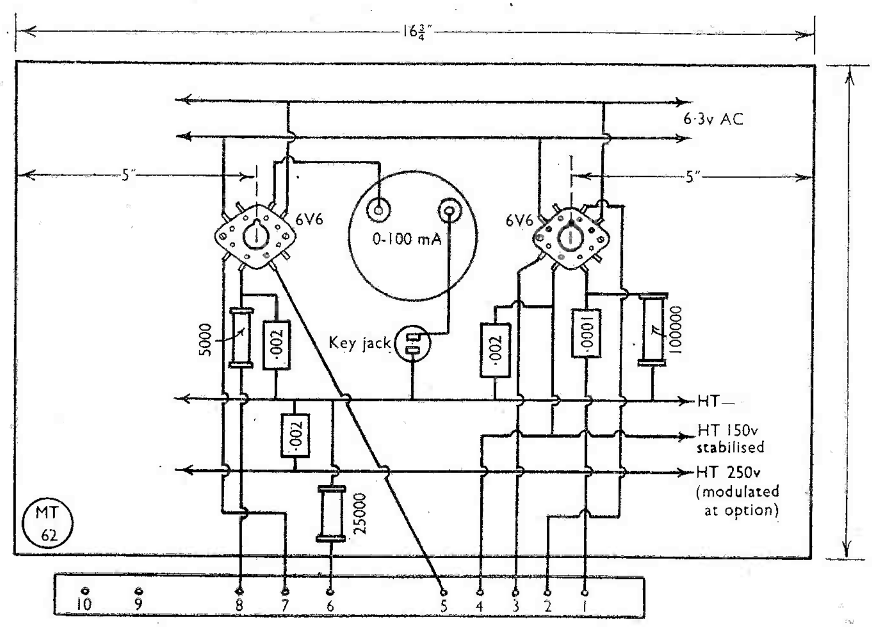


Fig. 3. Showing location of components on additional panel.

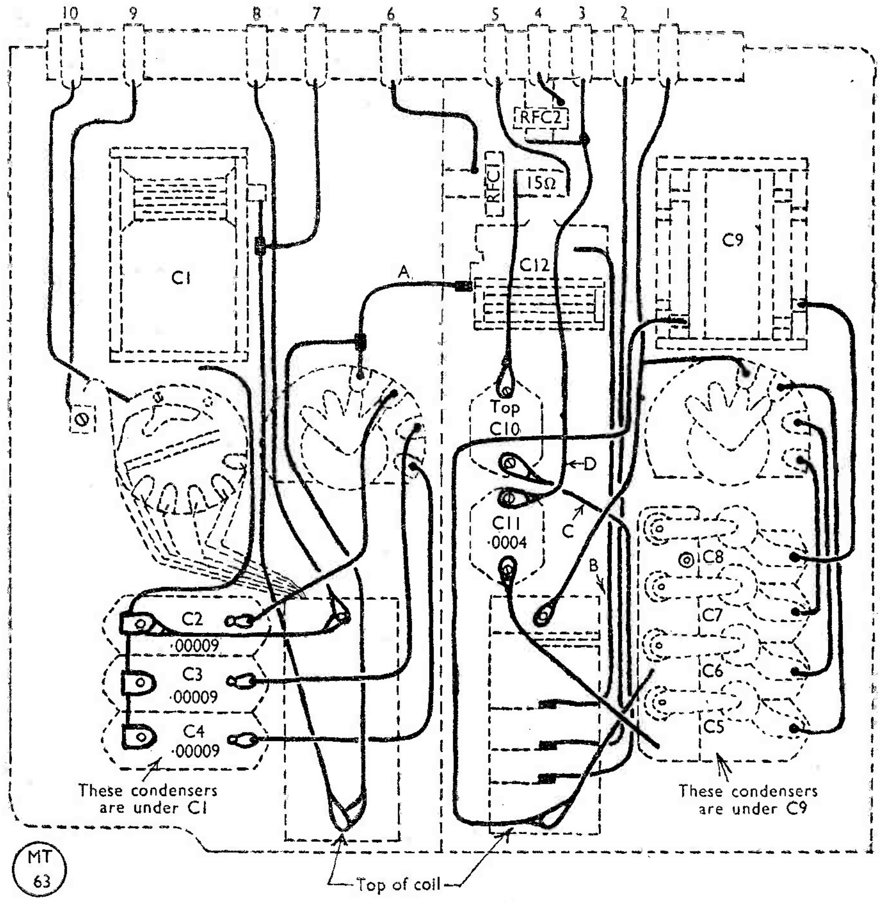


Fig. 4. Mechanical layout of TU5B, with positions A, B, C, D, marked—see Fig. 1.

increases the cathode current to 38 mA. As it was noticed that none of the components in the TU5B was connected to the chassis it was decided to take the chassis to the HT negative busbar by means of a wire placed under one of the self-threading screws and soldering the other end to the busbar. The transmitter has been used here on both 'phone and CW with excellent results.

The aerial coupling switch is used as a link point on the PA tank and a twisted pair is run from sockets 9 and 10 on the panel to the standard aerial tuning unit. At this QTH, the aerial tuner consists of 30 turns of No. 18 gauge enamelled wire wound on a 2-in. diameter tube. One end of this coil is connected to a 152-ft. aerial and the other end *via* a ·0005 μF tuning condenser to a 102-ft. counterpoise. A four-turn link is used at the aerial coil end.

Amateurs who possess one of these tuning units but are reluctant to dismantle it on account of the splendid workmanship could do worse than build themselves a Top Band transmitter as outlined here—on which they could QSY to their hearts' content on 160 metres !

A chart showing the calibration of the author's completed transmitter is given in the table, as a guide for other constructors.

DX COMMENTARY

ON CALLS HEARD, WORKED & QSL'd

By **L. H. THOMAS, M.B.E. (G6QB)**

Well, well ! What a month ! There may still be a few people about who don't realise what has been happening, but let us hasten to put them in the picture. This time, all the excitement has been transferred from our usual DX bands and the really frantic activity has settled down on 3·5 and 7 mc, where most of the active stations have been working all sorts of unexpected DX. What with the break-through of VK's on 3·5 mc and the steady accumulation of DX on 7 mc—even at mid-day—the customers have been kept pretty busy changing coils.

But before we go into details band by band, let us deal with the event of 1948—the WAZ Marathon. Results have now been sifted out, checked and counter-checked, and generally pored over, so that we can proclaim the winning stations, as under :

Phone and CW Section

1st :	G2EC	—	40 *Zones*, 174 *Countries*
2nd :	G8KP	—	40 *Zones*, 169 *Countries*
3rd :	G4CP	—	40 *Zones*, 149 *Countries*

Phone Only Section

1st :	G3DO	—	35 *Zones*, 115 *Countries*
2nd :	G3DAH	—	35 *Zones*, 97 *Countries*

Hearty congratulations to these operators on their stout work during 1948. We are not running a Marathon in 1949, but no doubt they will all find something to tax their capabilities during the very exciting year that is ahead. Judging by the "new faces" showing up on 7 and 3·5 mc, we feel that the Four-Band DX Table will shortly grow too big for one column !

Rivalry in Zone 20

It is interesting to note that we have had two stations in Zone 20 reporting their Marathon scores during 1948. SV1RX (now G3FNJ) had a score of 39Z and 129C at the time he left Athens—early in the year. On the other hand ZC1CL started up in Transjordan late in the year and apparently finished up with a score of 37Z and 122C—although he may have improved on those figures by December 31. G3FNJ (now London, N.W.6) says it was nice to know there was *some* competition out there in Zone 20 !

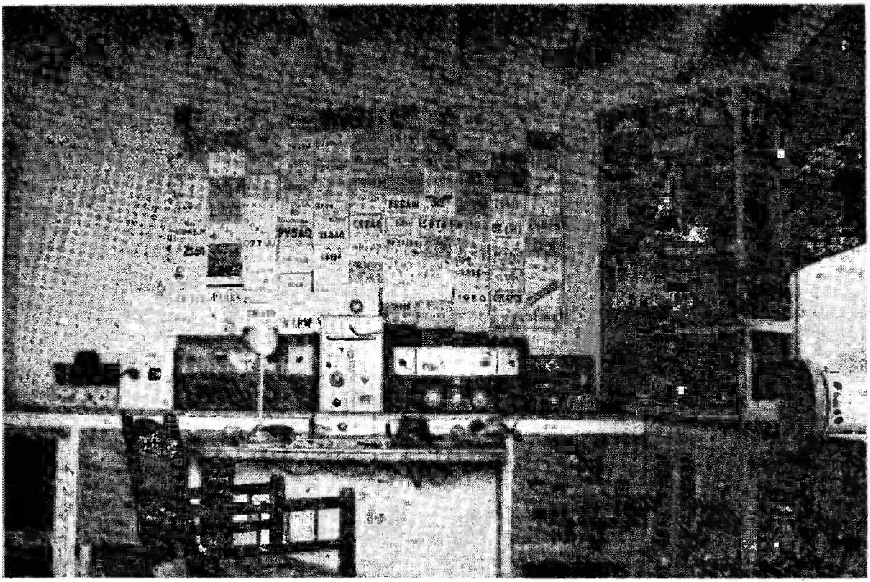
The 80-metre Witch-Hunt

And now for the news that everyone is waiting for. It all seems to have started with G6CJ (Stoke Poges) who, remembering that the first VK contacts on the band were made about 24 years ago and that the DX came through again in 1935-36, persuaded VK5KO to try his luck on 3·5 mc *in the evenings*. The VK did this, and the result was a QSO with G2KO (Driffield) on December 12, 1948. This is believed to be the first of the present series, and certainly was VK5KO's first G QSO on the band.

The second G station to make it was G3ACC (London, S.E.22). She worked VK5KO at 1930 on December 16, and was overjoyed to receive his Air Mail QSL at the end of the year ; this was sent to us for inspection—practically under armed guard ! G5BZ (Croydon) worked VK5KO on December 26, and since then contacts have been too numerous to mention.

G5BJ (Birmingham) persuaded ZC6XY to come up on the band, and made the first 80-metre phone contact between G and ZC6 ; G8VB (London, W.5) made the second, with S8 phone both ways, and is running a schedule ; 'VB also worked KV4AA on CW and three CT1's on phone. Incidentally, G8VB passes on the sad news that Harold Ward (VE1GR) is now a Silent Key. He will be missed on the band.

Since the blossoming forth of these first DX contacts, new stations have been arriving thick and fast, with an incredible number of "phoneys" among them. With the help of the regular DX operators we have tried to sift them out, with the following results : *Certainties*—VK5KO, VK4EL, VK7YL, VK2RA, ZL4GA (all



VP6CDI, Barbados, B.W.I., is as well known with his new call as he was when G2CDI of Stokenchurch, Bucks. The interesting thing is that he still uses the original 25-watt Tx with the same 807 which collected 132 countries for G2CDI ; it has brought in 117 under the VP call.

1900-2100) ; PY7WS, KH6IJ (2200), CE3BC, KL7GH (2200), VS2BC (2000), ZC8PM, VP2LA, ZL4IE (0815). *Queries :* YJ2FF (evenings), VS6AJ, VS7LA, VP8CH, ZS1M, and ZS1T (0800). *Definite Phoneys :* VK5KO (S8 at 0900 !), VS9AN (station closed), YA3B, AC4YN. G2PL (Wallington) says he is amazed at the number of phoneys and even more at the gullibility of certain G's who are taken in by them. G6HL (Shepperton) says the same and suggests that some of the 7 mc DX is pretty smelly, too.

The QRP fraternity have been doing well with the genuine stuff. G3EIZ (Liverpool), with 25 watts, has worked VK2RA, 5KO, 7YL and OX3MG. He was called by the doubtful YJ2FF—let's hope he proves genuine. G3CRK (Southall), likewise with 25 watts, raised OX3MF and VE1GU. G3BDQ (St. Leonards) worked VE, W and CT3, the interesting thing in his case being the use of a "curly" 66-foot aerial 20 feet high at one end and 4 feet at the other !

Best QRP performance reported to date is by GW8WJ (Prestatyn), who, with 8 watts, has worked VK5, KP4, OX, VO, VE1 and W1, 2, 3 and 4. The PA stage was a 6V6 !

ST2AM (Khartoum) is reported to be "on the way" to the 3·5 mc band. The significance of ZC6XY and ZC8PM is, of course, that they are in Asia and make a 3·5 mc WAC a nice target at which to aim.

Spivvery and Bad Manners

This particular DX-hunt has shown up band operating and bad manners more than ever, for the reason that all the G stations are much stronger than the DX. Thus, a small group of G's calling ill-timed "CQ DX's" can completely ruin the DX for everyone. This has been the chief trouble all along. A VK calls CQ ; all the pack descend on him. So far, so good. But now the "long-caller" shows up as a menace, by blotting out the VK's reply to the fortunate one. Hardly any of the interested parties having heard the VK's come-back at all, some of them sit tight, but some call him again ; the real spoilers of the DX sit *on the same frequency* and proceed to call CQ DX again !

With only two or three DX stations there and a whole flock of G's (all crowded, by the way, between 3500 and 3510—a senseless procedure if ever there was one) what *is* the use of calling CQ DX ? It's just that some people are too aggressive to

FOUR-BAND DX

Station	Countries Worked					Power
	28 mc	14 mc	7 mc	3·5 mc	Total	
G6HL	118	118	70	29	159	150
G6QB	105	147	58	30	173	150
G3DO	91	138	30	16	167	150
G2BJY	81	46	24	4	105	25
G2WW	76	155	31	20	165	60/150
G2VD	64	148	39	21	156	150
G8QX	63	95	17	12	120	150
GC2CNC	61	134	52	8	162	Phone 10/50
G8IP	59	110	33	13	127	3/150
G6OM	55	28	30	20	87	?
G3COJ	50	31	21	1	83	75
G2VJ	41	59	12	4	84	25/150
G3ATU	40	139	44	24	150	10/150
G2AO	32	111	33	29	119	150
G2HIF	30	42	9	6	64	150
G8IH	27	164	55	14	172	Phone 7/150
G5HH	27	81	37	22	98	25/75
G2YS	25	96	22	21	107	150
G8VG	24	96	48	17	117	60/75
G3AKF	21	64	30	22	83	60/150
G2DLJ	19	112	36	24	115	120
G8VB	13	88	29	41	110	150
G5WC	12	112	49	1	114	45
G3AKU	11	123	12	21	130	30
G8LO	10	106	27	10	106	150
G2AVP	8	144	47	19	153	25/120
G5FA	8	114	77	7	124	100
G2AVC	7	55	22	15	?	10/100
GW3ECH	6	32	5	7	36	25
G3AGQ	5	22	35	25	50	6/150
G5GK	4	92	78	3	174	150
ON4JW	2	172	65	23	176	35/75
G3ACC	2	102	5	19	102	150
G4QK	2	73	22	19	77	100
G2DHV	2	58	21	12	61	25/60
G3BDQ	1	105	26	18	107	25/150
G3EIZ	1	25	6	31	39	25
G8PG	1	25	28	10	38	1½/14

sit quiet and listen. They *must* stick out both elbows and yell "Stand back, you scum ; *I*, the great *I*, am going to work this one. And if I don't get him I'll see that you all hear what a punch there is behind my signal." Ah, well ; if you are bad-mannered on the air you are probably bad-mannered off the air, too, so there's nothing much we can do about it.

G5WP did have a shot at inducing VK5KO to call QML once. 'KO did so, and everyone shot up to 3600 to call him, but by the time they had finished tuning up and playing around he was calling a plain ordinary CQ again and everyone charged back on to his frequency. So there is VK5KO calling G's, and on his frequency are (*a*) about ten G's calling him ; (*b*) about ten more calling CQ DX ; (*c*) a DA working a PA ; (*d*) a G6 happily chatting about his Christmas dinner with a G3 ; (*e*) a G sending strings of ABC's and dots while he tests his new key on the air.

The 7 mc News

Goodness knows the 3·5 mc DX is startling enough, but some of the arisings on 7 mc are even more unusual. Note the times of some of these QSO's : KH6IJ and ZL4FT (0815), CM6AH (0830), YV1AI (0850), W4SLW/KL7 (0915), KL7QK (0950), W6LHN (1000), VE7VC (1015).

Pause for breath. Now note *this* lot : VS2BC (1045), YJ2FF (1050), W7IYA (1100), ZD9AA (1100), KM6AD (1145), VR2FI (1205), VR1CC (1220), KV4AA (1430).

Some of these seem almost incredible, but if you've tried working KM6AD at 1145 through French phone, Swiss gramophone records, twenty-five G's calling him and a local vacuum cleaner, you'll admit that it's real enough !

Other nice ones are YK1AF (1955), VQ4RAW and VQ5JTW (1930), HZ1JE (1930), VP2KS, 4TZ and 6JS (midnight) and XE2CB (0820).

For the stations and times in the previous paragraphs we are indebted mainly to G5FA (London, N.11), G2AVP (Stradishall), G8IH (London, W.5) and G6HL (Shepperton). All of them have had very nice pickings from the bunch.

Other 7 mc news comes from ON4JW (Brussels), who has worked KV4AA, VQ5JTW and HR1AT ; from G8IP (Hampton) who found VQ5JTW "outstanding" ; from G3ATU (Roker) who, still chasing Wycoming on 7 mc, continues to get VE7's instead ; and from G3ESP (Wakefield) who worked W3KNY with 12 watts on the band.

Some New Ones

Now a slight break from DX for some new arrivals in the way of prefixes. YK replaces AR1, for Syria; YK1AF is already on the air. JA is now in use for Japan, and DL2, DL4 and DL5 for Germany (but still *not* German nationals). KC6 is the prefix for the Caroline Islands; KC6EA, 14 mc at mid-day, is old W8WEA/Truk. KR6 is Okinawa instead of J9. KG6IA-6IZ series is allotted to Iwojima.

The 14 mc DX

By comparison with 7 mc, 14 seems quite tame. But some nice steady work goes on. G2AVP (Stradishall) has piled up VP3CW, KX6AF, J2AAO, HZ1AU and PZ1NB. G2EC (London, W.1) and G2PL (Wallington) were both able to work AC2MA in Bhutan, after which 'MA packed up the station, so the rest of us are unlucky. 'PL, by the way, has one target in life now, which is to get his "200 confirmed." ON4JW and G3ATU both managed to raise VQ1CUR in Zanzibar; he, too, has packed up and is now VQ4CUR again. G3ATU worked W7KMV/Iwojima on 14 CW, and he was the first G ever heard there on 14 mc. 'ATU has also received his QSL from W6ODD/FI8, so he is pretty happy man these days.

G3DXC (Roehampton) and G3DER (Compton Bassett) both remark on AG2AG (Trieste), who is, we think, genuine. 'DXC has been pirated by someone whose name is Jack (his own is Doug!), and has heard "ZL1S," the phoniest of phoneys, complete with S9 key-clicks. 'DER, with 50 watts, has raised ZD9AA, PZ1NB, UL7BS, UI8KAA and scads of VK, ZL and ZS stations.

28 mc

Ten-metre news is quite dull, really, for it is obvious that the band is nowhere near as good as last year. But at least two lucky ones, G3ATU (Roker) and G3COJ (Hull) have worked VU7AF at Khatmandu, Nepal. 'COJ has also collected CP1AP (1740), ZS3G (1030), FE8AB (1230), and EP1RY (1025). He also passes on the news that the Philippines are now using the prefix DU. He worked DU1VVS, ex-KA1VVS.

G6HL (Shepperton) says that TA3FAS is not quite the black sheep that he seems; he is only allowed to work for the purposes of handling traffic (but does he *have* to do it on 28000 kc phone?) 'HL heard XI1YI, or XI1NMI. Now who the heck is *he*? He was drifting roughly from 28040 to 28085 kc.

G8KP (Wakefield) turns in a long list of 28 mc DX, mostly on phone, and tells us that his confirmations now number 143.

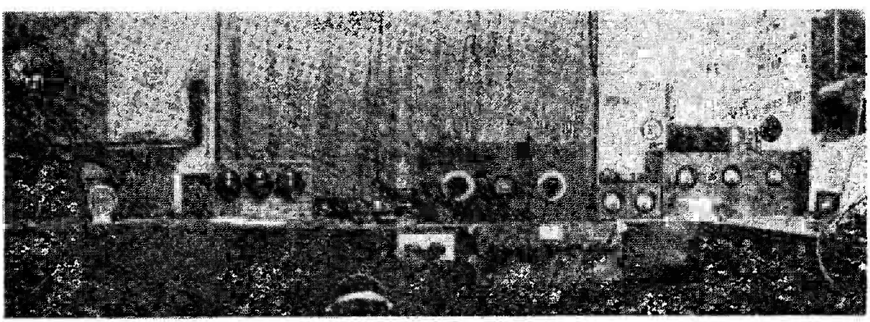
21 mc News

Yes, that cross-head *does* say 21 mc! G3COJ (Hull) has been listening on the band and has heard SM5KM, UR2KAE and UA9DP; he also tells us that ZE and VU stations are now licensed for the 21 mc band.

From Overseas

D2CH remarks that he likes the Four-Band idea, but why not make it Five Bands? He has 14 countries confirmed on 1·7 mc. ZC1AL writes to say that the following stations are now operating in the Arab area of Palestine: ZC1AB, 1AL/ZC6, 6GC, 6JL and 8PM.

VS2CQ (QTH in list) now has a BC348 and hears the DX replying; he has worked ON and PA but no G as yet. He



Another view of G6QB—then located at Thornton Heath, South London—in the pre-1930's. The equipment in view, l. to r., is frequency meter, 1-V-1 Rx, 50-watt PA on 14 mc, the modulator unit, and the exciter stage, CO DE5B-LS5B.

says he is the first authentic VS2CQ and will QSL 100 per cent. He was in England until August, 1948, so any VS2CQ QSO's before that were shady. VQ4SS is ex-G3SS but is not yet active in Kenya. He hopes to be on the air in early March, and is already hearing G's. As a matter of fact he sends some Calls Heard, but as they are all on 28 and 14 mc and hardly DX we are not using them this time.

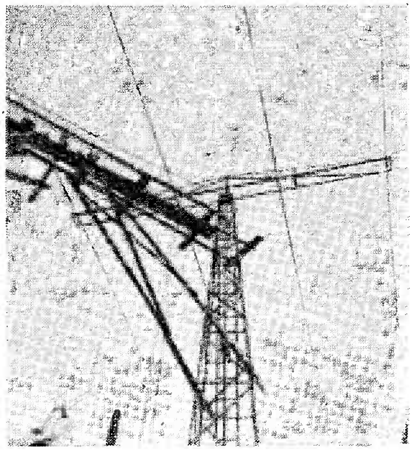
ZD4AM (Tafo) made a complete WAC in new countries as soon as he put up his new aerial. The stations were UC2CB, CT3AA, KZ5IP, OA4AP, VS2CH and W8SIR/KG6. He heard KX6AF but was unlucky. Harold makes a plea for honest reporting, and says he has been reported T9 or T9X when he *knows* that his note was T8 at best, owing to trouble.

ON4JW (Brussels) tells us that ON4QF has now gone to the Congo and has become OQ5QF. He also asks us to make it clear that *all* ON stations with three-letter calls are pirates ; to say nothing of a few of the two-letter people as well ! The Belgian PO is so worried about piracy that it has eased off on the exam. to make some of them official ! ! UBA is also co-operating by giving Morse lessons on 3515 kc at 1930 for an hour. (Hope they keep off those VK's).

G5IH (HMS *Duke of York*) spent a lot of time at VP6CDI's station in Barbados and says that the W's aren't content with replying to "CQ G—no W" calls from 'CDI—they wax offensive into the bargain and one of them sat on the frequency calling "CQ, not VP6CDI, Louse !" Apparently 28 mc is not so bad, but attempts to contact Europe on 14 mc meet with every conceivable kind of sharp practice. G5IH says he was given a terrific welcome

1948 MARATHON
TOP SCORERS

Station	Zones	Countries
Phone and CW		
1. **G2EC**	40	174
2. **G8KP**	40	169
3. **G4CP**	40	149
4. **G3AAE**	40	113
5. **G3DO**	39	130
6. **G2AVP**	39	129
7. **G2VD**	39	127
8. **G3ATU**	38	137
Phone only		
1. **G3DO**	35	116
2. **G3DAH**	35	97
3. **G3ZI**	32	81
4. **G2VJ**	29	72



This is the 14 mc beam (and mast) at VE7AFM, who was G3NQ at Whitstable not long ago. The "bridge", connected by speech-line to the Tx position, is used to reach the aerial for tuning purposes. The input runs just the 500 watts to this impressive erection—oh, well, they can do it in Canada !

in Barbados, and was astonished at the succession of S9 QSO's with 'CDI's little 25-watter, which still (as in Stokenchurch days at G2CDI) uses an 807 doubler in the final.

Ex-G3CNM (s.s. *Padana*) is still plugging away at the possibility of obtaining Maritime Mobile licences for our own fellows. He wants all sea-going operators who are in favour of MM's to drop him a card. He will send the lot, with a letter, to the Board of Trade. His full address is F. Armstrong, Radio Officer, s.s. *Padana*, c/o Mackinnon Mackenzie & Co., P.O. Box 122, Bombay. During a recent visit to New Zealand, 'CNM operated a QRP portable with the ZL1 suffix and had lots of fun—particularly when he left the suffix out and called CQ de G3CNM on 3·5 mc ! He worked nearly every ZL in Auckland, as well as a snip in the guise of VR5PL. He tried to find ZL1MP (ex-GW6AA) but only succeeded in losing his way and being chased off an estate by a ferocious gentleman with a ditto dog !

General News

G2ZC (Farnham) tells us that VK9NR (QTH in list) is active on 28, 14 and 7 mc from 0700-0800. 'ZC also remarks that ZL4BQ and ZL4GA are father and son, and *both* members of FOC ! G2WW (Penzance) has at last finished his rebuild, and is now on with 808's in the PA and a TZ40 modulator. All his QSO's since then have been on phone, and he lists so much DX that we can't even quote from it. He wishes there were a 1949 Marathon; by January 10, his score was 11Z and 38C !

G3CRK (Southall) has had a QSL from Bulgaria (which doesn't check) giving an alleged report on signals from his "famous station" and asking for four 32 μF condensers and British amateur magazines. The old racket again. . . . . . G6BB (Streatham) has passed on his TRF battery 3-valver, with the aid of which he has worked 102 countries, and awaits the arrival of a super-Rx. Weak DX please note—he will now hear you. . . . . .

G2NM (Bosham) says that a recent contact with ZD9AA showed him that he could *still* get thrills out of DX. . . . . . GC2CNC (Jersey) says that he did not imply disapproval of contests (see last month) ; merely feels that there are too many of them, especially at week-ends. . . . GC2AWT (Jersey) says he is fed-up with bad criticisms heard on the air. Some of the best phone on the band has been described as terrible—doubtless because of the frequency response of the receiver, selective fading and so on—and he suggests that technical comments and advice should be left to those really qualified to give them. We have certainly heard some terrifying suggestions made from time to time, some of which would certainly blow the gear or the operator sky-high.

GW3ECH (Trecwn) tells us that SU1HF is now back home as W6IAQ/5, and he says that all SU stations now on the air are either very brave or very foolish.

DX QTH's

AR8XA	Francis Semeraro Orsini, Hotel Normandy, Beyrouth
EA8CO	Crescencio Olias, Box 346, Las Palmas, Teneriffe, Canary Islands.
EQ2L	c/o U.S. Embassy, Teheran, Persia.
MI3NC	APO 843, c/o PM, New York.
MI3ZZ	Box 379, Asmara, Eritrea.
OQ5DE	c/o Symetain Compagnie, Kalima, Nr. Kindu, Belgian Congo.
VK9NR	N. Roberts, c/o Dept. of Civil Aviation, Norfolk Island, *via* Sydney, N.S.W.
VS2CQ	G. F. Bloomfield, Box 150, Kuala Lumpur, Malaya.
VU7AF	ARC of India, Box 6666, Bombay 20 (*Station at Khatmandu, Nepal*).
YK1AF	QSL via W3KXS (*Station in Damascus*).

ZONES WORKED LISTING

POST WAR

Station	Z.	C.	Station	Z.	C.
Phone and CW			Phone and CW		
ON4JW	40	176	GM3CSM	36	99
G6QB	40	173			
G8IH	40	172	G2YS	35	107
G4CP	40	168			
G3DO	40	167	G5WC	34	114
G2WW	40	165	G8PL	34	109
G2AVP	40	153			
G8IP	40	127	G2BJY	33	105
G2FSR	39	162	G3BNE	32	82
G2VD	39	156			
G3BI	39	146	G3ACC	31	102
G4AR	39	131	G3FNJ	31	76
G2AO	39	119			
G5MR	39	110			
G6PJ	39	85	Phone only		
G3ATU	38	150			
G3AKU	38	130	G3DO	37	135
G5FA	38	124			
G8KU	38	116	G8QX	35	120
G3DAH	37	113	G3DAH	34	99
GC2CNC	36	162	G6CB	31	87
G6BB	36	102	G2VJ	31	84

Department of Low Moans

You didn't think you could get away without a few grouses, did you? But we have kept them until the end. G2AO (Malvern) says a character known to him as the Arch-Spiv practically drove him off 14 mc, and now he's cropped up on 3·5. With his T7 note he practically oozes "Get off the air, boys ; *I'm* going to work this one."

G3ESP (Wakefield) suggests that wielders of bug keys shouldn't send fast until they know how to—a recent "569" report, sent twelve times fast, contained 6's with every number of dots from two to seven ! Phones which are in the CW bands and modulated 150 per cent also come in for comment.

GW3ZV (Rhigos) says there are too many moans, and "Spiv" is just another name for someone who works the chap you are after. When they pile up, he says, he either joins the pile and takes what's coming or goes off the air.

G4QK (Croydon) remarks that although one of the advantages of a Clapp oscillator is that it will key nicely, even through a lag circuit, some of them dish out wonderful key-clicks. G2HIF (Didcot) pleads for more use of the 28 mc band for local phone, in the evenings after the DX has gone. As he rightly points out, there are lots of kilocycles there and some of the local chatter on 3·5 and 7 mc is now causing more interference with DX than it would on 28 mc. If the lack of activity after 2030 is due to TVI, he suggests that it is a bad thing. There's too much of the attitude that QRT is the only cure for TVI; there *are* answers, and lots of people have found them, but not those who have gone off the air.

1·7 mc Postscript

Last month we mentioned that G3AUR was heard 135 miles South of the Azores on the top band. Now G3AUR (Benson) writes to say that he is very sorry, but he wasn't—he only operates on 7 and 3·5 mc. So it was either a pirate or a misread call. G2YY (Berwick) has, however, received a very nice report, according to G3AFL (Berwick), in the shape of an Air Mail from Habbaniya, Iraq, where his 1·7 mc signals were 459 at 2250 on December 11. A very nice piece of DX, this.

And on the subject of Top Band working, G5AU (Warrington) is running a series of enterprising tests which will be of great interest to many 1·7 mc operators. By holding it up on a number of balloons, he is testing a vertical (or near vertical) aerial 530-ft. long, on 1840 kc from 2300 on Saturday evenings and on 1740 kc from 0600 on Sundays; all transmissions will be on phone, and reports (which should be sent through us) are particularly requested from outside the British Isles.

". . . A long CQ call . . ."

Competitive Stuff

This month we publish only the top-scorers in the 1948 Marathon, which is now past history. Also, anent the remark last month about regretfully having to place ourselves at the top of the Four-Band Table (28 mc Order of Merit), we are glad to say that G6HL arrived in the nick of time and takes top place with the fine score of 118 countries on 28 mc. Next month the list will be in order of 14 mc scores once more.

Don't forget that if we don't hear from you for three consecutive months your score is automatically removed from the list to make way for others.

For the time being we will continue to publish the list of Post-War Zones and Countries worked, but we regard the Four-Band List as the main thing and are glad that it has become so popular.

Closing date for next month will be February 9, first post. Please note this, because on account of the short month it is about the earliest deadline we have yet had. All letters, lists and so on to be sent as usual, please, to DX Commentary, *Short Wave Magazine*, 49 Victoria Street, London, S.W.1. What will next month's mail bring? Anything might happen. So 73 and BCNU.

Power Pack Design

Condenser and Potential-Divider Values, Voltage Stabilisation and the Bias Supply

By P. E. LEVENTHALL, B.Sc. (G3CJJ)

PART I

(This useful article deals in detail with many obscure points in connection with power supply design. Too often, amateur power packs are thrown together without due regard to the correct choice of values for the service required.—Ed.)

WHILST designing a power supply recently it was borne upon the writer that there is scarcely any information available on the subject in a form suitable for assimilation by the average amateur.

In discussing the matter with several of them, the writer was forced to the conclusion that power supplies have hitherto been built on a system of hit-or-miss guesswork. This is particularly so in the case of the condenser input filter where there seems to be great difficulty in deciding on the correct value of the input or reservoir condenser.

The amateur generally regards the power supply as the least important part of his equipment and simply wires up the standard full-wave circuit using any condensers which may be to hand.

It will be clear that this is an unfortunate state of affairs when one realises that a power pack is required for practically every piece of apparatus in the station and may give rise to many troubles, from intolerable hum in a receiver to frequency creep in a transmitter.

It is with a view to easing this unsatisfactory position that this article has been written and it may not come amiss to give, by way of preamble, a few short notes on the operation of the reservoir condenser.

Basic Theory

The wave-form of the output voltage across the resistance load of the simple half-wave rectifier system Fig. 1*a*, is shown by the graph Fig. 1*b*. The resulting wave-form when a condenser is placed across the load is shown by the heavy line in Fig. 1*c*. The corresponding figures for full-wave rectification are shown at Figs. 2*a*, 2*b* and 2*c*. The dotted line represents the DC output voltage while the thick line is the superimposed ripple voltage.

It can be seen that the ripple voltage, or hum, has twice the frequency of the supply in the full-wave case and is therefore more easily filtered off.

The rectifier conducts only during a small part of each cycle when the applied voltage is near its peak, and the reservoir condenser charges up to this peak value. The charging ceases when the peak is passed, and the condenser begins to discharge through the load until the voltage across the condenser becomes lower than the rising voltage of the next half-cycle (or full cycle in the case of a half-wave rectifier), when the charging begins again. It is clear then that the condenser acts as a reservoir which is partially emptied and refilled during each half-cycle.

The smaller the charge and discharge with respect to the total charge on the condenser, the less will be the fluctuation or ripple of the voltage, *i.e.* the larger the condenser for a given current drain, the less the ripple or the better the smoothing.

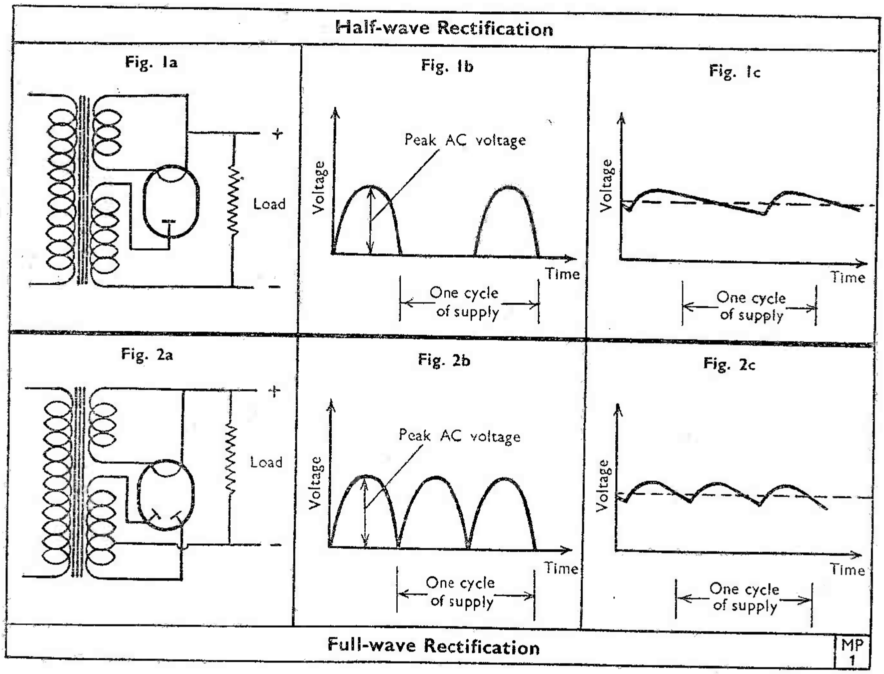
The DC voltage across the condenser equals the peak AC voltage *minus* the average ripple voltage. since the ripple decreases as the capacity of the reservoir condenser increases, it is plain that increasing the size of the condenser increases the effective DC voltage until the limiting case when the ripple is negligible, and the DC voltage across the condenser (or load) equals the peak value of the applied AC voltage.

A simple analysis shows that

$$V = E_{peak} - \pi IX$$

where V is the DC voltage across the reservoir condenser, E_{peak} is the peak value of the applied AC voltage, I is the load current in amps, and **X** is the reactance of the condenser (in ohms) at the ripple frequency.

The equation may be used as it stands to give most of the information necessary in the design of a power supply, but the



author has constructed a nomogram which greatly simplifies the task.

Using the Nomogram

The nomogram may be used to find the capacity of reservoir condenser necessary to give a required output from a given transformer, to find what transformer would be necessary to give a stated output using a specified condenser, or to find what output would be obtained using a specified transformer and condenser.

The nomogram has been constructed for full-wave rectification of 50 cycle AC, but may be used for half-wave rectification or for any other frequency by multiplying the values of capacity on the left-hand scale (A) by (100/f), where f is the lowest frequency component of the ripple.

It is necessary to calculate the value of E*peak* — V, where E*peak* is 1·4 times the rated value of the transformer, and V is the required output voltage. In order to simplify matters to the utmost a " yard-stick " has been provided to convert RMS values to peak values. Its range may be increased by multiplying both sides by 10 or 100 as required.

Examples

(1) A receiver requires a power supply of 300 volts at 120 mA. The rectifier is of the full-wave type connected to a 50-cycle supply. If the input condenser of the filter (*i.e.*, reservoir condenser) is 8μF what will be the required AC voltage?

Place a straight edge between 120 on the load scale (B) and 8 on the capacity scale (A). The straight edge then intersects scale (C) at 80 volts. Therefore the peak AC input required is $300 + 80 = 380$ volts and converting this to RMS values we have 271 volts.

Hence a 275-0-275 volt transformer capable of supplying 120 mA would be suitable.

(2) Given a transformer with a secondary delivering 350 volts (RMS) each side of centretap, what size input condenser is required to obtain a DC supply of 480 volts at 5 mA?

The peak AC voltage is $350 \times 1{\cdot}4$ (or from the "yardstick") = 490 volts. Therefore, Peak AC — Required DC = 490 — 480 = 10 volts. Placing a straight edge between 10 on scale (C) and 5 on scale (B) it intersects at 2·5 μF on scale (A) and this is the capacity of input condenser required.

(3) A 500-volt transformer used on 50 cycle AC is to have its output half-wave

rectified. What will be the resulting DC output at 200 mA if an 8 μF condenser is used?

The peak AC is 700 volts (from "yardstick"). Since the fundamental ripple frequency is now 50 cycles we must multiply all numbers on scale (A) by 100/50, *i.e.* by 2. The original 4 μF mark now becomes 8 μF. Placing a straight edge between 4 on scale (A) and 200 on scale (B) we have intersection at 250 volts on scale (C). Therefore the DC voltage output equals Peak AC – 250 = 450 volts.

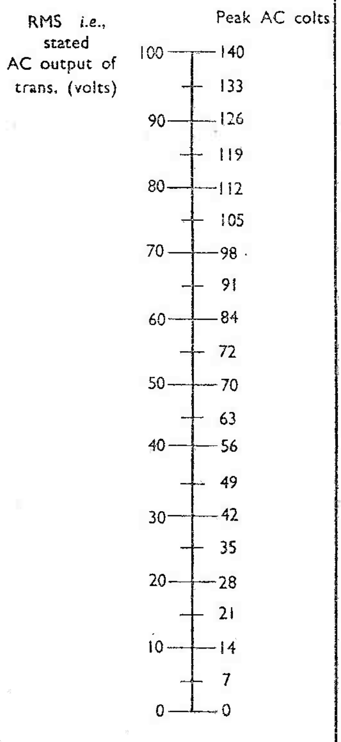
If the resistance of the smoothing choke following the reservoir condenser is known, the voltage drop across it may be found by Ohm's Law and added to the required DC voltage. If the rectifier valve is mercury vapour type an extra 15 volts may be added for the drop across the valve.

The nomogram may be employed for all values of load current from 1 mA to one ampere. It may be used for *all* voltages since (E_{peak} – V) does not depend on the absolute value of E_{peak}. For instance, if for a given current drain and condenser size, the DC output voltage is 100 volts less than the peak AC input it will be so regardless of whether the peak AC is 150, 729 or 10,000 volts, so long as the current drain and the condenser capacity remain the same.

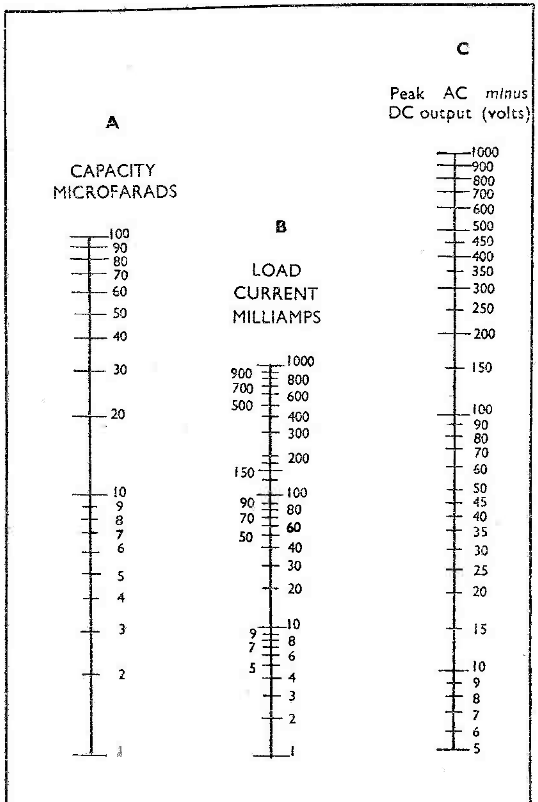
The Filter Circuit

The smoothing filter is another piece of apparatus which, though very important, is often imperfectly understood. This need not be so as its mode of operation can be quite simply explained.

Fig. 3*a* represents the ordinary type of filter circuit as used by amateurs, the terminals A and B being connected across the reservoir condenser. The input to



"YARDSTICK"



NOMOGRAM

MP 2

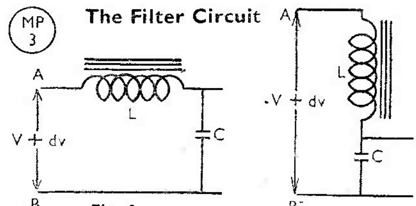


Fig. 3a Fig. 3b

A and B therefore, consists of a steady voltage V, with a superimposed ripple voltage of magnitude dV.

If the filter circuit is redrawn in the form shown in Fig. 3*b*, its operation at once becomes apparent as it is no more than a voltage divider or potentiometer.

As far as the DC component V is concerned, the condenser presents an infinite impedance to this and the total DC voltage is obtained across the condenser, minus only the ohmic loss due to the resistance of the wire in the choke.

The ripple component (which is AC) fares differently. The choke presents a high impedance to the ripple frequency, while the condenser acts almost as a short circuit.

Thus, the greater part of the ripple voltage appears across the choke and only a very small part across the condenser with the DC component.

It is in this way that the filter performs its operation of smoothing the rectified supply.

This result may be quite easily expressed quantitatively.

The magnitude of the ripple voltage across the condenser is given by

$$\frac{dV \times \text{Reactance of C}}{\text{Reactance of L \& C}} = \frac{dV \times 1/C\omega}{L\omega - 1/C\omega}$$

where L is in henries
C is in farads
dV is in volts

and ω is the pulsatance of the ripple frequency and equals $2\pi f$.

This expression reduces to approximately $\frac{dV \times 10^6}{4\,LC\,\pi^2 f^2}$

where C is now in microfarads (μF).

As an example, suppose L=30 henries, C = 8 μF, f = 2 × 50 = 100 cycles/sec. Then the magnitude of the ripple across the condenser equals

$$\frac{dV \times 10^6}{4 \times 30 \times 8 \times \pi^2 \times 10^4} = \frac{dV}{96}$$

Thus the ripple voltage has been attenuated to 1/96 of its previous value or to approximately 1 per cent. Further attenuation of the same order may be obtained by connecting another such filter after the first one.

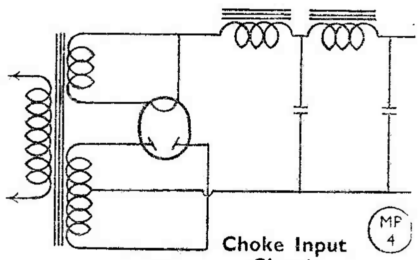


Fig. 4 Choke Input Circuit

It is clear from the expression above that the attenuation of the ripple depends upon the values of L, C and f, the ripple becoming smaller as these are increased.

Therefore, in order to obtain good smoothing the advice is to use full-wave rectification (f = 2 × supply frequency), and to make L and C as large as possible. It is, of course, necessary to see that the working voltage of the condensers is not exceeded and that the chokes can pass the required current. The resistance of the chokes must be such that they do not cause too great a voltage drop at the required current.

Choke Input Filter

Where good regulation of a heavy power supply is required (such as for a large class-B modulator) it is often preferable to use a choke input filter as shown in Fig. 4. Filter stages as described in the previous section may be added to give any required degree of smoothing.

Advantages of the choke input filter as compared with the condenser input filter are,

(*a*) The regulation is better, *i.e.* the output voltage is more nearly constant when the load is varied.

(*b*) The condenser charging current is reduced owing to the choke being interposed between the rectifier and the condenser. This restriction of the current prolongs the life of the rectifier and is particularly useful in the case of mercury vapour rectifiers.

The choke is usually of the swinging type, and for design data it is merely necessary to refer to the manufacturer's details for the rectifier being used.

The voltage output for a given transformer and rectifier is less with the choke input filter than with condenser input.

(Part II of this article will follow)

Two-Metre CC Converter

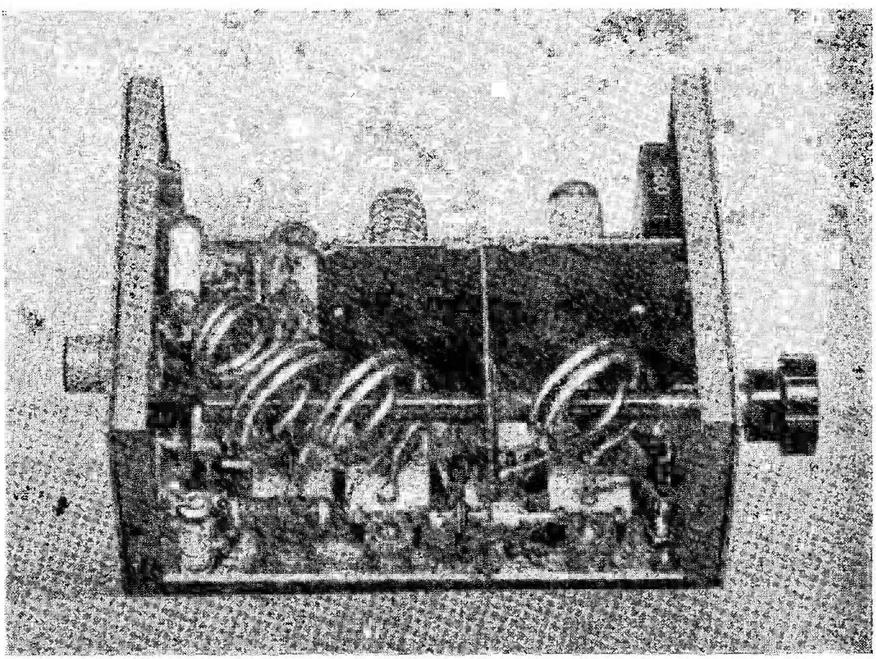
New All-Triode Design for the 144-146 mc band

By M. D. MASON (G6VX)

(It can fairly be said that the design here presented typifies the very latest in VHF receiver techniques. It is a crystal-controlled converter tuned on the IF side and can be operated with any modern communications receiver. Our contributor brings out a number of very interesting design problems in VHF receiver circuitry and shows how they should be met.—Ed.)

THE more simple a converter becomes, the better it seems to perform, a point which is proved by the performance of this all-triode design.

The crystal-controlled converter to be described is probably the simplest and cheapest yet devised. The only requirement for smooth performance is a reasonably good communication receiver, free from unwanted signal pick-up within the IF channel with the converter in operation. The IF channel considered is the range over which the receiver is tuned to cover the 144-146-mc band—in this case 8-10 mc. When this condition is satisfied, signals on two metres are handled with the same ease as when the set is used direct, working on the 8-10 mc band with its normal aerial. Hard-bitten operators do not really worry about the congestion on the HF bands—they only grumble a little but still work who they want. Well, let the QRM come to 144 mc and with this converter you will be more than half-way equipped to cope with the worst congestion.



Underside view of the 144 mc converter. The permeability tuner is clearly visible, working in the fields of the RF circuit inductances.

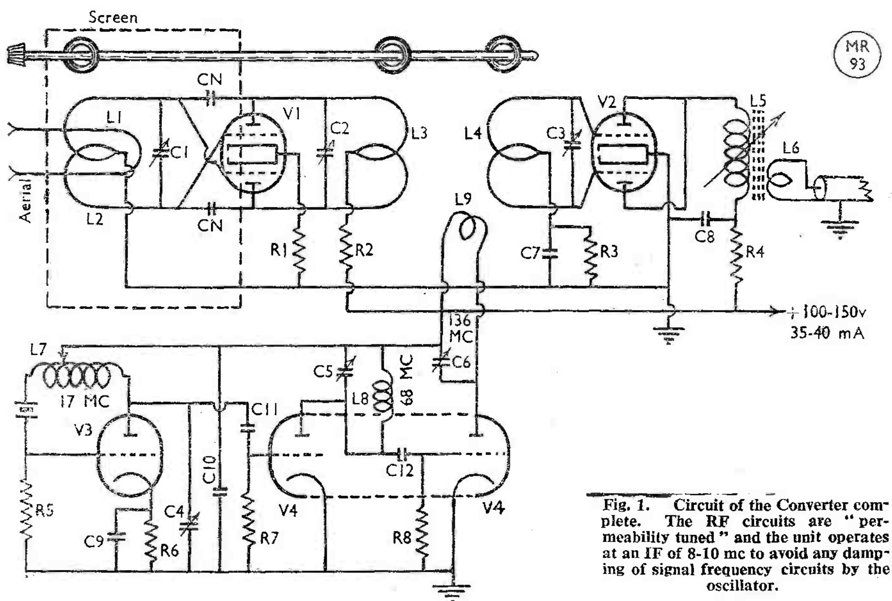


Fig. 1. Circuit of the Converter complete. The RF circuits are "permeability tuned" and the unit operates at an IF of 8-10 mc to avoid any damping of signal frequency circuits by the oscillator.

Circuit

The RF stage was developed after several broad-band amplifiers had been used, all producing very good results. It was felt that a little off-channel discrimination would be worth having if this could be achieved in some simple manner. All the gain required can quite easily be realised from two stages of broad-band RF amplifiers, adjusted for 2 mc bandwidth using, say, 6AK5's. A single 6AK5 with optimum concentric line input and output circuits will out-perform the broad-band amplifiers as far as noise and selectivity are concerned, but this system requires some expert plumbing for a pretty job.

The neutralised push-pull triode RF stage has had some very convincing support from leading VHF workers, and seems fully to justify its consideration when quiet RF amplification is the object.

This RF amplifier is, indeed, well worth a trial on its own, since it can be constructed so easily. It may be tested by link coupling to the regular two-metre receiver. The noise increase is only just noticeable, but when the tuning is peaked on a signal the real benefit is immediately apparent.

The 6J6 mixer was chosen for its clean symmetrical input circuit at signal frequency. Optimum oscillator injection is

Table of Values

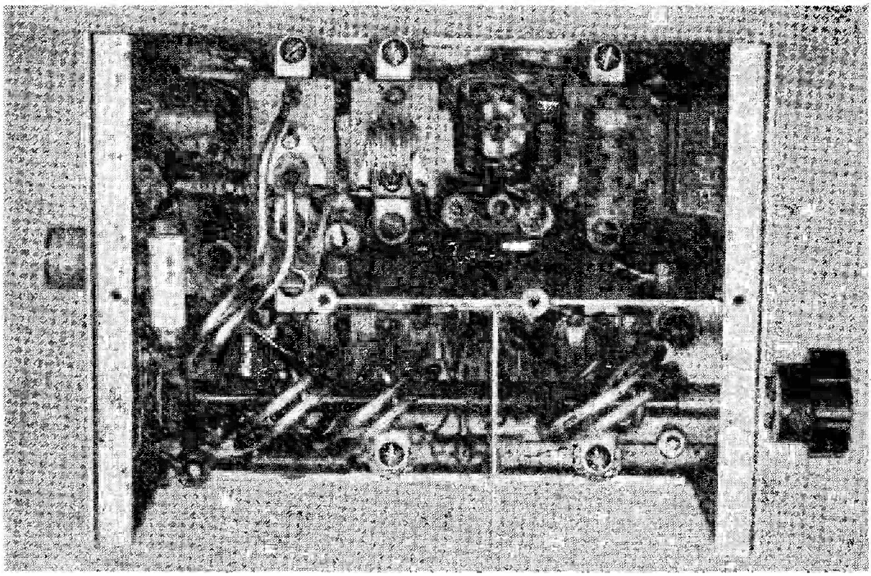
Fig. 1. Circuit of the 2-Metre CC Converter

C1-C6	= 3-30 $\mu\mu$F trimmers
C7	= 50 $\mu\mu$F
C8, C9	= ·001 μF
C10	= ·01 μF
C11	= 15 $\mu\mu$F
C12	= 25 $\mu\mu$F
Cn	= ½-in. dia round discs spaced 1/32-in.
R1	= 50 ohms, 1 watt
R2	= 3,000 ohms, 1 watt
R3	= 1 megohm
R4	= 50,000 ohms
R5	= 10,000 ohms
R6	= 150 ohms
R7, R8	= 47,000 ohms
L1	= One turn 20 SWG enamelled
L2, L3, L4	= Two turns 14 SWG silvered ⅞-in. I/D. spaced 1/16-in.
L5	= 50 turns 40 SWG on ¼-in. dia iron-dust core, adjusted for 9 mc
L6	= 10 turns 30 SWG wound close to L5
L7	= 21 turns 30 SWG on ⅞-in. former, tapped at 7 turns
L8	= 5 turns 20 SWG Tinned on ⅜-in. rod, turn spacing equal to wire diameter
L9	= Two turns 14 SWG silvered wire ⅝-in. I/D

Note : L1, L3, L4 mounted at 45 deg. to shaft. Spacing L3-L4, ¼-in. Spacing L4-L9 ⅝-in.

V1, V2, V4	= 6J6
V3	= 6J6 or 6C4

One side of heater line earthed. Crystal of 5666·66 kc for 8-10 mc IF. RF tuning by means of ⅜-in. I/D completed rings of 14 SWG silvered wire mounted at 45 deg. to paxolin control shaft.



Another view of the underside of the G6VX converter.

not too critical and conversion efficiency is quite good, with the added advantage of low noise. This particular circuit in conjunction with a 6J6 is recommended by RCA for operation up to 600 mc.

The IF Side

A few suggestions are in order for choosing a suitable tunable IF to use with a fixed HF oscillator or crystal-controlled converter. The most important point to check is that the main receiver is free from unwanted pick-up on any of the bands that may be usable for the IF. This check can be quickly performed by connecting the aerial terminal to chassis *via* a very short connection. Then turn up the RF and audio controls, switch on the BFO, and search the desired band for unwanted signals. This test is worth doing both for day and night time conditions, since signal strengths can vary so widely depending on conditions at any time Supposing a few weak signals are found, do not give up until a check is made to determine whether or not they are coming in through the HT power or heater wiring.

The power input cable is another source of pick-up. When a separate power supply is in use, by-pass the heater leads to chassis with ·01 μF condensers just after the heater heads enter the set. Do the same with the HT leads, but place in series with each a 1 mlH choke, and by-pass the set side of the chokes to chassis with ·01 μF condensers. If the RF stages of the set are sufficiently screened in the first place, the filters should complete the job.

One other possible source of slight pick-up is the coaxial cable connecting the converter to the set. A useful tip to help eliminate this trouble is to use an *additional screen* over the top of the first coaxial cable. This can be made by pulling the centre core out of a larger size coaxial cable and then threading the small one through. Bond the screens together at each end. Another worth-while precaution for avoiding unwanted pick-up on the tunable IF range is to place a 1 mlH HF choke in the HT lead, inside the converter. At the same time by-pass the "hot" heater lead to chassis.

The choice of IF can be governed by several considerations : Available crystals on hand ; calibration of the main set ; and band-spread and ease of logging. It is convenient to use a spot where the dial reads almost directly, *i.e.* 24-26 mc or 14-16 mc or 34-36 mc or 4-6 mc.

Choice of IF

A design factor comes into the choice of the final IF. If careful shielding of the

144 mc amplifier and aerial input is not possible or convenient, it is a good tip to use a high IF so that the local oscillator frequency is well removed from the signal frequency, otherwise several volts on the grids of the RF amplifier may completely overload this stage and render it worse than useless. It must be remembered that the selectivity of the usual coil-condenser arrangement at 144 mc can be measured in megacycles and not in kilocycles. The exception to this is a properly designed coaxial line tuner. The converter being described has sufficient shielding to allow an IF as low as 6 mc without any trouble. It will be realised from these remarks that a mixer giving the lowest possible injection voltage for optimum conversion will help a great deal in avoiding RF amplifier overloading by the local oscillator. Another important point in selecting the tuning range is to determine the IF of the main receiver, and whether the oscillator tracks on the HF or LF side of signal frequency. These points must be known so that a suitable crystal can be selected to avoid unwanted "birdies" being generated. The crystal frequency for the converter must be on the LF side of 144 mc if the main receiver is to read the same way as the dial calibrations, and not backwards.

Crystal Frequency

Choosing the fundamental crystal frequency: Suppose an IF of 8-10 mc is convenient, the final oscillator frequency must be 136 mc, *i.e.* 136+8 = 144. If the main receiver IF is 455 kc and its own HF oscillator tracks on the high side of the signal, no harmonic of the crystal must fall in the range of 144 to 146·5 mc, or 8 to 10·5 mc. If the image-ratio of the main receiver is not very good, crystal harmonics must not fall in the range of 8 to 11·5 mc. When this point is taken care of, it is still possible to receive strong stations in the 144 to 146 mc band on their correct frequency, and again at 910 kc removed. This only occurs when the image ratio at 8 to 9 mc is very poor. Of course, a possible solution to all these difficulties is to feed the converter directly into a good TRF receiver. It works very well, but the usual advantages of noise limiters and crystal gates are not normally available, and the main idea of using your favourite receiver on VHF is lost.

Working backwards from 136 mc, the next possible harmonics are 68 mc and 44 mc. Warning ! Do not touch 44 mc with any kind of tuned circuit ; TV smells this one out yards away ! But 68 mc can be generated from 34 or 17 mc ; this means that the lowest crystal frequency to be considered is 17 mc. It must be remembered that if the same accuracy of calibration on 144 to 146 mc is desired as when the main receiver is tuned on the 8 to 10 mc range, the converter crystal must be *exact*, so that the 136 mc oscillator frequency is nothing but 136 mc. Whatever errors appear will misplace all signals by that amount.

Fortunately, a crystal oscillator circuit recently described from America is just right for making use of nominal low-frequency crystals on the third harmonic, which in this circuit appears as the fundamental. Therefore, to generate 34 mc a 11·3333 mc crystal could be used. However, it is much cheaper to make it a 5666·6666 mc crystal and let the oscillator frequency be 17 mc.

It is fairly safe to say that practically any of the "surplus" crystals mounted in the small-type holders can be made to go off at their third harmonic without any difficulty. The only points to watch are that the crystal is perfectly clean, that the LC ratio of the oscillator circuit is correct, and that the feedback winding is just sufficient to produce oscillation with the crystal in circuit.

Construction

The converter can be made up in any convenient form as long as certain precautions are taken. It is important that the RF amplifier be built symmetrically and screened as much as possible. The 6J6 RF valve is mounted so that the grids are on one side of the screening partition and the plates on the other. The neutralising condensers are placed so that one connection from each goes directly through the screen partition and connects to the crossed-over grid leads. The coils have been mounted directly on their respective trimming condensers. The trimmers are mounted on half-inch lengths of ⅜-in. polystyrene rod. A trimming hole is drilled through the chassis so that the final adjustment can be made with the bottom covers in place. This assembly is common to all trimmers and coils.

The tuning system is straightforward in construction, and very easy to build and adjust. The amount of frequency coverage is determined to some extent by the diameter of the tuning loop. The dimensions given cover about 143 to 147 mc for 180 deg. rotation. Tracking troubles are quite easy to overcome since the coils tune fairly flatly. The aerial coupling is very

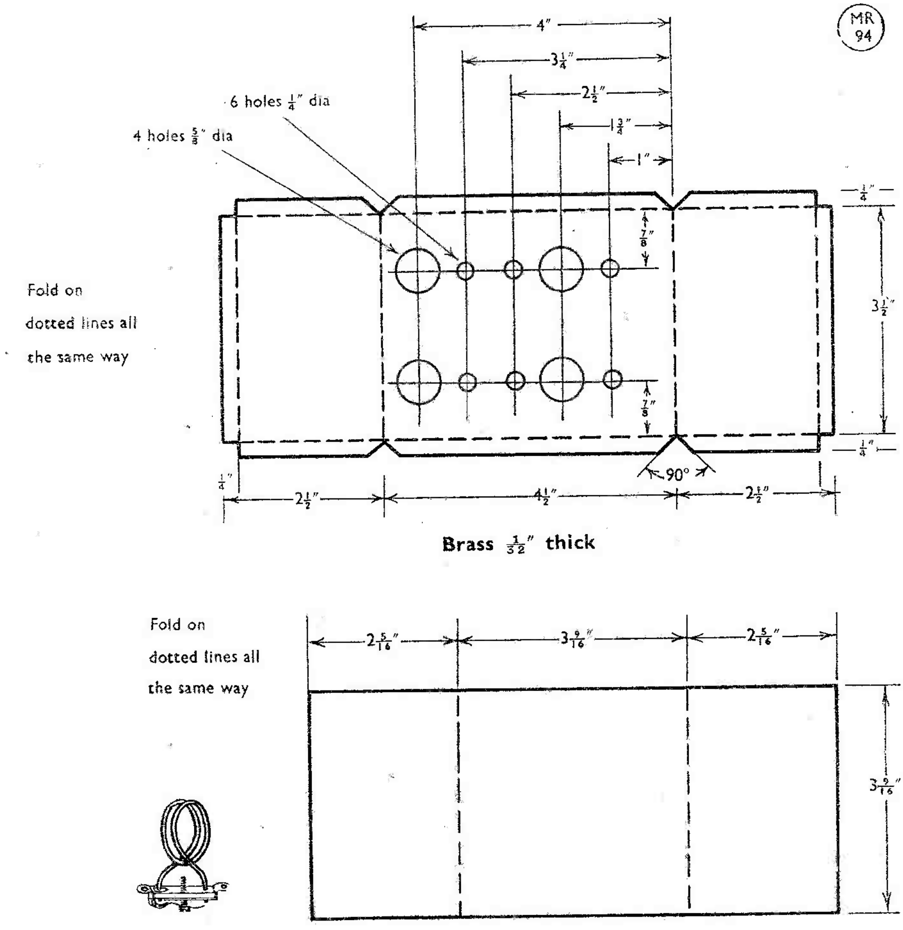
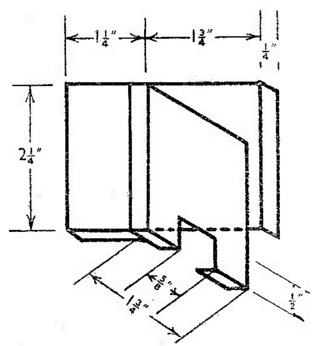


Fig. 2. Detail of the chassis construction.

tight, consisting of one turn almost in line with the two on the input coil. The coupling is adjusted by bending the single turn at right angles to the input coil for minimum coupling. The amplifier plate winding and mixer grid coil are far more critical for tracking. The coupling is fairly loose, and the trimmers are very effective. All trimmers are set for the HF end of the band and the spacing between turns is adjusted to vary the inductance at the LF end. The tuning loops should all be spaced symmetrically in the centres of their respective coils. When the tuning shaft is rotated 180 deg. the loops should have moved together from a position at right



angles, to a position perfectly in line with the coils.

Neutralising of the RF stage may be checked in several ways. One method is to place a 25 mA meter in series with the 3,000-ohm HT feed. When the tuning loops are rotated or when any of the coils are touched there should be *no change* in the plate current once the neutralising condensers have been set correctly. The second way is to put the converter in operation, and when the RF tuning is rotated, oscillations all over the 144 band will appear if the amplifier is not neutralised. Adjust the condenser until the amplifier becomes perfectly stable. A third method suggested is to connect up the converter with no HT on the RF stage. Tune in a strong local signal and then adjust the neutralising condenser until minimum signal gets through the RF stage. When the HT is now applied the amplifier should be working correctly. The use of the 3,000-ohm 1-watt resistor in the plate feed was found to give more stable operation than a more normal RF choke.

From the photograph it can be seen that the coils are mounted by soldering to the eyelets on the trimmers. These eyelets are soldered to the plates on the opposite side, otherwise a very poor contact may develop. The oscillator socket should be connected as follows: Pin 1, anode; 2, blank; 3, earth; 4, heater; 5, blank; 6, grid; 7, cathode. When this sequence is observed, either a 6J6 or a 6C4 may be used with no change in operation.

Mechanical Construction

The chassis size is 4½ in. long by 3½ in. wide by 2¼ in. deep. The centre screen is 3 in. long and the dividing screen which mounts through the RF is 1¾ in. The outside cover just meets this screen and therefore encloses the input circuit more or less completely. The converter could be built much larger without affecting the performance. In fact, one was built where the crystal control section is completely separate from the signal circuits. The 136 mc signal was link-coupled to the mixer and results were just as good. The neutralising condensers were made by fitting two thin metal discs, ½ in. diameter, on to the small ceramic tube removed from a Philips' 3-30 $\mu\mu$F trimmer. The same results could be achieved by twisting two pieces of insulated wire together, long enough to make up a condenser of 2 to 3 $\mu\mu$F.

One or two final points when adjusting aerial coupling: If the aerial coupling is made too loose, the aerial trimmer will appear quite critical, and if the amplifier is only just neutralised a great increase in noise will appear which may give the impression of colossal gain. This condition is unstable, and will be upset by a strong local signal; at the same time the signal-to-noise ratio is nowhere near optimum. When this converter is operated in conjunction with a HQ-120 receiver, the RF gain control on the latter is set so that the background with BFO in operation and the converter HT off is just perceptible. When the converter is switched on there is a slight increase in noise, but when the aerial is connected there is a very definite increase. This condition is very comfortable to operate, and there is not much fear of missing any signals that should be heard. When the receiver is operated in semi-sharp crystal filter position there is practically no noise at all, although the sensitivity is just the same.

CARDS IN THE BOX

If your call is here, it is because there are card(s) being held for you by our QSL Bureau, and we have not got your address. Please send a large stamped self-addressed envelope to BCM/QSL, London, W.C.1, and the cards will be forwarded on the next G clearance. Should you want your callsign and address to appear in our "New QTH's" column, please mention it at the same time; this will also ensure publication of your QTH in the *Radio Amateur Call Book* in due course.

G2AKU, 2ALV, 2BZT, 2HCR, 2HHP, 2KS, 2KZ, 2ND, 2PH, 3AAP, 3AAW, 3AEA, 3ATX, 3AVV, 3BER, 3BIT, 3BMY, 3BOQ, 3BQT, 3BRZ, 3CBO, 3CFP, 3CLT, 3CXY, 3CZA, 3DAQ, 3DBY, 3DEO, 3DEZ, 3DKJ, 3DNP, 3DOK, 3DPE, 3DPH, 3DQA, 3DQL, 3DRE, 3DRP, 3DRT, 3DSG, 3DUB, 3DUD, 3DUP, 3DWK, 3DXI, 3DYD, 3DYZ, 3DZR, 3DZU, 3EAJ, 3EBG, 3EBR, 3ECR, 3ED, 3EDO, 3EDV, 3EFX, 3EGJ, 3EGK, 3EGV, 3EHA, 3EIP, 3EJH, 3EJP, 3EJV, 3EKG, 3EKW, 3EKY, 3ELI, 3ELL, 3ELQ, 3ENO, 3EOG, 4JZ, 4QA, 6GU, 6IW, 6SP, 8PT, GC2AW, 2FMU, GI3AXE, 3ECQ, 3EEP, 4BA, GM2AZN, 2CAP, 3BS, 3EJS, 3EMG, 3ENJ, 5PJ, GW3CYB, 3DPO, 3DXP, 3EOP.

THE VHF BANDS

Lull in Activity—
Notes on Propagation—
Club Progress—
Individual Reports—

By **E. J. Williams, B.Sc. (G2XC)**

MOST of our experienced VHF enthusiasts have come to recognise the types of weather that produce DX conditions, and as a result many are tending to appear on the bands only when conditions are likely to be favourable. This is regrettable, for not only does it discourage newcomers but occasional good spells pass by without there being sufficient activity on the band to take advantage of them.

There is, however, another aspect of the question and we believe many may share our own view that if only a limited time is available for Amateur Radio, then it is best to do the constructional work during the periods of poor conditions and operate when the bands are open for DX ! One therefore hopes that the low level of activity of which everyone is complaining this month may indicate much benchwork in progress preparatory to renewed activity in the coming months !

Conditions generally have been poor compared with November, although there have been indications of occasional good days. To judge by the strength of the TV signals on the South Coast during the Christmas period VHF conditions must have been very good indeed. December 25 and 27 were outstandingly good evenings. Other good evenings are mentioned in the individual reports.

Propagation Notes

No apologies are made for returning to a subject which has been discussed on numerous occasions in the last twelve months. More than once has it been given as your conductor's personal opinion that ducting failed to explain at all adequately the good GDX conditions so frequently encountered on 5 metres during the past few years. We are well aware that the long-distance radar effects experienced during the war were explained by this theory, but in every case the phenomenon occurred *over the sea* and usually in hot climates where temperatures and humidity conditions would almost certainly be very different from those existing *over land* in this country.

By the ducting theory VHF DX is due to super-refraction which is caused by an abnormal gradient of refractive index with height in the lower atmosphere, or troposphere. The rate at which the refractive index decreases with height is determined by three factors, *viz.* pressure, temperature and humidity. At the surface of the earth the refractive index of the air is of the order of 1·0003, and decreases in the tropospheric regions by about ·000012 per 1,000 feet under "normal" conditions. By "normal" is meant occasions when there are no markedly rapid changes in humidity, and when temperature decreases gradually with height. The bending produced in radio waves by this change in the index is small and far less than the curvature of the earth's surface. It does, however, extend the "radio-horizon" to beyond the geometrical horizon, the extension being about 1/5. To produce a curvature equal to that of the earth the refractive index must decrease by ·000048 per 1,000 feet. This figure is the generally accepted one and can easily be obtained by a consideration of the dimensions of the earth. Under such conditions a ray radiated horizontally from a transmitter would just follow the earth's curvature, while all rays leaving the transmitting aerial at angles below horizontal will ultimately reach the earth's surface.

If the gradient of refractive index exceeds the figure given above, then some of

TWO METRES
COUNTIES WORKED LIST

Worked	Station
25	G2AJ, G2AXG
23	G2IQ
20	G5NF
19	G2NM, G4LU
18	G2CIW, G5BY, G6PG
17	G2XC
15	G8KZ, G8QX
14	G2NH, G5RP, G6LK
13	G5BM

the horizontal radiation will be bent sufficiently to come down again. Thus, some of the rays are trapped as if in a duct and travel round the earth's surface, aided sometimes by reflections at the ground. The effectiveness of the trapping is dependent on the height of the duct and the wavelength, long waves requiring larger ducts than short waves. Hence ducting is most noticeable on VHF and UHF.

Analysis of Conditions

An examination of the Air Ministry data for most of the good dates of the post-war years has failed to reveal even one occasion on which a ground-base duct with the necessary gradient of ·000048 per 1,000 feet has existed, although figures of up to ·00004 have been obtained on rare occasions due to particularly favourable dispositions of temperature and humidity. But such a figure will not do more than extend the VHF horizon somewhat. It will not produce a true duct. Further, GDX has been reported on many days when there has been no indications whatever of even a tendency towards a ground-based duct. On these dates the characteristic tropospheric phenomenon is always the existence of an elevated temperature inversion and/or humidity gradient, frequently at a height of 3,000 to 5,000 feet. If such a layer is to return signals to earth by pure refraction the index gradient will have to be considerably in excess of ·000048, as the length of path in the layer where most, if not all, the bending has to be produced is small compared with the total distance from transmitter to receiver. Again, such gradients do not exist over the British Isles, but there is no reasonable doubt that GDX conditions are produced by the elevated humidity contrasts and inversions.

In view of the arguments set out above it appears to us that the actual turning back of the waves must be reflection, aided of course by the condition of grazing incidence produced by refraction.

Two-Metre DX Working

Worked	Station
Over 350 miles	G2IQ, G5BY
300 to 350 miles	G2BMZ, G2MA, G4LU, G6WT
250 to 300 miles	G2XC, G6OS, G8DM
200 to 250 miles	G2AJ, G2CIW, G2OI, G3DEP, G5MQ, G5RP, G5TZ, G6DH, G6PG

The reason for dealing with this topic at some length is that we were recently challenged by one reader to prove our grounds for arguing with the "experts" ! We are not sure that we are really arguing, as so far we have seen no paper dealing with GDX in the British Isles. Your commentator is still open-minded on the subject and ready to listen to arguments showing that he is wrong—to which end the correspondent mentioned is providing a full article for the *Short Wave Magazine.*

Individual Reports

G2ADZ (Oswestry) enquires what has happened to activity in the South. He found conditions very good on December 17 and 23. On the former date G3DEP (Ryde) was worked, but nought else, and on the latter G2NH and G6YP provided the DX. G2ADZ usually comes on at 1830 and keeps going until 2130, but finds it tiring listening to nothing ! A maximum activity period from 1930 to 2300 daily is suggested by him and we strongly commend this to all 144 mc operators. The Cheltenham stations G5BM and G6ZQ provide consistent signals in Oswestry, 83 miles away, under all weather conditions—including six inches of snow on G2ADZ's beam. Signal strength is better than was obtained on 5 m. and never less than S7. But QRK's are not so good at G4LU 250 feet higher up. GW5SA has been heard through (?) the Welsh mountains.

G2AOL (Otford, Kent) still continues active on five, and hopes to do so until the bitter end. He occasionally finds a new station and has reached 97 ; his target was 100 by the end of 1949. G2AOL is there daily, 1830 to 1915 and 2215 to 2245, and says all callers are welcome. G2BMZ has been endeavouring to receive the TV programmes in Torquay and in spite of some extremely poor conditions has met with a measure of success.

G2CIW (Brentwood) now has a crystal controlled convertor in use on 2 metres and finds it markedly superior to anything he has yet built. The line-up is 6F6 7 mc CO, 6V6 quintupler, 9002 quadrupler into EC52 mixer. RF stage is 6J6 cathode coupled, and IF is 3·4 to 5·4 mc on AR77. G2IQ (Sheffield) reports activity very low in his area, but comments that he frequently hears London stations at S7, working each other, and asks whether they do not want to work DX or have they forgotten there are stations outside London ? However, he finds G6VX as consistent as ever he was.

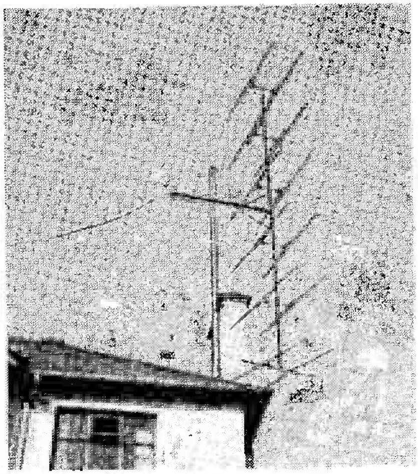
G3APY (Kirkby, Notts) has been inactive due to illness. In Lancashire G3DA (Speke) has maintained a schedule for six weeks with G5CP (Sale); but they have failed to find any kindred spirits. G2OI and G3BY are heard occasionally. On November 8 G3DMU (Scunthorpe) and G2IQ were worked. Both G3DA and G5CP are on 144·14 mc daily at 1900, and at intervals up to 2230.

G3DCV (March) is yet another to join the ranks of the DX TV enthusiasts and finds he receives AP very well when the barometer is high. G3EHY (Banwell, Somerset) reports increasing activity on two metres in his area, at least three stations putting out good signals. Much time was wasted due to an absorption wavemeter being 6 to 8 mc off calibration. Now that this has been rectified it has been possible to locate the band and signals are coming in. A 3-ele. w.s. beam is up and a number of carriers have been heard from over London way. A little more signing on CW would be appreciated at G3EHY. His convertor is CV66-EF54-EC52 into BC-342. An EF54 RF stage was found to be noisy, and a test is to be made with a 6AK5 between the CV66 and the mixer. G3EHY has tried neutralised triodes using 6J6, but in spite of the low noise level and good gain, finds the GGT superior; IF is 18 mc. Active in his area are G3YH and G6JG, both in Bristol, the former VFO on 145 mc, and the latter with MCW and RT on 145·3 mc.

G4LU (Pant, Salop) has worked only six stations in the past month, although they included two new counties. G8DM was a good signal on December 20, G5MA being heard the same evening. G8WV was worked on December 27, the solitary DX occupant of the band at the time. The first 11 days of 1949 produced *nil* results for G4LU. We hope the remaining 354 may be a little better!

G4LX (Newcastle) has now deserted five and is on two metres only. Frequency is 145·116 and he beams on London nightly at 2230. G3CYY is also active and G2BDQ is nearly ready. The last-named is in a poor spot for working South but hopes for some GM's.

G4LX again complains of the poor response to QSL's. Being in a rare county all stations working him make special requests for cards and he has been in the habit of sending these direct whenever possible. In spite of this a large number of stations have failed to reply. He has supplied us with a list of these—so look out, you VHF Century Club claimants!



The 24-element two-metre beam at G6WT, Torquay, S. Devon. This is a Chinese copy of the W2NLY version and gives tremendous gain on both transmission and reception.

A ZB2 Unit has been modified as described in the December 1948 *Short Wave Magazine*, but on his model G4LX has had to use 4-turn coils instead of 3 turns, and also found the IF coil tuned to too high a frequency. He wants some information on switching 600-ohm line be means of $\frac{1}{4}$-wave stubs.

G5BM (Cheltenham), now active on 2 m., has been spending much time on convertor design. The final set-up is 6AJ5 RF and 6J6 mixer/osc, with 30 mc IF into HQ120X. A 6J6 cathode-coupled RF amplifier is to be added in front of the present RF stage. He confirms the consistency of the path to G2ADZ and he is usually active 1900 to 2030 and again from 2215 to 2300. A 6-ele. c.s. beam is mounted above his 10 m. beam; frequency is 145·35 mc. On January 9 G5BM worked G2IQ and on January 12, G2OI.

G5MR (Bognor) has doubts about his Rx on 145 mc, although he has heard G6OS at 200 miles. The line-up is EF54-954-955. A crystal job is being designed. G5RP (Abingdon) is still active on five, but has made a new convertor for two metres. This is based on the 220 mc convertor described in *QST* for October, 1948. On 420 mc G5RP has two receivers in operation—an ASB7 and a P29. The Tx is under way, and a CC convertor.

G6DH (Clacton) has been working ON4FG and PAØPN regularly in spite of the winter season. F8OL, F8NW and F8ZF have also been QSO'd. ON4FG calls G6DH at 1840 daily. G6DH calls "Test 2," beamed ESE, at 1845 ; and CQ beamed WSW at 2200.

G6HD (Beckenham) is concentrating at 430 mc, and has worked G2FKZ at nearly four miles using 'phone. His Tx is CV82 oscillator and the Rx R.1359. The aerial is a dipole in a corner reflector, and fires east.

G6WT (Torquay) is active nightly at 1900 and 2200, just to see if the 2 m. band is open. He worked G2NM on January 13. G8PX (Oxford) has a beam 16 feet high for 2 m. and hopes to push it up a bit soon. He has worked G2CIW and describes a CC convertor built by a local listener. It has a pair of "lighthouses" in a cross-neutralised RF stage followed by 6J6's, the designer saying that triodes are the only valves to use on 144 mc. We know others who agree !

In Scotland GM3BBW and GM6SR are there every evening at 2200 and would appreciate reports. From France F8OL comments on the excellent November conditions, when there was a strongly negative gradient of humidity and rapid increase of temperature in the first 900 feet above ground. He remarks that the horizontal field strength of G6DH, PAØZQ and ON4FG reached 5mV/m, which is stronger than the value for rectilinear propagation in free space with no attenuation. F8OL also worked G6WT, though in that direction the local hills subtend more than $3\frac{1}{2}$ degrees above horizontal.

VHF CENTURY CLUB

LIST OF CERTIFICATED MEMBERS

*G2AJ(200)	G3CWW(150)	*G5PY
G2AXG	G3DA	G5RP
G2CIW	G3DCV	G5YV
G2HDY	G3WW	G6HD
G2KI	G4AP	G6KB
*G2MR	G4IG	G6MN
G2MV	G4RO	G6OS
G2NH	*G5BD(170)	*G6VX
G2OI	G5BM	G6XM
G2RI	*G5BY	G8GX
*G2XC(250)	G5GX	G8SM
G3ABA	G5JU	G8TS
G3APY	G5LQ	G8UZ
G3BLP	G5MA	
G3CGQ	G5PP	

Total : 43 *Full Members*

ASSOCIATE MEMBERS

G3IS	G8KL	G8WC
G5UM	G8LY	

Founder Member

Fiveband Club

During recent months the Fiveband Club has grown substantially in numbers, and plans for social and technical meetings for the coming year are under discussion. With a little more space available this month we would like to give new readers some details of the Club and its activities.

The prime object of the Fiveband Club is to encourage VHF operation and membership is open to all amateur transmitters working on the VHF bands, irrespective of their affiliations. Applicants should send a signed statement that they are actively engaged in VHF work and give an undertaking to encourage and support all such activity so far as they are able. An attractive membership certificate is issued, and no fees of any sort are levied, as the running expenses of the Club are met by the *Short Wave Magazine*. There are thus no conditions of membership other than activity on VHF, nor do we even restrict membership to direct subscribers to the *Magazine*.

On the other hand, regular reports from members are greatly appreciated and help to provide the news in these columns. Club circulars are issued every few months with news of members, including full QTH's. A committee (consisting of G3APY, G5RP, G5YV and G6VX) advises us on matters of policy and organises area meetings. It is hoped to arrange a meeting in the Midlands in midsummer, while discussions are in progress regarding a suitable centre for a meeting in the South in the spring. Oxford, Bristol and Portsmouth are among the places suggested. The London area members, under G6VX, have recently started a very useful 145 mc frequency measuring service and the first list of frequencies has been circulated to the Club. It is hoped to issue amendments every few months.

The VHF Century Club

The VHF Century Club is open to all Fiveband Club members who can produce 100 post-war QSL's confirming two-way contacts on frequencies above 50 mc. Full rules are as follows :

(1) Cards should be sent by registered post to the address at the end of these notes. They will be returned in a similar way.

(2) The following count as separate QSL's for the purpose of the Club :

(i) (*a*) Card from a station at his fixed home QTH.
(*b*) Card from his alternative (/A) QTH.
(*c*) Card from his portable (/P) QTH.
(*d*) Card from his new home QTH if he moves to a new postal area.
(*e*) Card from his new /P location if it is in a different county from his original /P site.

(ii) Stations worked from *your* portable or /A QTH may be counted *provided* they have not already been included in the list of those worked from the normal home QTH.

(iii) A station worked on more than one frequency band may be counted once for each band, provided separate QSL's are obtained. All bands 50 mc and upwards may be included.

(3) All applications for membership must be accompanied by a signed statement that the applicant has replied 100 per cent. to all QSL's received and will continue to do so. A list of the stations to whom the QSL's refer should also be included.

(4) Operators who have worked more than 100 stations (but who have not the QSL's to prove it) may claim *associate membership* by sending a list of the 100 stations. **Full membership will be strictly limited to those who can produce the cards.**

(5) The VHF Century Club is open only to members of the Fiveband Club.

Special attention is directed to Rule 3, as many applications have been received in the past without this statement.

Quick Ones

G6MN is staying on five till it goes, and though he has found it deserted recently has at last brought in G2XS for Norfolk, making 150 stations in 35 counties ; on 145 mc, G6MN has worked the only station heard so far—G2IQ. . . . G5PY has also found 58 mc a bit quiet recently, so has got himself going on 430 mc, with G2FKZ and G3CU as best DX at about four miles ; G3AHB/A has, however, heard G5PY at about 14 miles, at Hayes. The G5PY Tx is a modified 105 Unit, with 6 watts, a "Q" aerial and an R.1359 receiver. . . . G5BY remarks that as he is busy on a complete reorganisation of his station, he has nothing much to report ; he asks us to mention that he is temporarily out of cards, but everyone due a G5BY card will get one in due course. . . . G3CU, one of the 70-cm. kings, reports a fair amount of activity on the 420 mc band in the London area ; calls he lists are G2FKZ, G2RD, G2RF, G2WS, G3AHB/A, G3CU, G5PY and G6HD, which strikes us as being very satisfactory. Not all have yet worked each other, but most have heard two or three stations ; G2FKZ appears to have the best location, as he is able to work all but G2RF and G2WS. Though G3CU himself is on CC for 70 cm., others are mainly self-excited—a condition which will no doubt right itself as time goes on. Anyway, so much enthusiasm for the 420 mc band is very encouraging. Further to this, G3AHB/A reports that on January 22 he was heard by G2WS/P (Oxted) at 24 miles, R5, S5; G2WS/P also worked G2FKZ. So the coverage increases—well done !

Packing Up Five

As operations on our 58 mc band, both before the war and since the source from which all amateur VHF activity has sprung in this country, are to cease on March 31, it is proposed to wind up Five Metres with a general survey in the April issue of the *Magazine*.

This means that we shall want to get Five-Metre Counties Worked right up-to-date, as that panel has for so long been not only the measure of individual achievement on 58 mc, but also an indication of the steady collective progress made in VHF working. So please let us have your final claims by the due date in March, and provided nobody works another county after that date, the final panel will appear in April.

In Conclusion

May we again draw your attention to the suggested maximum activity period every evening from 1930 to 2030. Although 144 mc gear can be operated without interference to television a large number of the London area VHF operators are keen viewers and consequently activity in the South falls markedly during TV hours. So Northerners should note that 2030 to 2200 is *not* a good time to look for Southern DX.

We have also been asked by more than one reader to urge all G stations to stay in the HF half of the 144-146 mc band and to leave the LF end for the Continentals. So far we have not heard any G's in the LF portion. Reports for next month should reach us by February 11 addressed E. J. Williams, G2XC, *Short Wave Magazine*, 49 Victoria Street, London, S.W.1. CU on March 2.

Another Modulation Monitor

And a Discussion on Depth of Control and Power Levels

By A. B. WRIGHT (G6FW)

This article does more than describe a modulation level indicator which is easy to build and adjust—it will be of the greatest assistance to those who have yet to familiarise themselves with some of the practical problems of modulating the carrier.—Ed.

UNDER the present congested conditions prevailing in the amateur 'phone bands, the importance of making the fullest possible use of one's carrier is well understood by all telephony operators. But there are many, particularly among the beginners, to whom a simple explanation of the methods of obtaining that magical "hundred per cent." figure may be of some value—and there are others of us, who imagine we are fully modulated, to whom a simple form of modulation percentage checker might be useful.

The original purpose of this article was to describe an easily constructed modulation meter-cum-'phone monitor, but it is felt that a few words on the subject of modulation, besides stressing the value of such an instrument, would be of some help in introducing the subject.

Importance of Full Modulation

All methods of modulation aim at producing the maximum of audible output in the receiver, and this is effected entirely by variation of either the amplitude or the frequency of the transmitted carrier. In this article amplitude modulation alone will be considered since this is the system in common use on our communication bands.

Any full treatment of the theory of amplitude modulation would require a much longer and more detailed article than the present one, and as the average 'phone beginner requires practical advice rather than large doses of theory and mathematics, some knowledge of the principles of modulation will be assumed.

Supposing, then, we have our unmodulated 100-watt carrier. To modulate this carrier to the 100 per cent. level requires the addition of 50 watts of audio to be superimposed upon it. This extra 50 watts is expended in the generation of the two sidebands on either side of the carrier.

Under perfect conditions of modulation the positive and negative excursions of the radiated sidebands will be equal and opposite in amplitude, with the result that the S-meter of a receiver tuned to the signal will show no variation due to modulation. If the S-meter moves up or down to any degree it must be because the positive or negative modulation peaks are excessive.

When the carrier is 100 per cent. modulated, using a sine wave input, the average carrier power is increased by 50 per cent. whilst the *peak* power is increased to four times the carrier power. To modulate the carrier 50 per cent. only 12·5 watts of audio are required (again assuming a sine wave input) but in this case the peak power reaches only 2·3 times the carrier power.

As mentioned earlier, the audible output from the other fellow's receiver depends entirely upon the range of variation in the sideband power and from the figures given above it is clear that a 50 per cent. modulated carrier falls far short of the 100 per cent. modulated carrier in producing the maximum possible amount of audio power in the distant receiver. As a matter of interest, the accompanying table (Table 1), gives a few pertinent facts concerning the comparatively steep falling off in peak carrier power and aerial current for four values of modulation percentage.

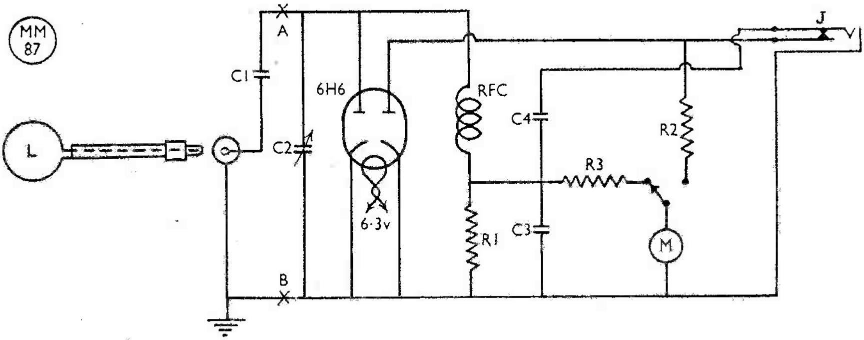
Table 1

Percentage Modulation	Ratio Peak Power To Unmodulated Carrier Power	Percentage Current Increase
100	4·0	22·5
70	2·9	11·6
50	2·3	6·1
30	1·7	2·2

It must be stressed that the above figures all assume a sine wave input to the modulator, as represented by a pure audio tone or a whistle. With speech input rather different conditions obtain, as speech waveforms are very peaky and when a transmitter is adjusted for 100 per cent. modulation on speech *peaks* the *average* depth of modulation is in the region of 40-50 per cent. only.

Effects of Over-Modulation

The latter statement will make it clear why it becomes so easy to over-modulate on speech inputs, and why some method of



Circuit of G6FW's modulation meter/monitor. It can be calibrated to read modulation depth directly.

modulation monitoring is necessary if such a state of affairs is to be avoided. Much BCI trouble and reports of spurious radiation can be caused by over-modulation, due to high damping of the 'phone signal resulting in induced voltages in nearby aerials, power wiring and so on, an effect which can seldom be cured by the usual wave trap or line filter.

It is a common experience to be given over the air a report of under-modulation when a glance at an oscilloscope shows the signal to be fully modulated or even over-modulated on *speech peaks*. The explanation is, of course, that the station at the receiving end is judging modulation percentage by comparing the *average* speech level with the strength of the carrier. The high speech peaks, which on the oscilloscope are giving evidence of full modulation, contain very little power and simply add nothing to the audible signal—but at the same time they may over-modulate the carrier causing "sideband splash" and even BCI trouble at the transmitter end.

The only remedy for this state of affairs is speech clipping—or cutting-off the high frequency speech peaks—in the speech amplifier or modulator by means of suitable audio filters. It would require more space than is available now to deal fully with this subject, but it would seem to be the only answer to the problem of putting out a carrier which is as fully modulated as possible on speech, while at the same time avoiding over-modulation. Briefly, by cutting off the peaks, the average depth of control can be increased without reaching over-modulation.

Observing Modulation Effects

The whole problem of modulation makes it a virtual necessity to have in the station some means of estimating modulation depth if over-modulation is to be avoided—or conversely, if it is evident from reports that modulation is down.

It will now be clear that one cannot altogether rely on reports received over the air unless the distant station is checking the transmission on an oscilloscope, though the effects of a grossly over-modulated or very under-modulated carrier are evident without actual measurement being necessary.

All the text-books say that when modulating the PA plate meter needle must be stationary, and an upward or downward kick of the needle certainly indicates faulty operation.

A downward kick of the needle can however, indicate poor regulation of the PA plate power supply, especially where the PA and modulator are receiving current from the same power pack. Under these conditions, however, it will usually be found that an RF ammeter in the aerial feeders will kick upwards despite the fact that the PA meter would seem to indicate "downward modulation."

The usual reason for the unsteadiness of the PA plate meter is carrier shift, caused by the carrier power shifting upwards when

Table of Values

The Modulatiou Meter

C1, C3	= ·001 μF, mica
C2	= 100 $\mu\mu$F, airspaced trimmer
C4	= 0·1 μF, paper
R1, R2	= 50,000 ohms
R3	= 150,000 ohms
RFC	= 2·5 mH, RF choke
J	= Closed circuit jack
L	= 1 or 2 turn link
M	= 0-1 mA, Milliammeter

the average power in the positive half cycles of the speech wave form exceeds that of the negative half cycles, and *vice versa*. A similar movement can be observed on the receiver S-meter or on the meter of the diode 'phone monitor which it is the main purpose of this article to describe.

Several conditions can cause carrier shift. First, for 100 per cent. modulation the PA must be capable of quadrupling its power output on peaks. Most modern RF valves, if run under the conditions and within the ratings specified by the manufacturers, can be used in a PA with the assurance that a modulation capability of 100 per cent. is possible, provided the following precautions are taken :

The driver valve must be capable of supplying sufficient drive to the PA grid or grids. Lack of drive is perhaps the most common cause of downward carrier shift and should be the first point to be given attention if "downward modulation" becomes evident.

Secondly, the PA must be adequately biased to beyond twice the cut-off value if it is to be run in true Class-C. It is no use decreasing the bias on the PA in an endeavour to increase the grid current, as by doing so the operating conditions are changed and the PA will no longer present a pure resistance to the modulator, as it would do in Class-C—that is, the PA plate current will not vary in direct proportion to the plate voltage when the latter is swung upwards and downwards under modulation. It is also clear that to preserve these conditions the correct load must be applied to the PA by varying the aerial coupling until the PA is drawing the amount of current specified under given values of plate and screen voltages.

Thus, any attempt to increase the PA output by increasing aerial coupling beyond its optimum value will result in improper conditions of modulation, as the downward kick of the PA plate current meter will show.

Visible Indications

Upward carrier shift, as shown by an upward kick of the plate meter or receiver S-meter, can mean over-modulation, but can also be caused by self-oscillation in the PA stage, either parasitic oscillation caused by wrong disposition of the components or wiring, incorrect values of by-pass condensers, or by self-oscillation caused by incomplete neutralisation.

And so, whilst the plate needle will indicate whether or not all is well with our modulation we are still in the dark regarding the actual *depth* of modulation.

In a transmitter described by the writer in the *Short Wave Magazine* (December, 1947, January, 1948) use was made of a lamp link-coupled to the PA tank to indicate modulation, but here again the indication is rough and ready, and the device was incorporated merely to give the operator visible assurance that the PA was being modulated. With practice it does become possible to judge by the relative increase in brilliance of the bulb whether the carrier is being adequately modulated, but that is all.

Then, again, it is possible to estimate modulation depth by noting the increase in aerial current in accordance with the figures given in Table 1. The usual thermo-coupled meter is however, heavily damped and sluggish in operation and while a sustained sine wave input (or whistle) to the speech amplifier will produce an increase in the meter reading, it cannot possibly follow the rapid fluctuations produced by speech.

On speech input the increase in aerial current is a measure of modulation percentage only to this extent : No increase indicates very low percentage, a slight increase of from 5 to 10 per cent. indicates a fairly high percentage, while an increase of 15 per cent. is almost certain to mean over-modulation.

The ideal method of checking modulation is by means of a cathode ray oscilloscope, which will give us a picture of the actual carrier under modulation. (See *Short Wave Magazine*, December, 1948). An oscilloscope is the only instrument which will follow faithfully the vagaries of the speech wave form, enabling the operator to see at a glance whether the speech peaks are over-modulating the carrier. The actual modulation percentage can also be estimated with some degree of accuracy by connecting the oscilloscope so as to present the familiar trapezoid pattern when the carrier is being modulated, and then comparing the lengths of the vertical sides of the trapezoid pattern.

But again, unless the source of modulation is a sine wave (which it never is on speech !) the shape of the trapezoid will be constantly changing and it is difficult to measure the actual percentage of modulation when speech input is being used.

Simple Modulation Meter

The writer has for some time employed a very simple form of modulation meter which does not require the use of an oscilloscope, apart from the initial calibration of the instrument, and yet enables the operator to form a fairly accurate estimation of the depth of modulation.

The circuit of the instrument is given in Fig. 1, being the basis of most modulation monitor circuits and having no claim to originality. It enables the operator to check modulation percentage with a fair degree of accuracy on sine wave input, and whilst it will naturally not follow the peaks of speech, the *average level of speech modulation* can be read off from the meter, due allowance being made for peaks. The instrument also functions as an excellent 'phone monitor and gives a visible indication of the amount of hum and noise on the carrier.

In effect, the modulation meter consists of a linear AC voltmeter, which compares the average RF carrier voltage with its audio frequency component, one diode of the 6H6 serving as a rectifier of the carrier RF voltage, the other diode rectifying the audio voltage.

Construction Points

Construction of the meter can take any convenient form, the model used at the writer's station being mounted on a narrow panel in the transmitter rack, the actual meter components being totally enclosed in a screened aluminium box, with the 6H6 mounted centrally on a vertical metal strip.

The actual disposition of the components is not critical so long as the audio side is kept well clear of the RF components.

Voltage is picked up by a 2-turn insulated link placed a few inches from the PA tank and fed into the modulation indicator *via* a length of 72-ohm coax cable terminating in a coax-plug which engages with a socket in the rear of the box.

With the carrier on and the meter switched in series with R3 the needle will be deflected to an extent dependent upon the proximity of the link to the PA tank coil.

Variable condenser C2 should now be adjusted to balance out the reactance of the transmission line, and should be tuned for maximum deflection of the meter. The coupling of the link to the PA tank coil should now be adjusted so that the meter reads, say, 0·8 mA, in an 0-1 mA instrument, although the setting is purely arbitrary and may be adjusted to any convenient figure. The meter is now reading the average carrier voltage.

Switching the meter in series with R2 will return the needle to zero unless there is hum or noise on the carrier, when the meter will be deflected accordingly. A sustained whistle into the microphone will send the meter needle upwards to an extent depending upon the depth of modulation and if the carrier is being modulated 100 per cent. the needle will go to the point of the original setting—in the example just given, 0·8 mA. Modulation percentages of less than 100 per cent. will result in correspondingly lower readings, whilst any deflection beyond the carrier level figure indicates over-modulation. The meter reading is linear and modulation percenttages may thus be read off directly from the meter.

In this connection it would probably be more convenient to set the carrier level figure at precisely 1 mA when the percentages can be read off with greater ease, although in this case little allowance is made for over-modulation indication. Plugging a pair of headphones into the jack enables the quality of the transmission to be monitored, although under these conditions the meter reading is meaningless.

The meter could, of course, be mounted in a box separate from the transmitter, and a coil and condenser connected between

This happy-looking chap is DU1AI, Pampanga, Philippine Islands, with a fine array of gear.

points A and B, when the instrument could be moved around the operating room and even used as a field-strength meter. The AC-fed 6H6 does not however lend itself to mobile operation and the writer prefers to have the modulation meter fitted permanently to the transmitter.

Whilst crystals of the 1N34 type can be used in an instrument of this description the writer has been unable to obtain them and cannot give any data for their use in the instrument. The plug-in type ex-radar crystals which are fairly plentiful on the surplus market do not seem to be applicable to this circuit owing to their non-linear rectification, and their low current limitation.

For a low power transmitter an 0-500 microammeter may be used instead of the meter specified, when a more sensitive instrument will result. In any case great care should be taken in adjusting the link, both from the personal safety standpoint and to avoid damage to the meter movement, and the transmitter should always be switched off when such adjustments are made.

If the specified component values are adhered to, the modulation meter will be reasonably accurate, but it is advisable to check the instrument by comparison with an oscilloscope, using a sine wave input.

Under usual operating conditions, with speech input an average deflection of 60 to 70 per cent indicates that the carrier is being adequately modulated, and whilst the meter will not of course follow the occasional high energy voice peaks, adjustment of the speech amplifier gain so as to restrict the maximum speech percentages to this sort of figure will ensure that no serious over-modulation takes place, and at the same time the operator can be assured at a glance that his modulation is such that the transmitter is being operated with maximum effectiveness.

XTAL XCHANGE

Below are this month's offerings ; negotiations should be conducted direct and it should also be noted that we can now only accept insertions for crystals within the communication bands, or for 100-1000 kc bars of certified accuracy. Notices should be set out in the form shown here, on a separate slip headed "Xtal Xchange—Free Insertion."

GC2CNC, 8 Havre-des-Pas, Jersey, C.I.

Has QCC octal based 100 kc bar and 3163 kc standard two-pin QCC crystal. Wants QCC types in CW area 3·5 mc band.

G2DDM, 34 Birch Avenue, Romiley, Cheshire.

Has new unused 7075 kc QCC Type P crystal mounted. Wants 7005 or 7008 kc US Signals type.

G3ALA, Oakley Training College, Cheltenham, Glos.

Has 7280 kc crystal, Standard Radio. Wants frequency 7000-7150 kc.

G3AUB, 4 Southcliffe Road, Reddish, Stockport, Cheshire.

Has QCC Type P5 7015 kc crystal. Wants similar type for frequency between 3500 and 3515 kc.

G5KC, 123 Kingsway West, Acomb, York.

Has QCC 3510 kc crystal, with certificate. Wants same make 1753 kc, or nearest.

G6FV, 5 Station Road, Teynham, Nr. Sittingbourne, Kent.

Has standard two-pin crystals 1875, 1890, 3500, 7010, 7040, 7050, 7150, 7210, 7270 and 7300 kc. Wants frequencies 7065-7140 kc, or 14 mc crystals.

SWL, 23 Carnarvon Road, Redland, Bristol, 6.

Has QCC Type P5 7037 kc crystal. Wants 100 kc bar.

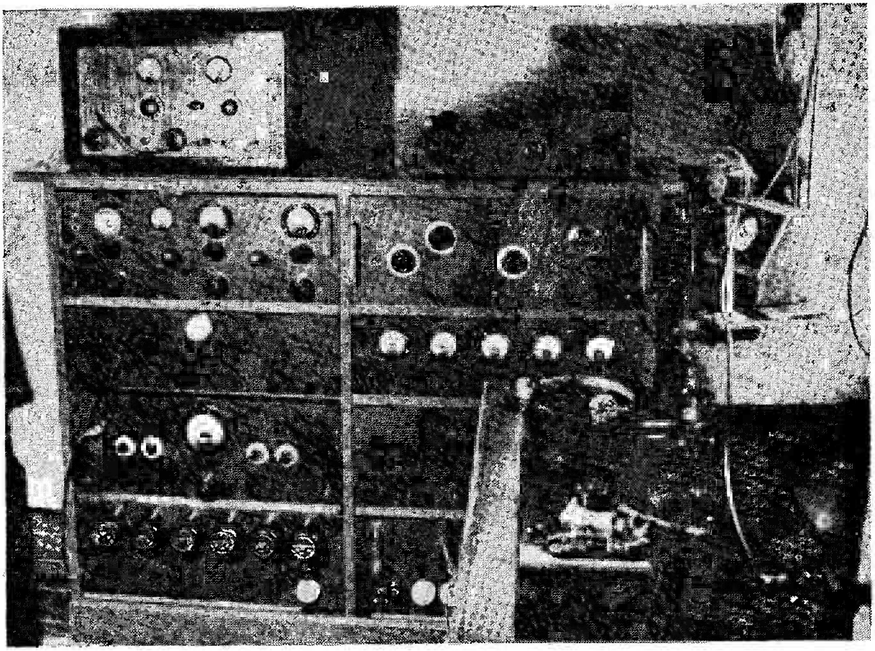
TRF 1-V-1 AMATEUR RECEIVER

The current (February) issue of our *Short Wave Listener* carries a full-length constructional article, by J. N. Walker (G5JU), on a modern three-stage TRF receiver, using branded parts throughout. This receiver is specially designed for level performance over the whole short-wave range, employs the latest types of miniature plug-in coils, and incorporates bandspread tuning for easy operation on the amateur frequencies. This is it for anyone who wants an easily built receiver of the simpler type, either for general use or as a stand-by.

★

RECORDED THANKS

At a recent meeting of the Bradford Amateur Radio Society, a talk and demonstration on BSR recording gear was given by G2UY. As several B.A.R.S. members have reason to be very grateful to the Queensland Division of the Wireless Institute of Australia, a record was made expressing their thanks ; an opening speech by G3UI, the president, and G6KU preceded messages from some 14 individual members, the disc then being despatched to VK with the good wishes of all concerned.



The other man's station G8GI

Here is a view of G8GI, the station owned and operated by C. B. Raithby, School House, Helpringham, Sleaford, Lincs.

The transmitter can be either CC or VFO at will, the general arrangement being Exciter-PA with two RF amplifiers —one on 3·5 mc with an 808, and the other for 7, 14 and 28 mc using a 35T. With crystal control, a separate CO-Buffer unit with its own stabilised power pack is employed ; the VFO unit is also separately powered and consists of a 1·7 mc Hartley oscillator, untuned buffer and doubler.

Output from either of these self-contained units is fed to the exciter, arranged to give drive on any band 3·5-28 mc with the PA to be used. Level input of about 100 watts can be obtained to the PA on all bands ; for telephony transmission, a speech amplifier-modulator ending in a pair of TZ40's gives full control of the carrier.

For CW operation, keying can be accomplished in several ways, including remote control *via* relays. Station monitoring facilities include an oscilloscope, and frequency checking equipment is also available. To round off the transmitting side, a small "CW-only" Tx is installed for operation on the 1·7 mc band.

Receivers are an S11X for the lower frequency bands, a converter for 14 and 28 mc, and a Type 26 unit for 58 mc reception. The aerial at present in use is a 330-ft. long-wire, about 36-ft. high, Zepp fed on all bands through a 600-ohm line 66-ft. long—though the roof length is incorrect for 3·5 mc working. Bands mainly operated are 1·7, 3·5, 7 and 28 mc, on which G8GI can be heard on both CW and telephony. His layout is neat, and the units shown in this photograph are grouped in such a way that they interconnect conveniently.

NEW QTH's

This space is available for the publication of the addresses of all holders of new callsigns, or changes of address of transmitters already licensed. All addresses published here are automatically included in the quarterly issue of the Call Book in preparation. QTH's are inserted as they are received, up to the limit of the space allowance. Please *write clearly* and address on a separate slip to QTH Section.

G2AOL	W. S. Hall, 49 Sidney Gardens, Otford, Kent.
G2BAA	W. H. Forshaw, 202 Thicknesse Avenue, Beech Hill, Wigan, Lancs.
G2BAT	D. H. Phillips, Falbay Guest House, Clare Terrace, Falmouth, Cornwall.
G2BND	F. L. H. Jones, 16 Gayhurst Road, Dalston, London, E.8.
G2FIP	J. E. Kirk, 24 Marsham Road, Kings Heath, Birmingham, 14.
G2HLM	P. Weaver, 10 Roselyn, Harlescott, Shrewsbury, Shropshire.
G3AHR	A. R. Thomson, 63 Chestnut Avenue, Oswestry, Shropshire.
GW3BRI	S. D. Jones, 75 Manor Road, Abersychan, Pontypool, Mon. (*Tel : Talywain* 291.)
G3CBW/A	H. Walker, 92 Nelson Street, South Bank, Middlesbrough, Yorks.
GM3CIG	J. E. Priddy, 38 Selvage Street, Rosyth, Fife, Scotland.
G3CMB/A	A. D. Stears, G.P.O. Hostel, Oswestry, Shropshire.
G3CZU	Dorking & District Radio Society, 5 London Road, Dorking, Surrey.
G3DBE	H. J. Goodyear, 2/35 Grove Lane, Handsworth, Birmingham, 21.
G3DFV	F. N. Fovargue, 30 Hare Street, Grimsby, Lincs.
G3DGJ	W. A. Sparks, 36a Lovely Lane, Warrington, Lancs.
G3DJC	Capt. I. W. Peck, 1 Dean Park Villas, Plymstock, S. Devon. (*Tel :* 3218).
G3DJE	G. Ehunley, 4 Barnstaple Mansions, Rosebery Avenue, London, E.C.1.
G3DLL	A. Eades, 5 Ash Avenue, Runcorn Road, Birmingham, 12.
G3DMY	F. W. Leatt, Haldon, 49 Rivermead Road, Exeter, Devon.
G3DNO	A. E. Machin, 4 Westwick Road, Sheffield, 8
G3EBA	D. R. Wilde, 21 Great Croft, Cromer Street Estate, Kings Cross, London, W.C.1.
G3EBF	J. C. Perry, 51 Nimrod Road, Streatham, London, S.W.16.
GM3ECI	F/Sgt. D. W. McKay (*ex-D2HD*), Transmitter Site, R.A.F. Leuchars, Fife, Scotland.
G3ECP	J. & T. Brown, Flat 8, Ambervale, Ashover, Chesterfield.
G3ECW	A. E. Prentice, 14 Queen Mary Avenue, East Tilbury, Essex.
G3ECY	H. T. Hamer, The Orchard, Down Road, Portishead, Somerset.
GW3EEX	D. G. John, 154 Old Road, Neath, Glam.
G3EFG	R. C. Smith (*ex-VK3YQ*), 55 Kelvin Avenue, Palmers Green, London, N.13.
G3EHG	R. V. Jordan, Ravensdale, 70 Westbourne Road, Wolverhampton.
G3EHR	C. T. Bown, 55 North Street, Atherstone, Warks.
G3EHV	F. R. Tipping, 90 Westenra Avenue, Overpool, Ellesmere Port, Cheshire.
G3EJR	J. B. Armstrong, 1 Hartley Street, Wolverhampton, Staffs.
G3EKM	A. W. Tonkyn, Trewindle, Tregurra Lane, Truro, Cornwall.
G3ELU	C. R. Robbins, 23 Innis Road, Earlsdon, Coventry, Warks.
G3EMI	M. P. Hopkins, 54 Norman Road, Northfield, Birmingham, 31.
GC3EML	J. Watson, Noirmont, Grouville, Jersey, Channel Islands.
G3END	K. Callow, 40 Elkesley Road, Welbeck Colliery, Mansfield, Notts.
G3ENR	J. F. G. Hucklebridge, 146 Richmond Road, Montpelier, Bristol, 6.
G3EOS	A. H. Greasley, Jennifer Cottage, Heronsgate, Rickmansworth, Herts.
G3EPG	M. N. Fletcher, Butler's Hill, Cheadle, Stoke-on-Trent, Staffs.
GI3EPI	J. K. Bond, 23 Harding Street, Londonderry, Northern Ireland.
G3EPJ	A. S. Bendell, Merry Meadow, Dunster, Somerset.
G3EPO	K. I. Procter, 2 Mill Road, Hertford, Herts.
G3EPZ	R. G. Brown, 61 Debdon Gardens, Heaton, Newcastle-upon-Tyne, 6.
GM3EQD	J. K. Weir, c/o Cunningham, 23 Windsor Terrace, Glasgow, N.W.
G3EQE	J. H. Wess, 47 Barnhey Crescent, Meols, Hoylake, Cheshire.
G3EQM	J. A. Theobald, 66 Nelgarde Road, Catford, London, S.E.6.
G3EQP	A. F. D. Giddy, 99 Greenham Road, Muswell Hill, London, N.10.
G3EQU	J. E. A. Mortimer, 71 The Fairway, N. Wembley, Middlesex.
G3EQX	J. L. Rowe, Farmhill, Southchurch Boulevard, Southend-on-Sea, Essex.
GM3EQY	D. A. E. Samson, 56 Elm Row, Edinburgh 7, Scotland.
G3ERA	J. Wood, 37 Laines Road, Steyning, Sussex.
G3ERB	L. N. Goldsbrough, Evesleigh, 246 Chester Road, Whitby, Wirral, Cheshire.
G4HT	E. Preston, D.Sc., Ph.D., F.R.I.C., F.Inst.P., 8 Montpelier Court, Montpelier Road, Ealing, London, W.5.
G4MM	J. M. Miller, 51 Tolhill Road, Loughborough, Leics.
GW5SA	D. Price-Jones, Darran Court, Neath, Glamorgan.
GM6RV/A	W. B. Stirling, Rusken, Seamill, West Kilbride, Ayrshire, Scotland.

CHANGE OF ADDRESS

G2HIF	C. Sharpe, 12 Rossett Park Road, Harrogate, Yorks.
G3AHF	W. Howarth, 2 Mervyn Road, Owley Wood, Weaverham, Cheshire.
G3BA	T. P. Douglas, M.B.E., 18 New Street, Daventry, Northants.
G3CBW	H. Walker, 64 Ayresome Street, Middlesbrough, Yorks.
G3CZN	Maj. A. G. Acland, R.A., Markham House, Badminton, Glos.
G3CZN/A	Maj. A. G. Acland, R.A., Lammacks, Braydon, Swindon, Wilts.
G3DNT	B. N. Gregory (*ex-D2AQ*), 2 Pinfold Estate, Tideswell, Buxton, Derbyshire.
G3DRS	N. H. Brown, 13 Corporation Road, Audenshaw, Manchester.
GM3DXJ	T. Holbert, 5 Society Street, Maybole, Ayrshire, Scotland.
GM3PB	A. Herring, 81 Arrowsmith Avenue, Glasgow, W.3.
G4HI	W. Smith, 15 Sharphaw Avenue, Skipton-in-Craven, Yorks.
G5AM	C. P. Cowell, 5 Holywell Cottage, Bishops Hill, Ipswich, Suffolk.
G5GG	L. G. Young, 63 Paddington Grove, Bournemouth, Hants.
G6AD	N. Kellett, 91 Kings Road, Melton Mowbray, Leics.

Here and There

Index Vol. VI

The next issue of the *Short Wave Magazine* commences Vol. VII, and will contain as a loose insert a complete Index to Vol. VI, the twelve issues to date.

At about this time, we are frequently asked if we can supply bound volumes of the *Magazine*, or undertake the binding of readers' own sets. Regretfully, the answer is "No"—not at a reasonable price, anyway. Our advice is always to get any such binding done locally, as it is usually both quicker and cheaper !

Callsign Changes

The turn of the year brings into force a certain number of country-prefix changes, some of which will affect amateur operators—*see* "DX Commentary" in this issue. By the official Allocation List, some of the Russian sequences look as if they might alter ; others affected are Hungary, Norway, Lebanon, China, Denmark, Chile, French and Portuguese Colonies, Venezuela and a cluster of British Colonies. In some of these cases, there is no actual need for a change, so that a listing now would only be misleading —but it is quite likely that some unexpected prefixes will be heard from genuine DX locations. As they are unearthed, we shall notify them.

And just as this was being tapped out, a new one came in ! Amateurs in the American Zone of Germany are now using a two-letter suffix instead of three, *e.g.* D4AKW prior to January 15, becomes DL4KW—and, remember, the DL2-DL4-DL5 indicators are Allied Forces and not German national callsigns.

Radiovision's "Hambander"

This has been a popular amateur-band receiver in the lower-priced category for a long time now ; as we know, a large number are in use both by transmitters and SWL's. The latest on the "Hambander" is that the price has just been reduced to £17/10s. nett, and at this figure it is indeed very good value for money.

Photographs

We are always glad to see photographs of Amateur Radio interest—either equipment, stations or personalities. Any that are used are paid for, and can be returned if specially required ; the block-making process involves no damage to the face of the print.

All photographs should be clearly identified on the back, and though they can be any size, *must* be clear and sharp. It ought also to be mentioned that on occasion we have to hold prints for some time before they actually appear—so if we already have one of yours, don't feel you must write in to know if it has been lost !

Maps and Manuals

We can still supply the *DX Zone Map* (for wall mounting, price 6s. post free) and the *DX Operating Manual*, 2s. 8d. Together, they tell you all you need to know about DX operating in all its aspects, how the Zone areas are arranged, the country prefixes in each Zone, and much else of vital interest and importance to anyone in the slightest degree active in the DX field. Order on the Circulation Manager, Short Wave Magazine, Ltd., 49 Victoria Street, London, S.W.1.

Readers' Half-Guinea Ideas

As mentioned on p.818 of our January issue, we shall be happy to disburse 10s. 6d. a time for short hints, tips, kinks or wheezes with a touch of originality ; if a sketch helps the story, which should be short and to the point, include one. Whether we shall be able to run this feature regularly, or even to start it, depends upon the material sent in—we want this to be a readers' feature exclusively.

ZB3 Correction

The article on the ZB3 converter in our December issue contained two minor errors, both of which would be obvious to anyone undertaking the conversion. The left-hand heater pin of V101 must be earthed ; and under "Mixer Conversion," R110 is not actually removed, but disconnected from the anode of V103 and taken to the IFT, as directed later in the text. G3BJB also remarks that of course a stabilised power supply should be provided for the unit.

CQ MCC

THE MAGAZINE TOP-BAND CLUB CONTEST

DECEMBER 4-12, 1948

THE 1948 *Magazine* Club Contest was undoubtedly the most successful of the series; not only from the point of view of the number of entries, although that is a good sign, but also on account of the great keenness and competitive spirit shown.

For the Contest a total of 39 entries was received ; and, of these, 28 Clubs sent in their final logs.

Here is the result :

1st : Rhigos and District Radio Club, GW3FFE (2275).

2nd : Coventry Amateur Radio Society, G3FAB (1981).

3rd : Wirral Amateur Radio Society, G2AMV (1880).

These scores are considerably higher than last year's, chiefly on account of generally increased activity on the band. All credit to the winners, nevertheless, for rounding up so many of the available stations.

Rhigos worked with three operators (GW3ZV, GW2UL and GW3CDP) and they were having trouble with the gear for the first five days, with the result that they did not really get going until the Thursday evening. This did not necessarily reduce their score because of the limitation of operating hours.

Coventry, who were first in 1946 and third in 1947, maintained their fine record by filling the gap and scoring a second this time. They had no fewer than eleven operators : G2FTK, 2LU, 2YS, 3BVJ, 3CZS, 3FAB, 4NB, 5GR, 5SK, 5ZX and 6WH.

Wirral ran a station which was operated by G2AMV, assisted by G3AKC, 3AVI, 3BOC, 3DLF, and 8BM—six operators in all.

The Scoring System

About half the Clubs sending in comments suggested that the scoring system was too favourable to " zones " outside G ; the other half considered it to be fair enough. Our own opinion is that it cannot be too far out, from the mere fact that GW and GM stations have *not* romped away with the top five places ! Admittedly, the fact that non-G stations score two points for every contact with a G is a big help to them, but their geographical position is a hindrance. We shall review the system very carefully before next year.

" Zone " Multipliers

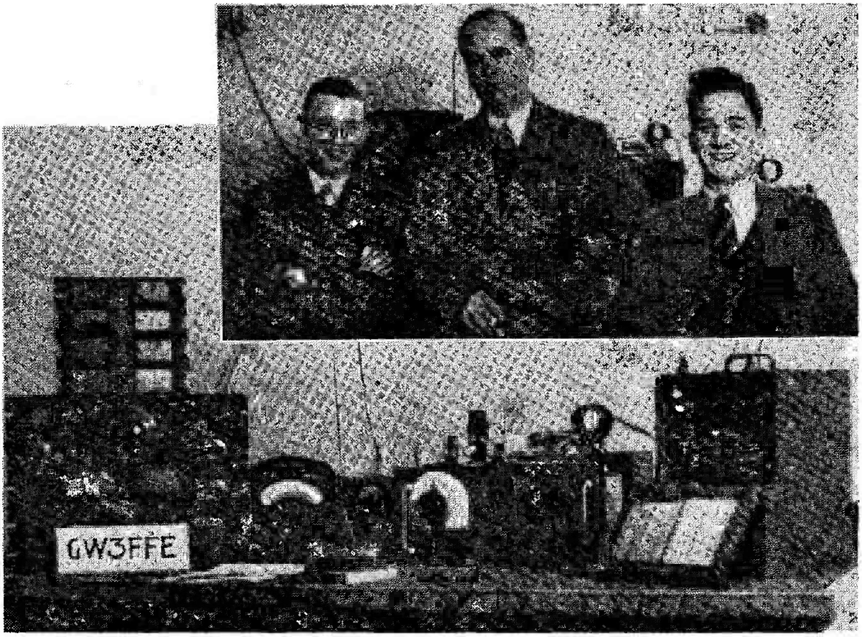
Most of the top scorers worked seven zones—G, GC, GI, GW, GM, D2 and OZ. Only one station—G2AMV (Wirral)—managed to work eight, the extra one being GD. No one can deny that geography helped slightly in this case ! OK's, ON's and PA's were heard on the band, but were believed to be "sub-harmonics" from the 3·5 mc band or just plain pirates. Only one station—G3CKR/A (Warrington)—worked OK1EM, but as their report was 599 they thought he was a pirate and did not claim the multiplier. By a fortunate chance it makes no difference to their position in the list whether he was genuine or not.

General Comment

One criticism is universal, and inevitable : That stations who were not entrants but called "CQ MCC" just because they heard everyone else doing it caused a lot of confusion. We know it only too well—we had to check all lists very carefully for claims of 3 points where they were not justified—and some of the scores have unfortunately been pared down by as many as 300 points for this reason. On the other hand many Clubs did manage to sort things out and avoided making a single excess claim. The general suggestion is that on another occasion a "flash" circular be sent to all Clubs at the very last moment, giving the full list of *bona fide* entrants.

Bouquet from the Judges

A special word of thanks for the neatest logs goes to Coventry, Beaumanor, Edgware and Derby. The latter's log (not



Rhigos were the winners of our Third Annual 1·7 mc Club Transmitting Contest, with the remarkable score of 2,275 points. Several operators helped to man the station, and between them put up a magnificent performance.

typed) was as easy to check as any of those that were, and was quite a beautiful piece of work.

Comments and Criticisms

Again we have to thank most of the entrants for their really helpful and thoughtful criticisms of the event. In spite of minor grumbles in some cases, all Clubs say that they thoroughly enjoyed it and that they are just bursting to get after each other again. Fifteen clubs say that the general standard of operating was "excellent"; two say it was "above average" but one (Rhigos, the winner !) says it was "very low" !

Local phone stations come in for a slating by many Clubs, and one or two such stations, on being asked to be tolerant, merely replied "Here not MCC so nothing to do with us." This, of course, they were fully entitled to say—but fortunately we don't *all* insist on our "rights" all the time. West Somerset says that local phones were heard complaining about the CW QRM—a good sign of the activity on the band. Spen Valley, on the other hand, suspects some of the local phones of not being able to read code.

Ten clubs say that the scoring system kept up the excitement right until the bitter end ; in fact Wirral was still "in the queue" for an OZ with only half an hour to go. Eight clubs counter this opinion by saying that it became very tedious towards the end. Rhigos says all credit should be given to the many non-entrants who came on specially for the fun of the contest ; Southend says it is a pity that so many stations come on the band *only* for contests.

Coventry suggests, for the future, a closure at 2300 for the benefit of operators who have a strenuous day's work in front of them.

Burton worked with only one operator —G2DAN ; Morley was operated only by G3ABG, and not at all on the 8th or 9th. North Angus had only one operator (GM6RI) and no mains, the whole equipment being battery-vibrator supplied.

Garats Hay remark that it was their first contest and that the last day was the most exciting of all. Kirkcaldy was "short of ops"!

Only one topic remains—our old friend "conditions"—but as roughly half

ANALYSIS TABLE

	CLUB	CALL-SIGN	MULTIPLIER	TOTAL
1.	Rhigos	GW3FFE	7	2,275
2.	Coventry	G3FAB	7	1,981
3.	Wirral	G2AMV	8	1,880
4.	Neath and Port Talbot	GW3EOP	6	1,812
5.	Edgware	G3ASR/A	7	1,771
6.	Derby	G3ERD/P	7	1,596
7.	Garats Hay	G3CHR	7	1,589
8.	North Angus	GM6RI	6	1,554
9.	Grafton	G3AFT	7	1,456
10.	Beaumanor	G3BMR	7	1,449
11.	Warrington	G3CKR/A	7	1,260
12.	Morley	G3ABG/A	6	1,242
13.	Burton on Trent	G2DAN	7	1,218
14.	West Kent	G4IB	6	1,056
15.	Harrow	G3EFX/P	6	972
	Baldock	G3EAJ	6	
17.	Petersfield	G3DDM	6	810
18.	Scarborough	G8KU	5	800
19.	Mansfield	G2DTQ	6	786
20.	Stroud	G2FRG	5	735
21.	Grays	G3DLC	5	730
22.	West Somerset	G3SB	5	665
23.	Southend	G3AXN	4	656
24.	Bovingdon	G3DGS	4	524
25.	Wanstead and Woodford	G3BRX	4	436
26.	Nottingham	G3EKW	3	402
27.	Spen Valley	G2CSJ	3	342
28.	Kirkcaldy	GM3CVL	3	261

the entrants say that they were exceedingly good and the others say they were very poor we don't propose to comment ! Maybe the fact that so many have not had much experience of the band has something to do with it. Judging from the scores we should say that conditions were above average ; but even that is difficult to judge because of the greatly increased occupancy of the band.

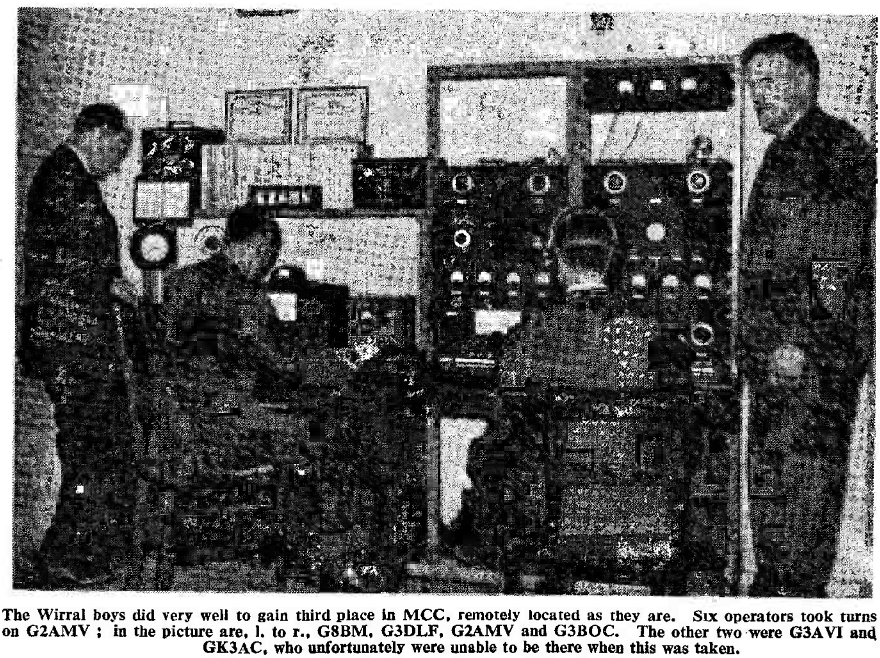
Apart from giving the entrants a thrill and an enjoyable week, we hope this Contest has served one other purpose—to prove that 1·7 mc is the ideal Club Band. If all Clubs would do something about running top-band schedules with others, some very useful co-operation should result.

Finally, from your Club Secretary, many thanks for the splendid support. And now don't go off the band until next December, but start getting some really red-hot ideas together !

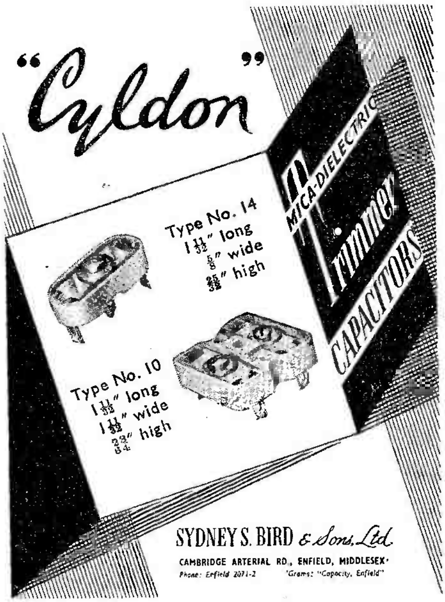
EDITORIAL NOTE :—We must apologise to those Clubs sending in the usual report for this issue for having to drop "Month with the Clubs" this time. No doubt because of their Contest participation, few Clubs have actually reported routine activity, and it was therefore decided to devote the space to a fuller account of the Contest than has been possible in previous years.

Date for next "Month with the Clubs" Report : February 9.

Coventry were again placed in the Third MCC, and were close runners-up to Rhigos. The station was operated under call G3FAB.



The Wirral boys did very well to gain third place in MCC, remotely located as they are. Six operators took turns on G2AMV ; in the picture are, l. to r., G8BM, G3DLF, G2AMV and G3BOC. The other two were G3AVI and GK3AC, who unfortunately were unable to be there when this was taken.



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EDDYSTONE 5 and 10 metre converter as described in Eddystone Short Wave Manual No. 5. Superhet circuit, using EF54's and EC52. Complete with valves and coils for two bands.
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MULLARD GM4140 Resistance-Capacity Bridge, measures capacity from 10mmf to 10mfd and resistance from 0·1 ohm to 10 meg-ohms. Provision for use as open bridge and for power factor measurement. *Reduced from £13/13/- to* **£7/10/-**

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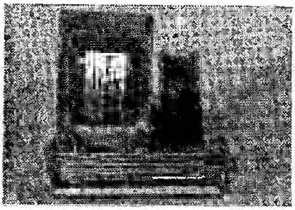

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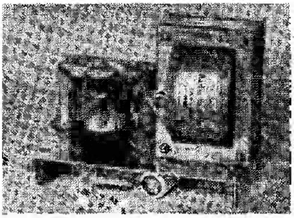

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THERMO Units containing two 7 mc Xtals, 4/- each. 4 mc Units, 1/- each. 7275 and 4 mc Blanks, 1/- each.—Thomas, GW3AX, Roseland, Kittle, Bishopston, Swansea.

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HAM emigrating offers AR88, lab. aligned, £40. New items: CV73, CV85, 10/-.; 6V6G, 807, VU133, CV54, 6Q7G, KT63, 7/6; EF50, 5/-; 7193, L63, 3/-; 0·5 +0·5 mF, 2,200v, 8/6; ·05 mF, 3,300v, 5/-; 1 and 2 mF, 9d. Pots, relays, pairs steel handles, 1/-. Steel ventilated cabinets with quick release chassis 21 in. × 11½ in. × 8½ in., perfect, for power or mod. units, 7/6. 18-480v dynamotor, 3-speed drive, £1. Junk box parcels, 5/- five lbs. Also used serviceable items—6SH7GT, 2/6; 6H6, 0Z4, 7193, 2/-. Nuts, bolts, washers, 2/3 gross. Valve bases, 3/- doz. C.W.O. Please add little postage.—Edwards, 12 Coledale Drive, Stanmore.

SELLING HRO Senior, 6 coils, being aligned commercially; BC221 working; 6v Hallicrafter P/Pack. Two R1147 (one 954 missing). Govt. 12v Tx, 807 × 807, slight damage. Valves 807, RK34, 955, others BII complete. Much mangled, seen solid service, Kent. Offers lot.—Box No. 460.

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Reinforced, rivetted corners, 2/- per chassis extra.

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