

The SHORT WAVE Magazine

VOL. XXII

SEPTEMBER, 1964

NUMBER 7

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AERIALS—K.W. & Mosley, G3FF & Webster Band-spacer (mobile).

MIC'S—Geloso, Shure, Acos.

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FILTERS—High Pass and Low Pass.

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SIG. GENERATOR—Nombrex Transistorized.

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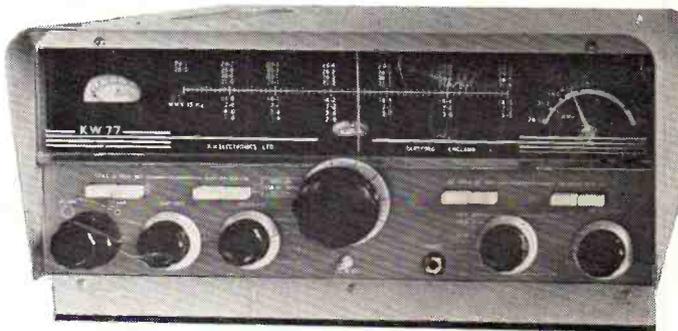
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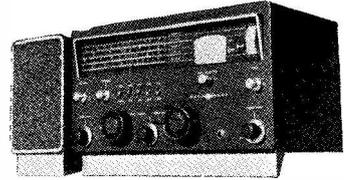


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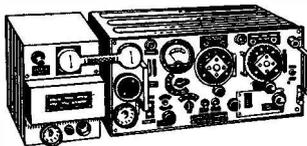
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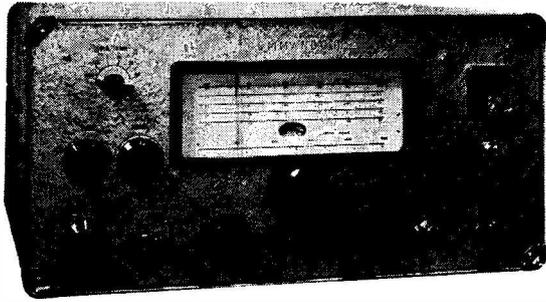
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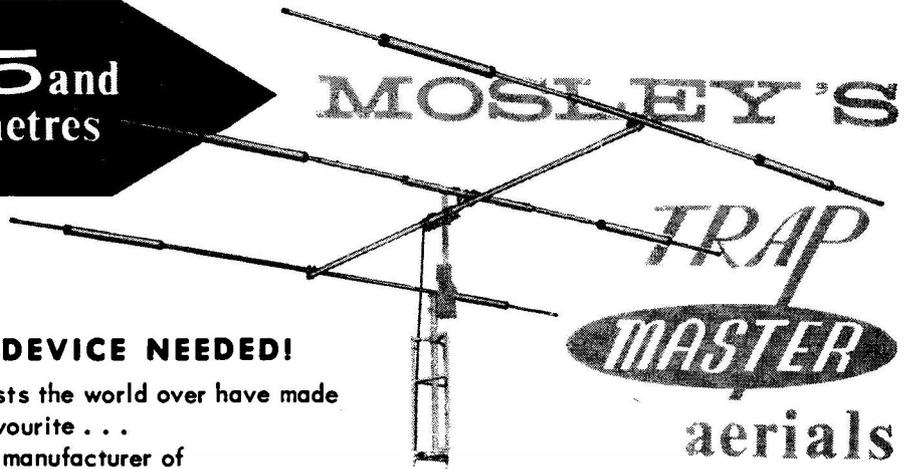
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15 and
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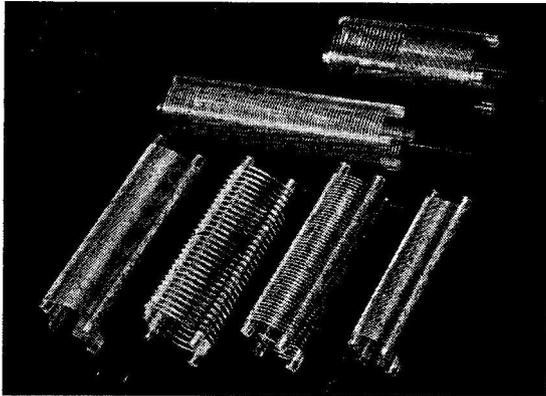
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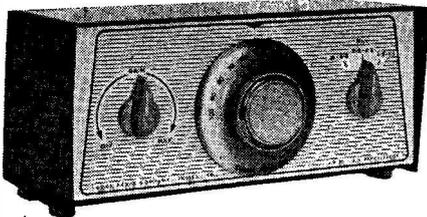
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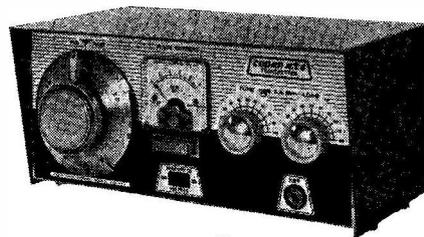
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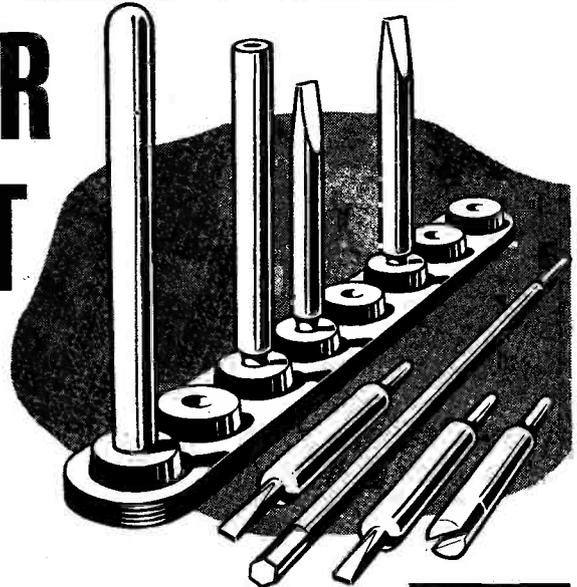
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(GB3SWM)

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FOR THE RADIO AMATEUR AND AMATEUR RADIO

The SHORT WAVE Magazine

EDITORIAL

Flashback *Twenty-five years ago this issue, the editorial — entitled “ Shadow ”, and signed as at the foot of this page — discussed the impending close-down of Amateur Radio activity and the part radio amateurs would play consequent upon the war about to break out with Hitler’s Germany, the threat of which had been hanging over us all through a glorious summer.*

On September 3, 1939, the Post Office started on their task of going round all U.K. amateur stations (there were about 3,300 then licensed) and collecting what was necessary to render them inoperative for transmitting purposes.

More than six years were to pass before that gear could be returned — and in all too many cases there was no claimant for the little collection of valves, crystals and meters which had been put carefully away in a box labelled with the owner’s name and callsign.

For SHORT WAVE MAGAZINE, of course, it likewise meant a complete cessation. Our story has been told before. It was not until March 1946 that the first post-war issue of the Magazine appeared, again with the same signature at the foot of the editorial page, to pick up the threads of Amateur Radio from where they had been left in September 1939. In the U.K., the first amateur band to be opened was ten metres, and the very first post-war constructional design we published was for a 10-metre transmitter (using mainly pre-war components).

All that is now history, as 18 years later we look upon a world which, though still seriously troubled, is at least free of any threat of the imminent total war we faced 25 years ago. But preparedness is still just as essential now as it was then and, as far as the radio amateurs of today are concerned, the best contribution they can make is to do as their fathers (and, in many cases, their mothers) did — join either a reserve formation of one of the three Services, or their local Civil Defence unit.

*Austin Forster,
G6FO.*

WORLD-WIDE COMMUNICATION

TWO-METRE TRANSMITTER

FOR MOBILE, PORTABLE OR
FIXED STATION WORKING
— TRANSISTORISED SPEECH
AMPLIFIER AND MODULATOR
— CIRCUITRY AND GENERAL
DESIGN

M. ALLENDEN (G3LTZ)

This is an interesting practical approach to the construction of transmitting apparatus for the two-metre band—on which so many newly-licensed amateurs are making a start. While it is not supposed that our contributor's design will be copied in detail, his ideas are such that many constructors will wish to incorporate some of them in their own gear.—Editor.

THE unit to be described has been in use for over a year and represents the author's approach to the usual mobile problems of lowest power consumption, maximum power output and minimum space. The control box is added to show one method of switching and metering, and although it is unlikely that anyone would wish to duplicate this exactly, it

does suggest one method of achieving the necessary control.

Circuit Description

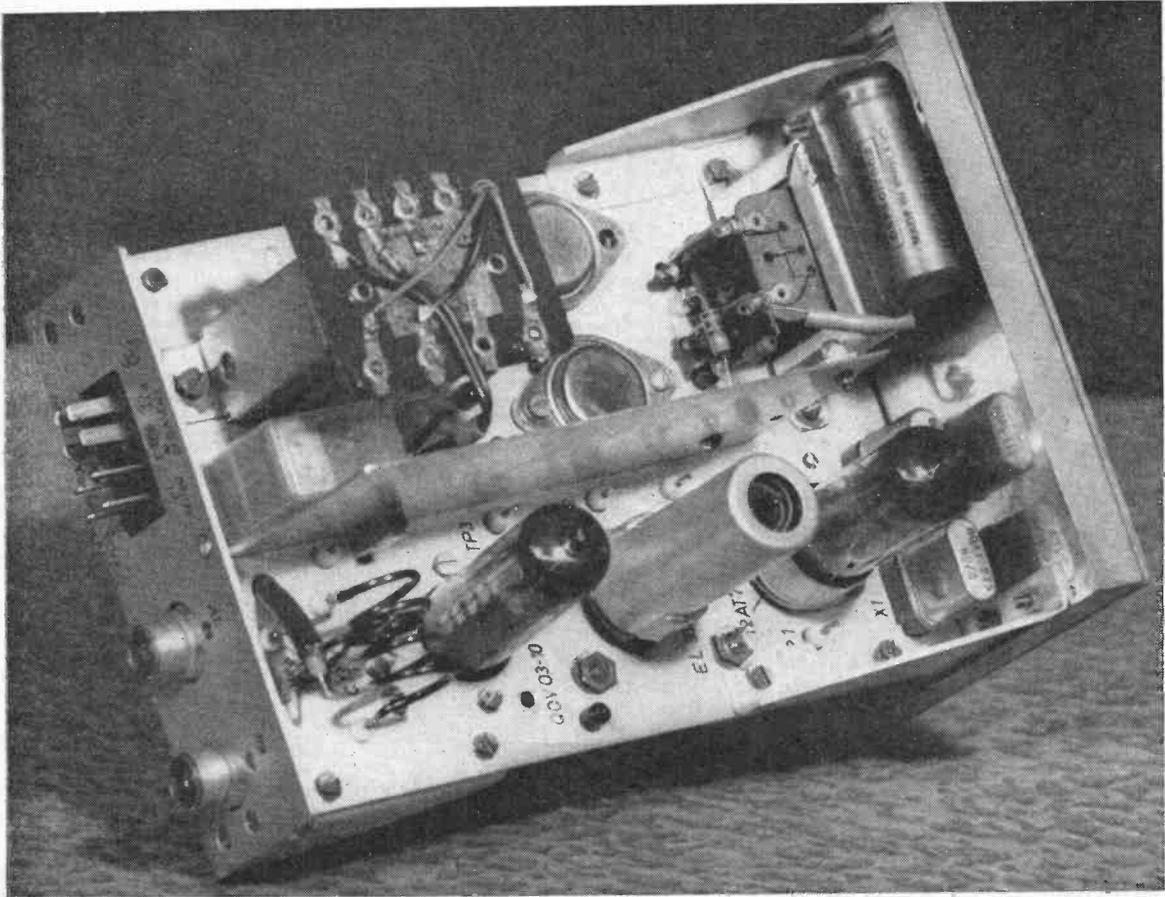
Transmitter: Referring to the circuit diagram at Fig. 1 it will be seen that the line-up is fairly conventional. V1 is a triode pentode, the triode being used as a third overtone oscillator with switched xtals to give a choice of two channels (to combat QRM) and the pentode section is the frequency tripler. The three neon tubes, of the small indicator variety, are included to avoid a change of frequency with varying engine speed, a condition that used to exist before their inclusion. V2, an EL95, is used as a frequency doubler and was found to be a very effective valve for this particular position (an EL91 has been used here, but it has a lower anode voltage than the EL95). L3 in V2 anode circuit has to be very tightly coupled to L4 in V3 grid and is interwound with it (see photograph). L4 tunes with the stray and input capacity of V3 to 144 mc. The power amplifier, V3, is a double tetrode type QQV03-10—it will be noticed that the screen is not bypassed for RF as this was found to be unnecessary. R15, the HT feed to L5, is a small wirewound resistor, which acts also as an RF choke.

Test Points: Test points are included to monitor and tune the transmitter, either with an external 50 microamp. meter, or the meter built into the control unit via pin 8 on PL1.

SWR Unit: This is included as a useful aid to tuning, aerial matching and monitoring. It is built as a sub-assembly on a piece of printed circuit board, and is shown full size with details in Fig. 2. Forward and reflected power can be monitored, and the meter



General view of the G3LTZ transmitter in its case (left), with the control unit, constructed as a separate item — see text and Fig. 3. The PA is a double-tetrode, and some constructional details behind the panel and under the chassis are shown in the other photographs.



Layout of the two-metre Tx above the chassis. The large iron-cored item is the modulation transformer, and the smaller one is the driver transformer, T1 in the circuit, and wound to have a ratio of 20:1. The rectangular unit next to the modulator transformer is the aerial/power change-over relay. Note the vertical screen between the speech-amplifier/modulator side and the RF section, with the push-pull OC36 transistor modulator in the upper compartment.

presentation is again in the control box *via* pins 6 and 7 on PL1.

Aerial Switching: A small relay is used for switching the aerial from "transmit" to "receive," and no trouble was experienced with SWR despite the fact that it was not a coaxial type. A second pair of contacts switches negative 12v. to the modulator on "transmit." The relay coil is energized by returning one end to common earth, and is done *via* the control unit in this case, but it could be a push-to-talk arrangement on the microphone, or a foot switch.

Heaters: Trying to get a valve to do what you want functionally and then trying to combine this with similar voltage heaters and yet the lowest possible current combination is difficult; partial defeat is admitted here, and the use of R18 is to compensate for the 0.2 amp of the EL95 in series with the 0.3 amp ECL80.

Modulator: To keep the stand-by consumption as low as possible, an all-transistor modulator is used, and it is only powered during the "transmit" period.

The circuit is a conventional Class-B push-pull arrangement, with RV1 adjusting the standing current to TR4 and TR5 during the no-signal condition. TR3 is the driver stage, and although an OC36 is shown, any transistor that can produce 500 milliwatts would suffice. The pre-amplifier is built into the microphone case and receives its power from the transmitter *via* a 3-way cable, PL2 and SK7; with this arrangement no trouble can be experienced with RF in the front end of the amplifier. The microphone used is a low impedance electro-magnetic type.

Construction

Without squeezing too hard, all the components are comfortably housed in a case $6\frac{1}{2}$ in. x 4 in. x 5 in. The actual "case" was a tin which had contained medical supplies, the lid of which was stiffened with a 14g. aluminium fascia panel. The chassis is a flat 14g. aluminium piece $6\frac{1}{2}$ in. x $4\frac{1}{2}$ in. with suitable brackets to attach the front and rear panels. An 18g. aluminium screen shields the transmitter portion from

the modulator. The photographs show the placement of the parts and not much further explanation is needed—but the arrangement of the PA grid coil should be noted, since it was found that this gave the best drive out of many configurations tried.

The power transistors TR4 and TR5 are mounted on the chassis, using mica washers to insulate them. The driver TR3 is on a small sub-panel under the chassis, near the microphone input 4-pin socket. The various tuning condensers are arranged so that they are all accessible *via* holes in the case when the transmitter is *in situ*. This allows tuning at any time using the control unit meter. Remembering that this is a mobile unit all screws and nuts are locked with a spot of enamel, and it is probably worth recording that the installation has withstood the worst of Belgian cobbles without anything coming adrift.

The control unit is made from an Eddystone die-cast box, the 4½ in. x 3½ in. x 2 in. deep version; the original lid is discarded, the four 4BA tapped holes filled with *Araldite* and then re-drilled and tapped 6BA. A 16g. plate is then cut to fit into the box to give a recessed panel. The box is mounted on the steering column to give easy access to the main control knob and to allow a good view of the meter.

Tuning

Power is supplied from a temporary power supply of + 250 volts DC and 12.6 volts AC. If 12.6 volts is not available, the heaters can be temporarily arranged in parallel to accept 6.3 volts AC (12.6v. can always be obtained by connecting two 6.3v. windings in the correct phase). Wedge RLA in the "energized" position, connect a 5-watt 80-ohm carbon resistor or suitable non-reactive dummy load to SK1. *Note:* Lamps can be used, but with a non-reactive load (as with a correctly matched aerial) a different set of tuning and loading conditions will be required when the aerial is put on. Apply the HT and adjust the dust core in L1 whilst metering between TP1 and chassis, using a 50 μ A meter with a series resistor of 100K (1 mA actual current then reads 10 μ A on the meter). When V1 overtones, there will be a rise in current at TP1; adjust the slug well on the "slow side" of maximum reading—check with a wavemeter or GDO that the oscillation frequency is 24 mc. Move the meter and resistor to TP2 and adjust C5 for maximum reading—check with the wavemeter that this is 72 mc. Move the meter and resistor to TP3 and adjust C10 for maximum reading—check that this is 144 mc and then, using an insulated probe, squeeze or open L4 for an increased reading, repeaking C10 for each adjustment. It should be possible to obtain 2 mA (actual) drive and this will equal 20 μ A deflection on the meter. Replace the 100K meter resistor with a 20K and connect to the "foreward" (pin 6, PL1) diode of the SWR unit, tune

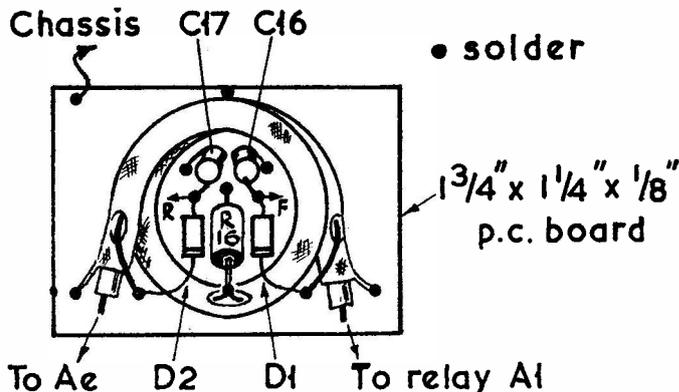


Fig. 2. Constructional details (full size) for the SWR unit incorporated in the G3LTZ two-metre Tx assembly. The loop is a 6-inch length of 70-ohm coax, double coiled, with the outer insulation removed. The inner pick-up wire is 6 inches of 30g. enamelled, connected across D1, D2—see Fig. 1.

Table of Values

Fig. 1. Circuit of the G3LTZ Two-Metre Tx.

C1, C2,	R23 = 560 ohms, ½-w.
C4, C6,	R24 = 82 ohms, ½-w.
C7, C9,	R26 = 270 ohms, ½-w.
C11, C13,	R27 = 2,700 ohms, ½-w.
C19, C20,	R28 = 820 ohms, ½-w.
C21, C22 = .002 μ F disc cer.	R29 = 8,200 ohms, ½-w.
C12, C15,	R30 = 2,200 ohms, ½-w.
C16, C17 = .001 μ F tub. cer.	X1, X2 = 8 mc fund., \times 18 for final freq.
C5, C10 = 5-25 μ F air trimmer (Philips)	N1, N2,
C3, C8 = 50 μ F tub. cer.	N3 = Min. wire-ended neon tube (CV-2213, Hivac)
C14 = 5+5 μ F butterfly var.	PL1 = 8-pin min. socket
C18 = 100 μ F elect., 25v.	PL2 = 4-pin min. plug for SK7 socket
C23 = 1,000 μ F elect., 12v.	SK1, SK2 = Coax socket, chassis mounting
C24, C25,	SK3,
C26 = 50 μ F elect., 25v.	SK4,
C27 = 4 μ F elect., 12v.	SK5, SK6 = Pin jacks, panel
C28 = 10 μ F elect., 6v.	SK7 = 4-pin min. socket
R1, R3 = 4,700 ohms, ½-w.	RLA = Min. DPCO 50-ohm relay, 6v. coil
R2 = 2.2 megohm, ½-w.	T1* = Driver xformer
R4 = 5,600 ohms, ½-w.	T2** = Mod. xformer
R5, R10 = 47,000 ohms, ½-w.	D1, D2 = OA202
R6, R7,	TR1 = AC107
R9, R13,	TR2 = OC71
R25 = 1,000 ohms, ½-w.	TR3,
R8 = 10,000 ohms, ½-w.	TR4,
R11 = 68,000 ohms, ½-w.	TR5 = OC36
R12, R14 = 22,000 ohms, ½-w.	V1 = ECL80
R15 = 100-ohm min. w/wound	V2 = EL95
R16, R21 = 47 ohms, ½-w.	V3 = QQV03-10
R17, R18 = 50 ohms, 1-w.	
R19 = 150 ohms, ½-w.	
R20 = 4.7 ohms, ½-w.	
R22 = 220 ohms, ½-w.	

NOTES: All resistors carbon, except as stated. T1* is of ratio 20:1, 0.4 sq. in. core, pri. 200 turns 30g., sec. 10 turns 24g. centre-tapped. T2** is 200-250v. pri. sec. 16v. centre-tapped (Radiospares). All valves, diodes and transistors are Mullard types.

C14 for maximum output, then adjust the coupling link L6 and retune to obtain the maximum output. At this stage, the power can be removed from the transmitter and -12v. DC connected to the modulator (Pin 2, PL1) putting a temporary load of approximately 3.5K across the secondary of the modulation transformer T2. A pair of headphones in series with the 3.5K load will soon indicate if all is well in the

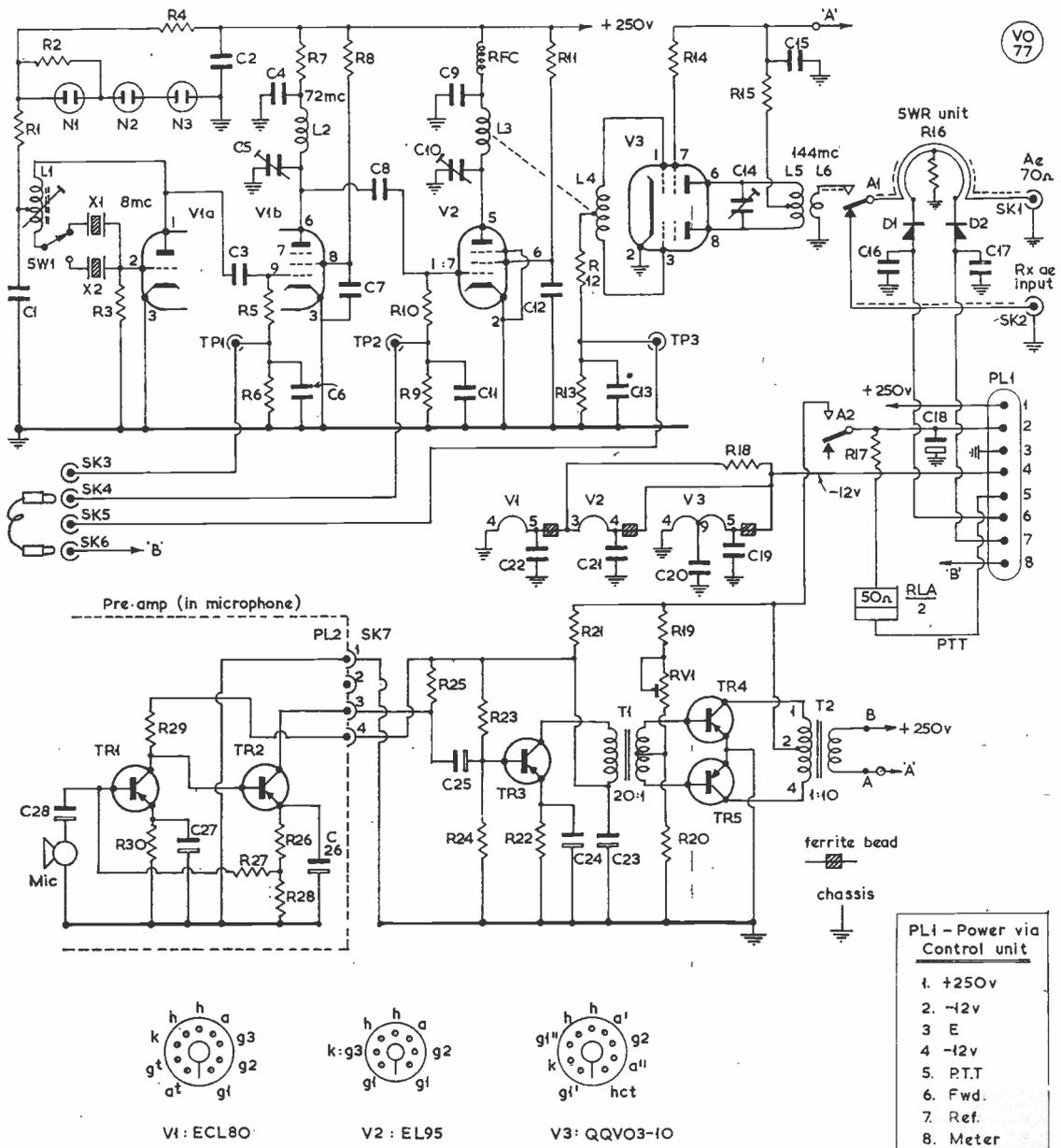


Fig. 1. Circuit complete of the two-metre transmitter described by G3LTZ. It is a four-stage arrangement, taking a QQV03-10 in the PA, and incorporates a built-in SWR indicator. The speech-amplifier/modulator is all-transistor, with OC36's in the output position. A transmitter of this type is suitable for mobile or portable working, and for fixed-station operation under QRP conditions. The detail for the SWR unit is given in Fig. 2.

TABLE OF COIL VALUES

RFC — 18 turns 30g. close-wound on 1/4w. carbon resistor body.
 L1 — 27 turns on 1/4-in. dia. slug-tuned former, 26g. close-wound, tapped 6t. from grid end.
 L2 — 4 1/2 turns 18g. silver-plated copper, 7/16-in. dia., spaced out to about 1/4-in.

L3 — 2 turns 18g., wound on centre L4, spaced about 1/5-in.
 L4 — 5 turns 16g., centre tapped, spaced over 7/16-in. total length with centre gap to take L3.
 L5 — 4 turns 14g. 1/16-in. dia., spaced over 9/16-in. total length, with centre gap to take L6.
 L6 — 2 turns 18g. close-spaced, to 3/8-in. diameter. [over

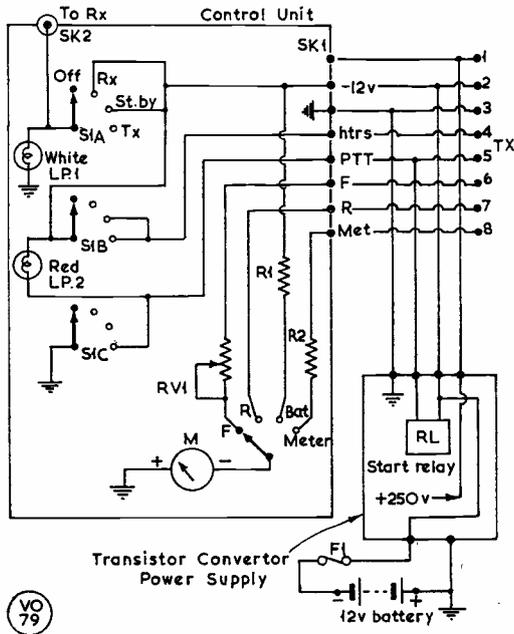
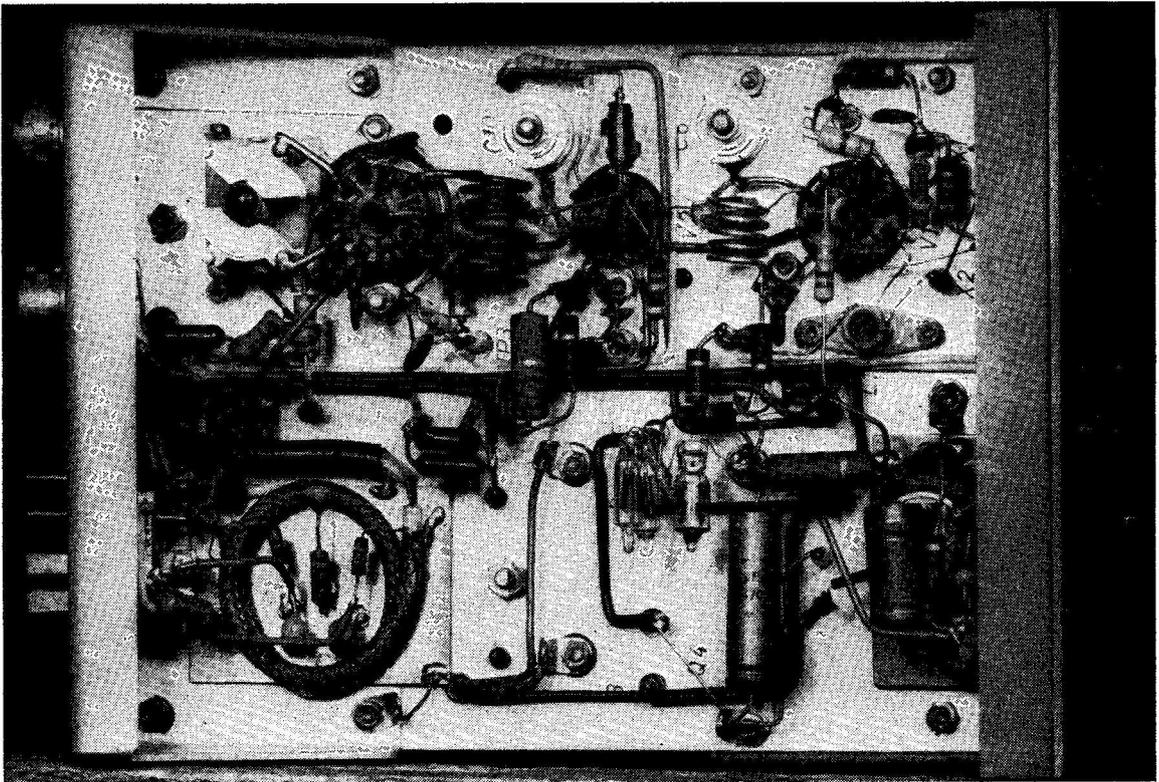


Fig. 3. Circuit arrangement of the control unit for the G3LTZ two-metre mobile transmitter, with its associated cable connections. S1 is 3-p, 4-w rotary; S2, 1-p, 4-w; M, 50 μ A meter; Sk1, 8-way min. socket; Sk2, coax socket; R1, 3.9K; R2, 100K; RV1, 25K pre-set; and LP1, LP2, min. 12v. pea lamps, white and red.

modulator. The potentiometer RV1 is set to give lowest distortion and this will be when the total collector current of TR4 and TR5 is approximately 60 mA; this should kick up on speech to about 750 mA; the actual peak collector current will be around 1.5 amps. Final testing can only be applied when all the interconnecting leads, power supplies, etc., are all assembled in the actual vehicle in which the gear is to be used.

This article has not set out to describe a complete mobile installation as such. Obviously the transmitter described could be run as a fixed or portable unit with an appropriate mains or battery power supply. The author uses a transistorised inverter for the mobile PSU which only comes on during "transmit." The receiver is all-transistorised, requiring only 12v. DC at 100 mA for power, and a G3JAM converter is included in the receiver. The total power consumption of the installation is: on "Rx," 100 mA approximately; on "Stand By," about one amp; and on "Transmit," approximately 3.6 amps.



View of the underside of the G3LTZ two-metre mobile transmitter, with the case removed. At bottom left is the SWR indicator unit (see Fig. 2), built as a sub-assembly. At lower right is the modulator driver transistor, an OC36, and the under-side of the PA stage is at top left.

SIMPLIFIED ELECTRONIC KEYER

USING TWO TRANSISTORS, WITH
SPEED AND MARK-SPACE RATIO
CONTROL

E. DAVIES (G3PGM, ex-MD7RCS)

THIS keyer is a compromise between the basic dot-dash generator and the more complicated type of El-Bug involving many valves or transistors, and in some cases demanding a stabilised PSU for successful operation.

No originality is claimed for the circuit as it is basically as used in timing devices; with some slight modifications it was made suitable for use as a CW keyer. Several models have been built up and have functioned without any trouble at all.

It is necessary to have some sort of paddle-action keying control available, and details of this need not be given as such a control is a matter of individual preference—and what can be made up to give the paddle-action. Some operators like a built-in paddle, while others prefer a separate control, mounted on a heavy base and connected to the “works” via a 3-core cable.

Circuit Action

In this circuit, to form a dot the paddle is pressed to the right; battery negative volts are then applied to the 12 μF condenser C1 (the speed control) and the base of the transistor, which makes TR1 conduct hard; collector current then flows and operates relay Ry1. As this relay closes (to A2 contact) it cuts off the neg. supply. But C1 still holds a charge, and so keeps TR1 hard on till this charge drops below a certain level. When C1 is discharged, TR1 stops conducting and Ry1 opens again (to A1 contact). At this point, if the paddle is still held over, another dot is formed—and so on, until the paddle is released.

To form a dash, the very same action takes place except that extra capacity is brought in to hold TR1 on longer during the discharge period. Since a dash is three times as long as a dot, it follows that three times the capacity is required, which is 36 μF . Having got 12 μF (C1) already in circuit, it is only necessary to bring in an extra 24 μF (C2) when dashes are being made, with the paddle to the left.

This is done by means of a diode D1 placed across the key contacts in such a way as to conduct only when dashes are needed. Many diodes are not much good for this because they have a poor front-to-back ratio, which makes the action of the keyer erratic. The solution is to use the base-emitter junction of an audio-type transistor, which has been found excellent. The base is taken to the dash-contact and the emitter to the dot side of the paddle control. The collector

is left open-circuit, so that the transistor functions as a diode.

Keying action should now be giving dots and dashes, with only the dot-dash ratio requiring adjustment for reasonable “following” over the normal range of keying speeds. This ratio is best adjusted by putting a small condenser, of about 3 μF , in turn across C1 and C2. In prototype models of the keyer, this value was found to give a reasonable degree of correction.

With 3 μF across C1, the ratio would be :
On Dash, $12 + 24 + 3 = 39 \mu\text{F}$. On Dot,
 $12 + 3 = 15 \mu\text{F}$, giving a ratio of approxi-
mately 2.6 : 1, for Short Dashes.

With the 3 μF across C2, the ratio would be :
On Dash, $12 + 24 + 3 = 39 \mu\text{F}$. On Dot,
12 μF only, giving a ratio of approximately
3.3 : 1, for Long Dashes.

These values give a tolerance of about 10 per cent, which should be within the average component tolerances. Obviously, this additional capacity (not shown in the circuit diagram, because it might be across either C1 or C2) can be a variable factor within certain limits.

Final Adjustment

The keyer was found to be “heavy” in its action, due to the fact that the transmitter on which it was tried had a separate keying relay; it turned out that

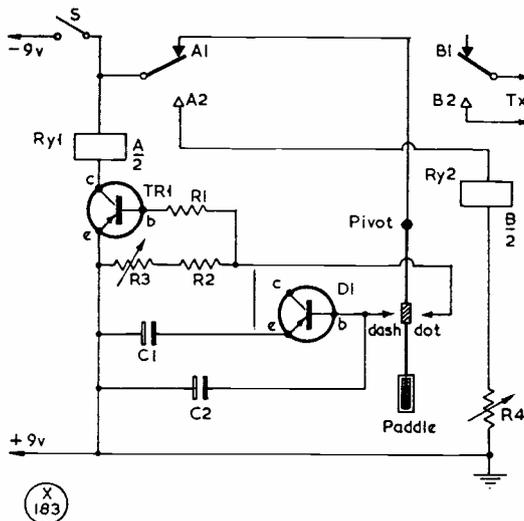


Table of Values

The Electronic Keyer by G3PGM

C1 = 12 μF , 12v.	Ry1, Ry2 = 500-ohm high-speed relay
C2 = 24 μF , 12v.	TR1 = Any audio-type transistor
R1, R2 = 1,000 ohms	D1 = Similar to TR1, used as diode (see text)
R3 = 5,000 ohms, speed control	Relays and paddle in “rest” position
R4 = 100-500 ohms, depending on Ry2 res.	

there was a slight mechanical delay between the action of the keyer relay Ry2 and the keying relay in the Tx. This delay was found to be an advantage at high keying speeds because the keying relay was only just able to start off before the voltage to it was switched off again. This being so, it was an easy step to introduce the series resistor R4, enabling the mark-space ratio to be adjusted to any keying speed.

In the writer's case, the whole keyer unit, including the battery, is built into a box chassis 6in. \times 3in. \times 2½in. deep (which allows ample space), with the control paddle protruding from one narrow end, and the controls—speed and mark-space ratio, and on-off switch—along one side. Layout and construction are, of course, not at all critical but, whatever your own keying speed may be, the relays should be of the light, quick-acting type.

The result is a small but efficient keyer, extremely simple to build and very reliable, with most of the trimmings found in more expensive electronic types. One last word if you have never handled an El-Bug before: Practise its operation on an audio oscillator, and get yourself keying-perfect, before you try it with a transmitter on the air. And "keying-perfect" means not just the ability to make "CQ de G3XYZ" correctly, but being able to conduct a normal CW QSO without faltering.

(Editorial Note: This article is based on a contribution by G3PGM to the July, 1964, issue of Mercury, journal of the Royal Signals Amateur Radio Society.)

RF MONITORING UNIT

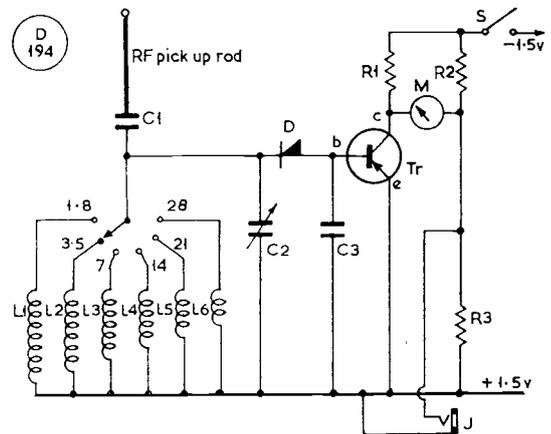
THE circuit shown here—by G5ZT, in a lecture to the Plymouth Radio Club—is of a more than usually sensitive RF indicator/monitor device, having a transistor amplifier after the diode detector.

Using a 100 μF variable condenser at C2, a switched coil-pack, L1-L6, is made up to cover the required amateur bands. Any diode can be used at D, and almost any RF transistor will do for TR.

The device can be built as a self-contained unit, incorporating the 1.5v. battery, and the RF pick-up rod could be one of those small telescopic aerials as used in portable transistor sets—alternatively, a piece of stiff wire about 18ins. long would do.

Coupling to the RF source (Tx, or transmitting aerial) will, of course, be found to vary from band to band for adequate meter indication. If a good quality 0.1 mA instrument is used, care will always have to be taken not to over-couple, which could result in a burnt-out meter.

Applications of the device include: Comparative carrier level indication (CW or phone) in Tx tests on the same band; the meter will show speech peaks on SSB, and also whether modulation is in the right direction on AM; in bad cases, it will detect harmonics being radiated off the aerial; and with an AM signal on tune, speech will be heard in the phones.

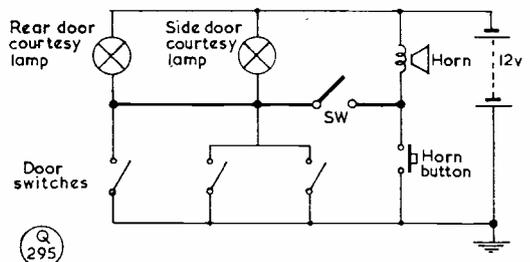


Circuit of the RF Indicator/Monitor, for which values are given in the text. As explained, it has a wide range of useful applications as a checking device.

With a telescopic-rod pick-up, calibration marks could be put on to ensure "correct exposure" for the different bands; if the unit is always used in one position with a given degree of pick-up exposure, any falling off of Tx output on that particular band would be immediately detected.

If the dial of C2 is calibrated, a reasonably accurate wavemeter is available for checking that the Tx is in the band—though calibration will be affected by coupling and (with 100 μF for C2) the tuning for the 21-28 mc bands will be pretty sharp. In other words, an RF monitoring unit of this sort is a very handy item to have on the bench, particularly as it involves no external leads (except when phones are plugged in).

Values are: C1, 100 μF ; C2, 100 μF variable, with slow motion and calibration dial; C3, 0.02 μF ; R1, 10K; R2, R3, 1K; D, any detector diode; TR, any RF transistor; M, 0.1 mA moving-coil meter (0-500 μA for more sensitivity); and L1-L6, coils made up as required, with switching.



Circuit of the thief-terrifier devised by G3BA for the protection of his /M installation (and his car, which is a Triumph "Herald"). When any of the doors are opened, the horn blares forth if Sw is at "on", and is calculated to start somebody running. This switch is fitted in some secret position on the exterior of the car—such as under a wing, or in the radiator grille—and is put to "on" when the car is left. If it is forgotten when out shopping, the resulting hou-ha can be embarrassing!

CONVERTING THE B.44

FOR OPERATION ON THE
4-METRE AMATEUR BAND

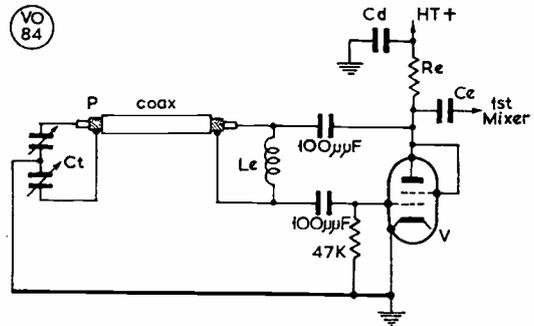
From Notes by GM3OTF

WITH the availability of the ex-Army B.44 Transmitter-Receiver Mk. II on the surplus market at very reasonable prices, many amateurs will have acquired them and be considering the conversion possibilities for operation on our 70.1-70.7 mc band.

The following is the procedure followed by GM3OTF to convert his B.44 :

In the original, the unit will be found set up on a particular crystal frequency (which probably varies from unit to unit) and on the Tx side the crystal oscillator V11 (see block diagram Fig. 1) multiplies by 6 to give the output frequency. For 70 mc working, it is more convenient to use a crystal in the 7 mc range, multiplied by 9 to get into the 70 mc band. For this, it will be necessary to bridge the small trimmer (C56) across the anode coil (L12) of the CO stage with an additional capacity of about 15 $\mu\mu\text{F}$; the CO can then be resonated to three times the xtal frequency; the driver stage V12 can also be taken to $\times 3$ this frequency by adjustment of (C60), and the PA will then be found to resonate at the required output frequency by re-tuning its trimmer (C65). The PA output passes through an elaborate filter network to a coil feeding into the aerial; this can be adjusted by means of a slotted screw on top of the filter box. Indication of RF output and aerial resonance is given by meter on the front panel, controlled by a push-button marked "Check Tx."

This completes the modifications of the transmitter side, but the Rx section involves rather more work if variable tuning is to be obtained.

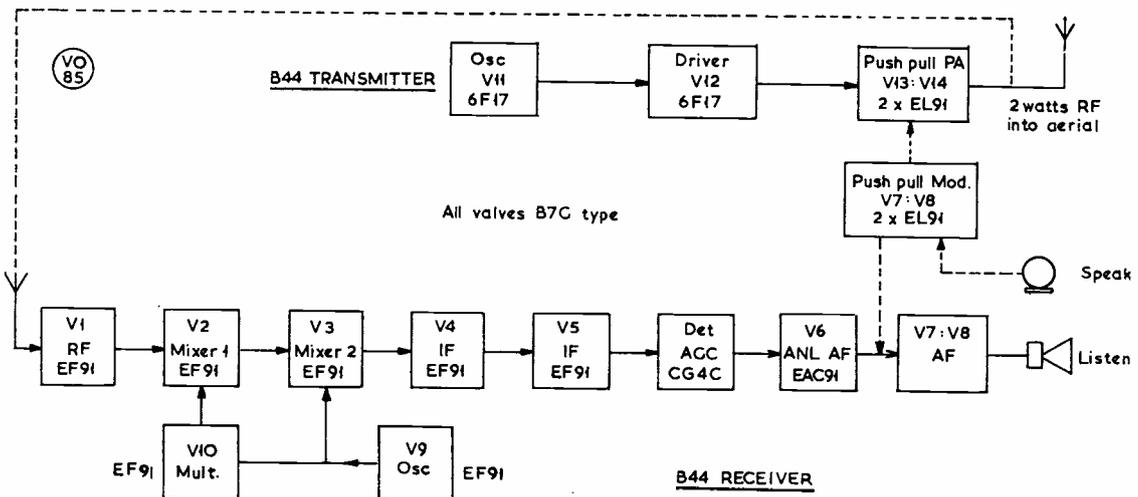


The block diagram for the B.44 Tx/Rx unit is given below. The modification shown here is to the multiplier stage V10 — see text for detail — which is in the receiver side, and is made tunable to cover the 4-metre band. Le is the existing coil, across which is placed the twin-gang condenser Ct, mounted on what was the loud-hailer socket (point P). A short coax lead takes this capacitor into V10, in which Ce, Re are as in the original (see text) and Cd is the screen decoupling capacitor. This makes the B.44 receiver tunable over the 70.1-70.7 mc band, on which it is most effective, though the Tx output (2 watts RF) is relatively low, since the permitted power on four metres is 50 watts.

Receiver Modification

The Rx is a double-superhet having a first IF of about 15.25 mc and a second IF of 2.65 mc. For amateur purposes it is, of course, most desirable that the receiver tuning should be variable, and to make this possible the following alterations were carried out by GM3OTF :

Looking at V9, the Rx crystal can conveniently be around 6+ mc, and is used only to inject about 18+ mc for the second IF. An 8 $\mu\mu\text{F}$ condenser (C16) will be found already in position between the anode of the oscillator V9 and the cathode-sup. grid of the second mixer V3, and this wiring is left in position. The green wire which goes from the first oscillator transformer (TR10, V9) to the second multiplier grid (V10) is removed. A 47K resistor is put across the grid of V10 to ground, and the screen



of this valve is strapped to its anode, the screen decoupling condenser (C45) being taken out; thus the existing screen resistor (R30) becomes the HT feed for V10, now to function as a variable-frequency oscillator.

The anode feed to V10, which is *via* its oscillator coil (L14), is removed, as is the small trimmer (C41), and the circuit is then arranged as shown on p.401 herewith. In this, the elements marked Le, Ce, Re and Cd remain as in the original. The existing coil Le is then tunable to provide variable injection to the first mixer, at around 54.5 mc. On the front panel will be found a jack for a loud-hailer; when removed, this will provide a suitable point (P in diagram) at which to mount a small twin-gang condenser, connected to Le by a short length of coax, as shown in the circuit.

It will be necessary roughly to align the Rx signal frequency circuits by GDO, also the second IF coils in accordance with the crystal frequency used; a simple arithmetical calculation will give an idea of the frequency involved.

Mobile Note

If the transceiver is to be operated mobile (for which it is very suitable, using a Green & Davis 4-wave whip for 4 metres) another slight modification will have to be done, as most cars have their electrics at positive to chassis. Under the power-pack panel, the two feed leads to the vibrator unit should be reversed, and the voltmeter and RF indicator diode connections also changed over; the latter will be found in the filter box.

(Editorial Note: Even if the main circuit diagram, which should come with the set, is not available, these modifications can be carried out by identifying the various stages from the block diagram, and going by the instructions. The block schematic and the element references here, (in brackets) are in accordance with the official R.E.M.E. diagram, called "W.S. B44 Mk. 2 Circuit." It helps to have this—unfortunately, we are not able to supply it.)

G9BF CALLING

Hot Stuff, Right Off The Cuff!

Huge success this new series now guaranteed — rude letters reduced to trickle (less than 100 a week, anyway), though Editor still crusty over space, what about Parametric Amplifiers, Masers/Lasers, and such. But what earthly use that esoteric stuff in comparison real practical gen by me G9BF, now busy compiling long lists exotic EU/DX — example YU, LZ, UV, YO, HA, etc., etc., etc. — not within reach Big Boys scratching after weak Pacific stations never heard anyone else. Only fly G9BF ointment failure old flame SUSIE respond — G9BF still carrying candle for SUSIE though flickering a bit now.

Remarkable new results claimed by old pal AV2PBE, described as Reheated TV. He uses Ch.23 vision signal as modulation his UHF Tx, producing wobbly BBC-2 picture on all TV screens in neighbourhood, irrespective whether tuned BBC-1, ITV, ATV, Radio Caroline, Spanish bullfight or whatever. AV2PBE claims this uncanny effect due new anomalous propagation mode discovered and exploited by him. Some viewers round about not too satisfied but BBC highly delighted enormous compulsory increase BBC-2 watchers.

Pal MO1FFI not letting clay stick to boots, either. New six-channel PA consists broad-banded rotary turret tuner taking 813 for each freq. area, involving six 813's, controlled by handwheel selector (having bands marked in megs, of course). This PA giving such FB results—and so much light and heat — that MO1FFI planning extension to double up on 813's. This fine PA, guaranteed to put about 5 amps. RF into anything, incorporates electro-mechanical techniques ("patents pending") much too difficult for beginner comprehension. Beginners advised start with 807's in broad-banded rotary turret tuner controlled

by handwheel selector with band positions marked in megs.

Our SSB boy XX2XX (from near Midlands) also going great guns confusing 80m. pundits by conducting QSO's with himself in pidgin English explaining how in XX2XX rig carrier suppression obtained by crystal blocking. This guaranteed start long haggle about how many dB's down, can't you get netted, what make car you having on h.p. next time, and did you read that tripe in last month's issue. No conclusion ever reached but evening passes in happy confusion.

Much regret Editor tamping again about space and what about getting off that typewriter for some real work so must QRT with final message all beginners—keep behind me G9BF to be in mode and right with it. Also little msg for SUSIE — pse (*that's enough, buzz off.*—Editor).

NEW BOYS ON THE AIR

About a year ago, William Longmire (Thornton Cleveleys, Lancs.) started to take an interest in Amateur Radio. He joined the Blackpool & Fylde Club; sat the R.A.E. last May; received his pass slip on July 21; took the Morse Test on July 24, with a pass confirmed on August 4; and on August 18 he was licensed as G3TKL. The point of particular interest about all this is that—G3TKL is 70 years of age! We congratulate him, and hope that he will have many years of happy retirement, with Amateur Radio to keep him alert and vigorous. His letter to us was dated August 19. Under that same date, we also had a letter from Vincent Lear (Wallasey, Ches.) notifying his new callsign, G3TKN, and mentioning that as he is only 15 years old, he is the youngest licensed amateur on the Wirral Peninsula. So congratulations to him, too, and we hope these two will meet over the air!

Miscellany

OPINIONS, BIASED AND UNBIASED: NEWS ITEMS: AND SUNDRY IRRELEVANCIES

"We still have many amateurs who prefer the skill of telegraphy; many others take the easier path of telephony; increasing numbers prefer teletype. Of the three, telegraphy requires the greatest skill, because it takes little effort to operate teletype, SSB and AM equipment, but you have to practice patiently to acquire skill to handle telegraphy at any decent speed. It's a sort of additional language, unspoken and completely unreadable to the unskilled."

(W3AX in "Autocall," Washington, D.C.)

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"What could happen if the Amateur Service fails to hold its ground at Geneva? The answer is anyone's guess. Envious eyes are turned to our 20-metre band and what is left of 40 metres; 80 and 160 metres, largely neglected by amateurs in Africa and non-exclusive, could be lost to us. It is easy to envisage what can happen to the remainder — at least a reduction in size, cuts in bandwidth, cuts in power and facilities, or total loss. Perhaps the most effective part that we East Africans could play would be to send a delegate to Geneva, or a contribution towards the expenses of the experts of Region I who will be going."

(Editorial in "QTC," Radio Society of East Africa)

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"There are three types of people in Amateur Radio: A few who make things happen; a lot more who watch things happening; and the vast majority who just don't know what the heck goes on."

(Ancient Proverb)

— • • • —

Ever been annoyed by a Russian commercial in the amateur bands? If so, there's not much to be done about it. Russian amateurs who made this same complaint were informed that the Soviet Government does *not* operate transmitters on any amateur frequencies.

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Believe it or not, it is 33 years since STC and LMT demonstrated microwave communication across the English Channel. The commercial link between Lympne and St. Inglevert opened three years later, in 1934.

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It is not generally known that, after the Skopje disaster, German amateurs got together and shipped half a ton of radio equipment and valves as replacements for YU stations damaged in the earthquake. D.A.R.C. handled the effort, but DL2OU and DL9KG did much of the hard work in packing and despatching.

(I.A.R.U. Region I Bulletin)

Heard on the Air: "If the gentleman swishing a VFO over this frequency for the last twenty minutes will kindly deliver a QSL card in person ... I'll be delighted to knock his blinking block off!"

(G3-- on 80-metre AM)

— • • • —

VE1US, arriving in the U.S.A. recently, found that he had nothing to prove his identity except his A.R.R.L. membership card. The examining officer looked at it and said "Well, you sure are a Canadian if you have that." ("QST," August 1964)

— • • • —

"Meeting was adjourned early due to the fact that it was almost impossible for anyone to be heard over the noise from another meeting in the adjoining room. W6KG suggested that the club purchase a public address system."

("The DX-er," Northern California)

— • • • —

Visits to members' homes are always very entertaining and attractive. After the formal introductions are over — the wife — children — dog — cat — budgerigar, etc. — the showpiece of the evening is revealed . . . the Shack. Heavens above — what a pile of junk. Looks more like the local scrap yard or the corporation refuse dump. Does that thing work? What are all those bare wires twisted together for? I see you own a second-hand book store, too. These and lots of other comments race through the brain, but remain unsaid on remembering that "An Amateur is a Gentleman at All Times."

("GM Magazine")

— • • • —

A connoisseur of advertisements has to have his wits about him, these days; he has to know the language. How about this: "Hardware that is iridite treated to MIL specs . . . injection moulded cycloc plastic insulators . . . plus all new moisture-proof traps encased in ageless aluminum housing." Or this: "Our exclusive fiberglass construction provides this antenna with a precipitation static barrier over the 108in. max. length." Just two current American advertisements, selected at random from CQ and QST.

— • • • —

"We chuckled when we found that the time-switch mechanism on the TNT was wired in such a way that the battery was across the switch instead of in series. If our good friends had spent more time studying the rudiments of Ohm's law, instead of the racing results, they would have been more successful in their dedicated task of assassination."

("Marcogram," Montreal)

THE PRACTICAL APPLICATIONS OF SEMICONDUCTORS

IN THE AMATEUR STATION

Part V

AUDIO AMPLIFIERS (I)

M. I. DAVIS, B.Sc.

THE aim of this particular article in the series is purely to give as many useful audio amplifier circuits as possible. Very little theory will be entered into, and any constructional details given will be for guidance only.

We consider amplifiers in two sections. The first covers Class-A circuits, including both low-level amplifiers and single-ended output stages, while the second deals with the Class-B configuration, and describes low- and high-power output stages, including the increasingly-popular transformerless amplifiers. The reasons for the mounting popularity of this type of audio amplifier are not difficult to determine.

Principally, the omission of the two split-secondary transformers is the main asset, since these components, in a high-power, high-quality amplifier, are bulky, expensive, and often difficult to obtain; they are also prone to hum pickup and to "ringing." The whole circuit (less power supply, of course), can be built on tagstrips or a piece of printed board. Further, it is much more likely that the amateur possesses a very large range of resistors and capacitors than that he has to hand exactly suitable transformers for any given design.

Offset against the advantages of compact, inexpensive, efficient, lightweight circuits, it must be admitted that at least one n.p.n. transistor is required. The author did, however, make some comments *apropos* this point in a previous article, and n.p.n. transistors are no longer the rarity they used to be in the amateur's repertoire.

Low-Level Class-A Amplifiers

Let us consider, then, the simplest of all circuits using a three-terminal active device; the single-stage, common-emitter, Class-A amplifier, the circuit of which is shown in Fig. 1A. It must be mentioned that this is not intended to be a practical circuit; this comes later. At present we are merely interested in choosing suitable values for C1, C2, R1 and R2. No protection against thermal runaway is provided in this circuit.

We choose a supply of 9 volts. For Class-A operation, the quiescent value of the collector voltage should be half the supply voltage, *i.e.* 4.5 volts. If the collector current is chosen as 1 mA, then a

collector load of 4.5K is required; so, to the nearest preferred value, R2 should be 4.7K. Suppose the β of Tr1 is 50. The quiescent base current will be

$$1/50 \text{ mA, and so } R1 \text{ must be } \frac{9-V_{be}}{1/50} \text{ K. Since } V_{be}$$

is small (0.4v. or so for a germanium transistor) R1 will be about 470K.

The value of C1 depends on the lower 3 dB frequency required, and on the input impedance of the amplifier; the former may well be 50 c/s, and the latter may, for this purpose, be taken to be 1K.

$$\text{Then } C1 = \frac{1}{2\pi \times F \times r} \text{ where } F \text{ is the fre-}$$

quency of the lower 3 dB point, and r_{in} is the input resistance.

$$\text{In this case, } C1 = \frac{1}{2\pi \times 50 \times 1000} \\ = 3 \mu\text{F approx.}$$

The value of C2 will be the same if we are feeding an identical stage; if this is not the case, then C2 will have to be calculated as above.

Input and output resistances are both dependent on load and source resistances, amongst other things, and are not straightforward to calculate accurately. The current gain of the stage is equal to the β of Tr1, and the stage voltage gain may be roughly approximated to:

$$G = \frac{\beta R_2}{r_{in}}$$

if the source and load resistances are fairly small. Two typical practical single-stage common-emitter amplifiers are shown in Figs. 1B and 1C. They illustrate the two different ways of reducing the possibility of thermal runaway.

In Fig. 1B, a pair of resistors provides the base current, not from the supply rail, but from the collector. This forms a DC feedback path, and reduces the risk of thermal runaway. If only one resistor were used, the gain of the stage would be very much reduced by this negative feedback. To overcome this, we split the resistor into two, and decouple the mid-point with C3, a capacitor whose reactance is low at signal frequencies. R1 and R2 are made equal to compromise between shunting the collector load, or the input terminals, with C3.

This system works best with low output voltage swings, and thus is not really suitable for a large-signal amplifier, but it is widely used in low-level amplifiers.

Moving now to the arrangement of Fig. 1B, let us suppose that we make the collector swing 1.5v, in either direction, and hence bias the transistor so that, drawing 1 mA of collector current, the quies-

cent voltage is $-1.5v$. Then $R3 = 4.7K$, and the base current required is $1/50 mA$, (again assuming a current gain of 50). Now the collector voltage is -1.5 , and since V_{be} is about $0.4v$, then $1.1v$ across $(R1 + R2)$ must provide this current. Thus

$$(R1 + R2) = \frac{1.1}{1/50} = 55K. \text{ So to the nearest preferred value, both } R1 \text{ and } R2 \text{ should be } 27K. \text{ A value of } 6 \mu F \text{ for } C3 \text{ will decouple the junction of these two resistors for most audio frequencies, and } C1 \text{ and } C2 \text{ can be as in the previous case.}$$

Although an OC71 is specified for Tr1, any LF low-power transistor would be suitable. This, broadly speaking, is true for all the low-power circuits given, the only proviso being that the device used is not too noisy under operating conditions. If noise turns out to be a problem, it may be worth using a low-noise transistor such as the GET-106.

The circuit of Fig. 1C has also been designed for 1 mA collector current. With $R3 = 1K$, the emitter will be at 1 volt, allowing 8 volts for Tr1 and R4. In order to make the quiescent base

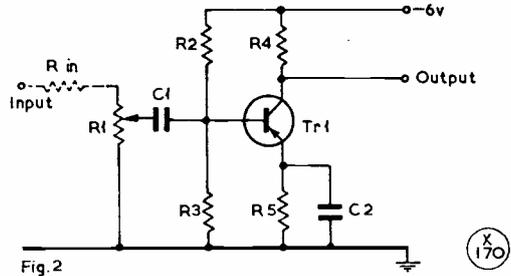


Fig. 2. A low-power amplifying stage. C1, see text; C2, $100 \mu F$; R1, 1 megohm; R2, 56K; R3, 10K; R4, 12K; R5, 3.9K; Rin, see text, and Tr1, OC71.

voltage only slightly dependent on base current, we arrange for the parallel resistance of the potential divider $R1/R2$ to be small, so that the bleed current is about ten times the base current.

Since $I_c = 1 mA$, and β is still assumed to be 50, I_b is twenty microamps, and the divider chain bleed current is $0.2 mA$, so that $0.22 mA$ flows in R1, and $0.2 mA$ in R2. Assuming that V_{be} is small, the base and emitter voltages are equal, i.e. one volt. Thus 8v. across R1 must produce a current of $0.22 mA$, making R1 33K, to the nearest preferred value. Similar considerations with R2 (one volt and $0.2 mA$) lead to R2 being $4.7K$. *

R4, the collector load, might again be $4.7K$. Since R3 would cause a large amplitude of negative feedback, and hence degenerate the gain of the stage, C3 is used to decouple it. The parallel combination should have an impedance of less than 20 ohms at the lower 3 dB point.

Having briefly covered the basic details of common-emitter amplifiers, let's consider their practical applications. Note first that no mention has yet been made of transformer coupling. The author prefers not to use audio transformers except where absolutely necessary, and whilst it is not his intention to foist this outlook on readers, it does seem that the specified transformer is never to hand. For that select band of initiates who successfully "roll their own," or have a supplier with a wide range on the shelf — fine, by all means use transformers. Anyway, transformer-coupled circuits will be mentioned later.

Fig. 2 shows a typical low-level amplifying stage. Such stages are to be found immediately following a detector, microphone, tape head, or pickup. Crystal mikes and pickups like to "see" an input resistance of more than 250K, and this can be provided by connecting Rin (330K) in series with the input. C1 can then be as low as $0.1 \mu F$. Other high-impedance inputs can also be dealt with in this way. For low-impedance sources, however, Rin should be omitted, and C1 increased to about $12 \mu F$ depending on the bass response required.

Further examples of this type of circuit occur later when we consider the overall diagrams of

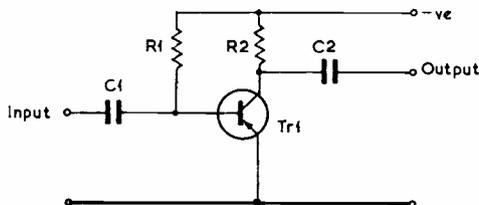


Fig. 1a

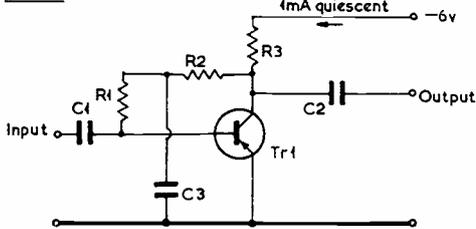


Fig. 1b

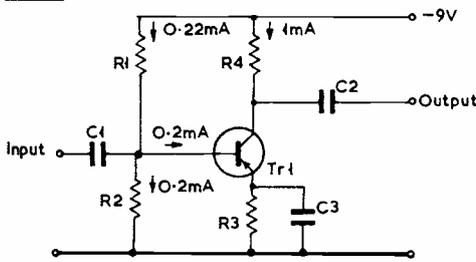


Fig. 1c

Fig. 1A. Simplified circuit, common-emitter amplifier — for discussion, see text. Fig. 1B. Preventing thermal runaway by use of a collector-base resistor: R1, R2, 27K; R3, 4.7K; C1, C2, $3 \mu F$; C3, $6 \mu F$; Tr1, OC71. Fig. 1C. Potential-divider method of providing DC stability: R1, 33K; R2, R4, 4.7K; R3, 1K; C1, C2, $3 \mu F$; C3, $500 \mu F$; and Tr1, OC71.

* It is hoped that this concept of "negative current" does not confuse readers. It is simply handy for p.n.p. devices.

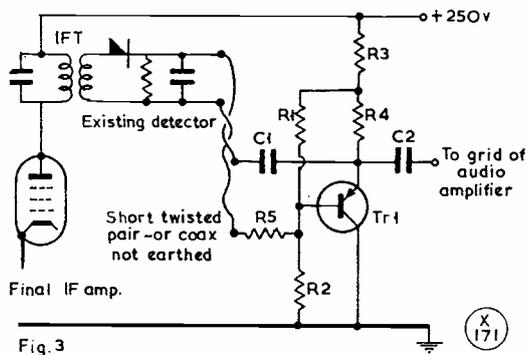


Fig. 3. An audio booster stage, in which C1 is 100 μ F; C2, 0.1 μ F; R1, R3, 470K; R2, 100K; R4, 6.8K; R5, 220 ohms and the transistor is again an OC71.

complete amplifiers.

Another useful application of this type of circuit occurs when it is desired to increase the gain of a valve amplifier; for instance, the audio stages of some ex-W.D. receivers do not possess all the gain they might, and a simple transistor stage will soon put this to rights. The circuit of Fig. 3 might be interposed between the detector diode and the first audio amplifier valve. A very high increase in gain may be achieved, and no microphony troubles will occur. Noise should not be excessive. Even though the noise figure is higher than that for a valve circuit, the overall noise in the receiver is likely to be very much higher than the noise generated in this stage.

The unit is designed to work from a 250-volt supply; voltages much higher than this should not be used. Care must be taken to avoid wiring errors and accidental shorts—transistors *hate* 250 volts in the wrong places! As shown in the diagram, the leads connecting the detector to the amplifier should be either a short twisted pair or a short length of coax. The detector should not be earthed on either side, and this implies that if long leads are used, hum and/or RF may be picked up. Note that feedback is provided by the emitter-base resistor. This is an interesting circuit, in that although it seems at first glance to be an emitter-follower, it operates rather like a common-emitter amplifier, since the input is applied between base and emitter, and not between base and earth. Instead of the load resistor being placed in the collector circuit, however, it is in the emitter, so as to give the correct output level to drive a following valve stage. This arrange-

Table of Values

Fig. 4. Pre-amplifier using n.p.n. and p.n.p. types

C1 = 100 μ F, 12v.	R3, R7 = 560,000 ohms
C2, C3 = 25 μ F, 6v.	R4 = 220 ohms
C4 = .022 μ F	R5 = 10,000 ohms
C5 = .047 μ F	R6 = 33,000 ohms
C6 = 25 μ F, 12v.	R8 = 500,000 ohms
R1 = 1,500 ohms	Tr1 = NKT701
R2 = 15,000 ohms	Tr2 = NKT223

ment provides a voltage gain of between 250 and 400, and takes less than 1 mA of current from the HT supply.

A useful preamplifier is shown in Fig. 4. This circuit appears by courtesy of *Newmarket Transistors, Ltd.*, and uses one n.p.n. and one p.n.p. transistor. The output impedance is sufficiently high to drive a valve stage, and AC negative feedback is supplied from the emitter of Tr2 to the base of Tr1 via C4 and R6. DC feedback to stabilise the working points of the transistors is applied via the collector-base resistors of 560K to both transistors.

A practical point to bear in mind is that the circuits used as microphone pre-amplifiers are sufficiently simple and lacking in bulky components to be built on a small piece of *Veroboard* and placed inside the microphone case in many instances. A miniature battery capable of running the unit for many hours would make the assembly quite self-contained. In this way, the audio signal/noise ratio appearing at the main amplifier or modulator will be very much improved, especially where long microphone cables are necessary.

Transformer-coupled Class-A amplifier

A circuit which may be of interest to readers engaged in mobile work is shown in Fig. 5. It is an output and driver stage intended for a hybrid valve-transistor receiver, producing about three watts of audio. Unfortunately, because of the Class-A configuration, the efficiency is invariably less than 50 per cent, and the power transistor dissipates more than six watts. A heat sink of at least 12 sq. in. of blackened aluminium is therefore required. R5 should be adjusted until the quiescent current with no signal is between 400 and 500 mA; it may be necessary to change the value of R5 and R6 to accommodate transistors with very low or very high current gains.

The emitter resistor of Tr2 (R7), which is left uncoupled to provide feedback, may conveniently be made by winding the appropriate amount of

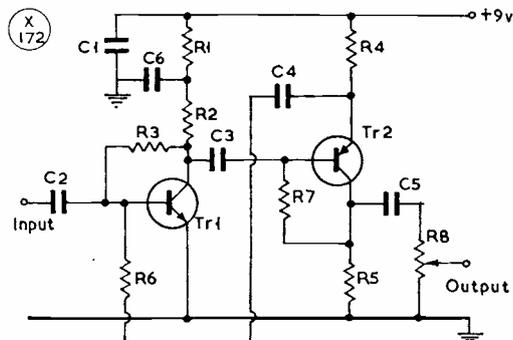


Fig. 4

Fig. 4. A pre-amplifier unit using negative-positive-negative and positive-negative-positive transistors, known as n.p.n. and p.n.p. types respectively. These are fundamental definitions, and determine which way round the supply battery is connected—or the transistor is wired in circuit.

Table of Values

Fig. 5. Output stage for hybrid mobile Rx

C1 = 0.5 μ F	R7 = 0.5 ohm (see text)
C2 = 100 μ F, 6v.	T1 = Driver, 24:1
C3 = 500 μ F, 6v.	T2 = Output, 3:1
C4 = 100 μ F, 25v.	LS = 3-ohm
R1 = 47,000 ohms	Tr1 = OC71, or equiv.
R2 = 10,000 ohms	Tr2 = OC28, OC29,
R3 = 750 ohms	OC35, OC36,
R4 = 470 ohms	V30, V30/P, or
R5 = 500-ohm, preset	similar
R6 = 10 ohms	

nichrome over a resistor of, say, more than 20 ohms; a 1-watt ceramic type is suitable. The fuse in the supply rail should not be omitted; it might save the day if anything goes wrong. The 3-ohm speaker impedance must be transformed to about 30 ohms to be an effective collector load, and a 3:1 output transformer accomplishes this. It must naturally have a very low primary resistance. T1, the driver transformer, is of a relatively standard type, with a step-down ratio of 24:1.

This circuit by no means represents the most sophisticated or suitable arrangement for mobile receivers; some physically smaller circuits giving higher outputs are described later. It does, however, have the advantage of using few components, and the transformers are the only bugbears in this respect. If these can be obtained, then the construction of the circuit should present no problems.

Amplifier Design using Class-B Output Stages

The advantages of Class-B push-pull operation over Class-A are widely known, but will be briefly summarised.

The quiescent current of the output stage may be very low; hence, dissipation is very much reduced, since high currents are passed only on peaks of signal, and for normal speech work this condition applies only for very short periods, interspersed with much longer periods of low-level or zero signal. This implies also that battery drain is much reduced.

Fig. 6. A Class-B amplifier rated at 200 milliwatts, which is adequate audio output into a small 3-ohm speaker. The output transistors can be in the OC72/OC81 category, these being Mullard types in their current range.

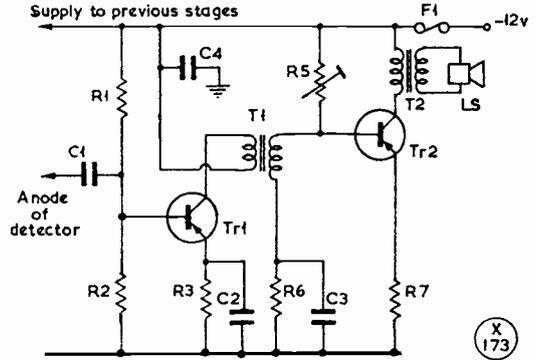


Fig. 5

Fig. 5. A hybrid mobile receiver output stage for which all values are given in the table.

The efficiency at high output levels is also improved by the use of Class-B. Finally, the configuration lends itself to the transformerless technique.

The first exhibit is a typical low-power audio amplifier giving about 200 mW into a 3-ohm speaker (Fig. 6). This circuit illustrates some of the principles mentioned earlier. Tr1 is a Class-A RC-coupled amplifying stage, and the driver is also in this mode (Tr2). In order to reduce the cross-over distortion (a phenomenon present in Class-B stages due to the output transistors not turning off and on at the correct voltage levels) the circuit should be temporarily broken at the point marked X and a milliammeter inserted; with the input shorted, R9 should be

Table of Values

Fig. 6. Transistor Class-B Amplifier, 200 mW.

C1, C2 = 10 μ F	R8 = 1,000 ohms
C3 = 100 μ F	R9 = see text
C4, C5 = 250 μ F	R10 = 160 ohms
R1 = 47,000 ohms	R11 = 62,000 ohms
R2 = 8,200 ohms	Tr1,
R3 = 3,900 ohms	Tr2 = OC71, or equiv.
R4 = 1,200 ohms	Tr3,
R5 = 22,000 ohms	Tr4 = OC72, OC81
R6 = 10,000 ohms	LS = 3-ohm
R7 = 470 ohms	

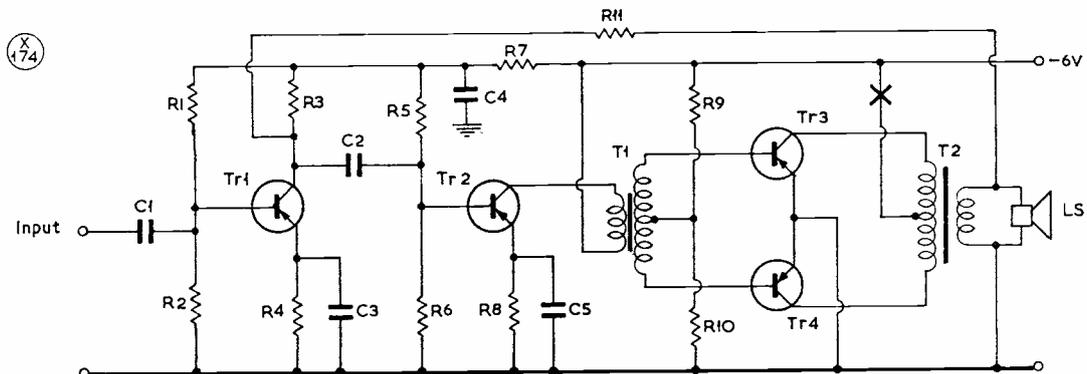


Fig. 6

adjusted so that the quiescent current is between 1 and 1.5 mA. A suitable starting value for R9 is 10K.

If a 500K volume control is connected to the input, C1 may be reduced to about 0.2 μ F, and a crystal pickup (or mike, or a detector circuit) used to drive the setup through a resistor of at least 100K.

This type of circuit is extremely popular, and so little difficulty should be experienced in obtaining T1 and T2. Transformers capable of handling higher powers, however, are more difficult to come by, and it is here that the transformerless circuit comes into its own. These will be discussed in the next offering.

Do You Know That —

— For testing a filter-type SSB Tx on two-tone, a square-wave multivibrator as shown on pp.212-213 of the June issue of SHORT WAVE MAGAZINE can be used, since it checks the transmitter all the way through, including the filter performance. Injection is at the microphone socket and if the filter is adequate it will remove harmonics of the fundamental frequency—what started as a square-wave will appear at the PA end as a sine-wave. The fundamental frequency of the multivibrator should be chosen so that its second harmonic falls outside the filter passband. (G3IHI).

— A neat and easy way to make printed-circuit boards is to draw the diagram on gummied paper, stick this to the copper side of the board, and then trim out (with a sharp knife or a razor blade) the portions where copper is to be left on. Paint the whole side with the resist and when it has dried, peel off the remaining paper and etch the board with the usual ferric-chloride solution. This method obviates the need for accuracy and a steady hand when painting on the resist to make an original circuit straight on to the copper. (R. Walker, Sheffield, 11).

— With transistor receivers, the front-end TR's can still be blown on "transmit" even with the aerial input shorted. By arranging the switching so that the transistor emitters are disconnected on change-over, this costly effect can usually be eliminated. (M. H. Judd, Peterborough).

— Tyre static can be considerably reduced by running wide strips of metallic paint (lead or conducting) from the tread to the rim, applied to the inside of each wheel, and using graphited grease in the wheel bearings. (G2HKU).

— A neat and effective mobile identification can be contrived by having the callsign mounted on standard motor-cycle number plates, fitted at front and rear of the car. (GM3LRG).

— In addition to the warnings already given about the use of carbon tetrachloride, smoking in the presence of its fumes can be dangerous. Vapour inhaled through burning tobacco can form phosgene, a highly toxic gas. (G3SFL). (We must really keep

that old *Thawpit* bottle in the poison cupboard in future!—Ed.).

— For UHF work, a very effective corner-reflector can be made up using peg-board (a thin hardboard, with a pattern of small holes, as used for window-display purposes) covered with wire-mesh, and then treated with a good outdoor paint or varnish. The result is a strong, light and weatherproof job. (GM3MCH).

— The adhesive known as *Styrenestik* (available from ironmongers and intended for fixing plastic tiles) has a polystyrene base and sets hard, as a white compound having the appearance of ceramic. On the amateur work-bench it can be used for joining or fixing items made of polythene, and is excellent for securing Tx coil windings, even with heavy-gauge wire. It can also be used as a moulding material and, being supplied in a tube, it is easy to work. (G5JU).

— With the BBC's Light Programme transmission being extended to about 21 hours a day, a ready source of power for transistorised equipment becomes almost continuously available. The Light Programme Tx, on either LW or MW, puts down a strong signal all round the country. A simple rectifier arrangement—see p.235 July '63 and p.239 July '56 SHORT WAVE MAGAZINE—with a pick-up circuit tuned to the transmission you receive best, will produce enough volts and mA for any transistor type up to about 6v. working. (The BBC modulation, which is at an average level of only 60 per cent, is easily filtered out by the rectifier action). One interesting practical application of this idea is for the powering of mast-head transistor broad-band VHF amplifiers, as now being used to boost TV reception in fringe areas. Use the mast as the PSU aerial!

Somebody has suggested that this little feature should be called "Nifty Notions." We don't quite go along with that, but we will pay 10s. 6d. for any "Do You Know" idea we can print—even if it is yet another use for empty ball-point pen cases!—
Editor.

DIRECT SUBSCRIBER NOTE

We have a large number of readers who are helpful enough to pay a direct subscription by banker's order. A recent check-up shows that some of these orders have not yet been adjusted to the new rate of 42s. for a year of twelve issues. It would be much appreciated if those who are on banker's order would take the necessary action to make the order payable at the new rate. It would save us an awful lot of paper-work!

AMATEUR RADIO EXHIBITION

This will be during October 28-31 at the Seymour Hall, near Marble Arch, London, W.1, as last year, and once again we shall be there—as we have been ever since these exhibitions started—on Stand 19, near the main entrance. We hope to see you.

SWL • • • • •

**NEWCOMERS — R.A.E. SUCCESSES —
 QUERIES — DX/TV — TEN METRES — VHF
 SWL's — NEWS AND VIEWS**

IT seems that SWL's, as a body, are rather better adjusted to a spell of poor conditions than are the transmitting fraternity. At any rate, there are not nearly as many moans despite an extremely dull period over the last two months. Those who thought last summer was bad have had a nasty shock this year—it has been far worse! However, we do know that we are now right in the trough, and it can be assumed that we have nothing but improvement to look forward to from now on.

The fact of the matter is that the SWL fraternity is not quite so completely obsessed with DX as many transmitting amateurs seem to be. So a spell of "non-DX" conditions merely means that they have something *different* to listen to. In all the large and varied mail received this month there is hardly a single grouse about ionospheric matters—which is strange but rather gratifying.

Of course there are, within the ranks, many keen newcomers who don't know what really good conditions are like—their experience doesn't go back as far as that. We promise them that they will have a real treat in the next few years, but they will need all the selectivity they can muster up. Better conditions will mean even more stations on the air—many more—and hence more QRM—much more!

Several newcomers to these columns are welcomed, and most of them appear on the HPX Ladder (not necessarily at the bottom end). *C. Crisp (Maidstone)*, for instance, joins with a score of 355, all SSB, of which he logged 192 in two days! He uses an AR-88 hooked to a centre-fed 250-ft. wire, 60ft. up, which obviously helps. And he asks whether BY3SI is known to be a legitimate one—anyone help?

A. H. Pardoe (Stourbridge) also comes on the Ladder with a score of 323. He has been held up by A-level QRM for some months, but is now flat out to get the prefixes, and doing very nicely. They are pulled in, in his case, by an old R.1155A, almost entirely on Eighty and Twenty. He thinks that amateurs spend too long complaining about poor conditions; if they were to look round a bit more carefully, he suggests, they would find something interesting.

Gil Bunting (Birmingham) has also been a sufferer from A-level QRM, but is now in full swing again on the bands. He had some interesting times with the local club (Dudley), with G3RXX on the air /P for a two-metre field day, and /A at a local garden fête (Gil being the one who climbed the trees for the 500-ft. long wire!). He sends a picture (unfortunately not quite good enough for reproduction) which shows his "Handy Angle" method of

construction for a kind of rack-and-panel set-up. Strongly recommended.

Phil Holliday (Mapperley) and others remark that the Ladder was published in the July issue under the headings "Phone and CW" and "CW Only"—and asks whether this was intentional. No, it was an unfortunate error, and the larger section should have been "Phone Only," as always. He hopes to join the CW section shortly.

Sundry Queries

I. Buffham (Spalding) heard 9N1MM on Twenty SSB, but as he remembers that our friend Gus used that call last year, he wonders whether it was genuine. Yes, indeed it was—Gus was operating the station, but he didn't own the callsign. SWL Buffham was awaiting R.A.E. results, by the way, but no doubt he knows by now!

J. D. Williams (Winchester) is moving to a new QTH half a mile away and is horrified at the idea that he might have to start scoring prefixes, for the ladder, all over again. Certainly not—same operator, same gear, so why cancel out previous successes (unless, of course, you move to quite a different part of the country, which does present a new problem.)

And *Colin Waters (Corbridge)* asks the really fundamental query that we often have to face: "How do I join the HPX Ladder?" Simply send in your log of *prefixes* received (not full callsigns), with the total number claimed (we hate counting them up!) and add to it from time to time. It couldn't be simpler.

Terry Popham (Exeter) puts up his total by no less than 93, and has serious designs on the top rung of the ladder; he would like to see H. G. Shaw, the "uncrowned king," start again—perhaps on SSB only—to give some of the others a good run for their money. And he adds that SWL's on holiday in his area will be most welcome, if they will first Phone EX 66372 or drop a QSL to 32 Summerway, Exeter. (Conversely, he will be in Austria later on, and hopes to drop in on an OE or two.)

Some Useful Gen.

Prefix-hunters, note! G3COJ (London, N.8) passes on the gen., from a Russian magazine, that the following are licensed: UV9's (UV9UA and 9UB active); UW6's; UV3's (UV3TP on CW and SSB); and UY5's (UY5AC and 5UY are in Kiev).

For the TV-chasers, here are some Identification Signals from European stations, collected for us by G2DHV (Sidcup):—

ARD: West Germany	RMC: Monaco
BRT: Belgium	RTB: Belgium
CLT: Luxembourg	RTP: Portugal
CST: Czechoslovakia	RTF: France
DFE: East Germany	SRG: Switzerland
DSR: Denmark	SRT: Sweden
JRT: Yugoslavia	SSR: Switzerland
MT: Hungary	TSS: U.S.S.R.
NRK: Norway	TVE: Spain
NTS: Netherlands	TVP: Poland
ORF: Austria	YLE: Finland
RAI: Italy	ZDT: Germany
RE: Eire	

[over

DX-TV

And that leads us, naturally enough, to the TV-chasers themselves. Roy Patrick (Derby) found the end of June a very good period. He doesn't aspire to pictures yet, but found the sound from Caen, France; from a German station on Channel 1; and from Italy (very strong) on Channel 3. And he says the "Voice of Free Scotland" mobile stations, operating on various BBC channels, have been accused of being "amateur mobiles." Mobile, perhaps, but not amateur, we hope.

Dennis Boniface (Ripon) says he is heartily sick of seeing bull-fights from Spain, the most consistent country with him; he also watched TV from Poland, Hungary, Switzerland, Norway, Sweden and France, as well as one unidentified test card. A transistor pre-amp for Band 1 has been built, and proved well worth while.

V. H. Woodcock (Edenbridge) sends photographs of pictures from Spain on June 30 (yes, bull-fights!); and of test cards from Sweden and Tallinn (Estonia) on the same date; on the following day he photographed a good test card from Czechoslovakia. The interesting point about his DX-TV reception is that it was all on a standard commercial set, with vertical dipole, only modified to the extent of feeding the Band 1 tuner into the IF's while the 625-line time-base was in action.

HPX LADDER

(Starting January 1, 1960)

Qualifying Score—150

SWL	PREFIXES	SWL	PREFIXES
<i>PHONE ONLY</i>		<i>PHONE ONLY</i>	
A. W. Nielson (Glasgow)	653	N. A. French (Highbridge)	274
R. J. C. Coats (Cowie)	637	C. Whaley (Cambridge)	269
R. Hunter (Kenton)	597	J. W. Smith	
R. Williams (Birmingham)	569	(Tunbridge Wells)	265
D. S. Smith (Stanmore)	544	G. S. Bunting (Birmingham)	251
S. Foster (Lincoln)	532	M. Shaw (Bromley)	235
B. Curnow (Plymouth)	505	M. A. Stephens (Hove)	233
T. R. Popham (Exeter)	501	R. V. Bruce (Norwich)	230
D. A. Whitaker (Clitheroe)	467	J. P. Fitzgerald	
D. A. Pickup (Preston)	456	(Great Missenden)	228
F. Bourne (Plymouth)	455	B. J. Turner (Westcliff)	218
C. N. Rafarel (Poole)	448	R. Turlington (Braunstone)	211
K. C. Staddon (Stroud)	447	P. R. Ball (Sligo)	210
M. Vincent (Cheltenham)	441	P. H. Moncaster (Goole)	206
P. Baxter (Winchester)	422	R. S. Finley (Harrow)	201
A. F. Huggett		G. Christie (Gainsborough)	201
(Lamberhurst)	410	A. E. Beales (Clacton)	194
P. Etheridge (Hull)	400	J. E. Hart (Leeds)	191
M. Healey (Horsham)	391	H. Wolton-Carr	
M. Woollin (Leeds)	381	(Cambridge)	191
P. A. Cayless (Exeter)	380	A. Parker (Chesham)	165
F. B. Blake (Beaconsfield)	366	D. Rogers (Wrexham)	165
C. Crisp (Maidstone)	355	P. A. Holliday (Nottingham)	158
N. J. Summers		N. Robson (Corbridge)	154
(Market Harborough)	325		
A. Stone (Kidderminster)	325		
A. H. Pardoe (Stourbridge)	233		
I. Buffham (Spalding)	315		
D. Gray (Croydon)	301		
S. E. F. Howell (Hove)	299		
J. R. Daws (Leeds)	284		
J. L. Pearce (Basingstoke)	279		
A. F. Roberts			
(Kidderminster)	278		
B. G. Hamilton (Belfast)	276		
D. C. Parker (Redditch)	275		

(NOTE: Listings include only recent claims. Failure to report for two consecutive issues of "SWL" will entail removal from the table. Next list, November, 1964 issue—deadline, SEPTEMBER 18).

After the Battle

Still more warriors returning to the bands after the horrors of exams! Barry Curnow (Plymouth) has done so to some purpose, and now occupies the top spot on the CW ladder. He says Forty has been extremely good for this purpose, and quotes such DX as VK, ZL, VP2, HI8, VS1, CP5 and many others less exotic. And now he is off to investigate listening conditions in Scotland and Northern England.

D. A. Pickup (Preston) "returned to full operation after severe QRM (GCE)," moved his gear to another room and put up a new aerial to celebrate. Result: VSILP on Forty SSB, and, a few minutes later, on Eighty as well. The early morning hours on both bands bring in many W's on SSB, but with few Europeans working them. The prefix score is now up to 456, and with a 270-ft. wire, four dipoles and plans for other experimental wires, hopes are high.

Malcolm Healey (Horsham) was the glad recipient of "a small piece of yellow paper with a 'P' in the right-hand corner"—so now for the Morse test. Meanwhile it's not all prefix-chasing, as he has heard GI on two-metre Phone, and F8AA on 70 cm CW. The 6-el. beam on Two is being replaced by a six-over-six, and there are thoughts of a 32-el. job for 70 cm. And of the HF bands, SWL Healey confirms that there are too many people saying conditions are very bad, instead of listening to what is being worked by others. On the technical side, he recommends a bit of rebuilding with close-tolerance resistors and capacitors; they cost a bit more, but what a difference they can make to local oscillator and BFO stages. He's even cured an old HRO of its slow drift!

R. Williams (Birmingham) now has a very high total on the phone ladder (569) and is another who recommends Forty SSB, quoting KC4USB, PJ3CF, VS1LP, VS9MB and 6O2BW. Meanwhile he has built a transistorised practice oscillator and got up to 6 w.p.m. . . .

Ten Metres

An encouraging number of SWL's reported on the Ten-Metre Activity Sunday (July 12) but their findings have been correlated in the references to that affair in August's "Communication and DX News," so no further comment is needed here. However, D. A. Whitaker (Clitheroe) says that it is reported that DL7AA (Berlin) has worked 70 countries on Ten Metres *this year*. And B. F. Hughes (Worcester) recently logged 9G1DM calling CQ on 28.5 mc, also F8QQ/M (Nice) on 28.3.

Pete Cayless (Exeter) says he often hears GM3SKX (Shetlands) down there—usually S5-7; and he actually gets QRM on the band, mostly from DM, DJ and F. M. Vincent (Cheltenham), having managed to lug the school radio society's CR-100 home (on a push-bike!) for the holidays, has heard something on the band most days and most hours of the day; apart from Europeans, he has logged 5B4, 9L1 and ZD7. Since he is in a fringe area for BBC TV, he

gets the nudge when there is sporadic-E about—if the TV goes groggy, he makes for the CR-100 and Ten Metres!

Permanent SWL's, R.A.E., and So On

Recent remarks about SWL's who take the Radio Amateur's Examination and still don't appear with a callsign have brought forth quite a crop of letters; and a still greater number who have no intention of taking the examination leap to the defence of the SWL aspect of the hobby.

Stewart Foster (Lincoln) says "I get tremendous pleasure and satisfaction from just listening, and have no desire whatever to transmit. There are already enough people on our overcrowded bands."

Most of those who have taken, and passed, the R.A.E. say that the hold-up is the Morse test. One points out that R.A.E. can be taken only twice a year, whereas the Morse can be fixed at almost any time; another passed the exam. in 1958 but didn't take the code test until 1963 (he's now G3SQV); and the longest gap of all is attributed to G3TGB, who passed R.A.E. in May 1950 and the Morse test on June 12, 1964, just 14 years later!

There are also two or three who say they could never have passed the Morse test without the help of local club members; and even one who admits that since his local club has died, he feels he has practically no hope of ever passing.

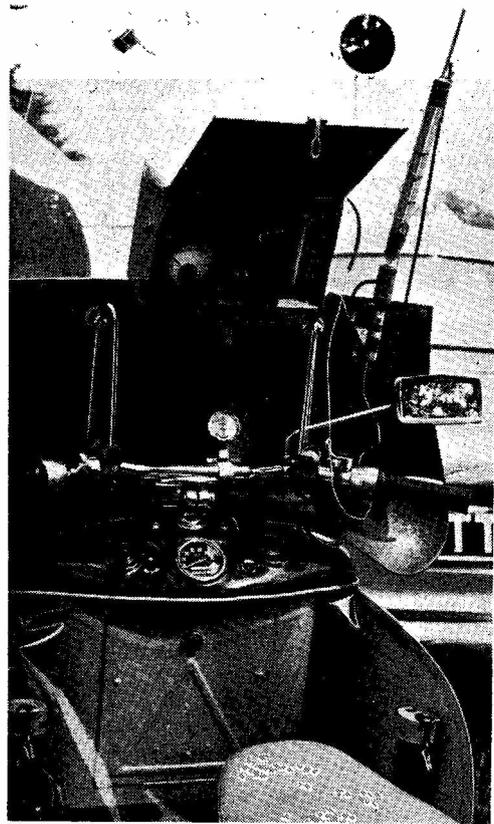
On the whole, we are of the opinion that most SWL's who *do* aspire to transmit, one day, are far more scared of the Morse test than they are of the technical exam. Why on earth don't they fit themselves with a BFO and just *listen* to the stuff! Goodness knows, there's no shortage of it. The chief requirement is *concentration*—and we pass on a valuable, but free tip . . . it's twice as easy to concentrate with headphones on as it is in front of a loudspeaker.

QSL's—Again!

Pete Cayless (Exeter) says his QSL returns overall are between 60 and 70 per cent. From G's alone they are more like 40 per cent for Eighty and 65 per cent for Top Band.

G3MQT (St. Leonards-on-Sea) writes to say that he doesn't throw *all* useless reports in the WPB, nor does he reply 100 per cent. But in some cases he derives a little satisfaction from sending someone a QSL costing a few coppers for card, envelope and stamp and hopes he is giving someone, somewhere, a little pleasure. "This, I fondly hope, will encourage them to continue in their new-found hobby, and keep them away off pop records and transistor portables, so that they will follow some *useful* pursuit." And he adds a P.S.: "If I get inundated as a result of this, I'll charge the cost of QSL'ing to the *Magazine*." (He'll be lucky!)

Laurie Margolis (Ilford) says he has been using a *fireguard* as an aerial, feeding through about four feet of flex into a Mohican; with this he heard quite a bit of DX on 14 mc and five European countries on 21 mc. He has also done quite a lot of listening



Seen at the Harewood Mobile Rally on May 24: The mobile motor scooter run by SWL D. Gray (Osset, Yorks.) with a 160m. transistorised receiver.
A G3GMN print

on the 4½-ft. whip provided, on which he has logged 123 countries this year. All of which proves that outside aeriels are very nice, but if you *have* to do without one—don't despair.

Chris Rees (Hatch End) had his R.A.E. result (successful!) presented to him by hand at the local club meeting . . . now he is flat out for Morse, but handicapped by a receiver *sans* BFO.

Shorts

J. L. Pearce (Basingstoke) and others query a "4X8" prefix heard recently. It emanates from Israel and was either a special or a portable station. (A 4X9 was active last year during a contest).

R. S. Finley (Kenton) says "If I pass the R.A.E. and code test, I think I will start straight off on two metres, as it is much more interesting than 80 metres and Top Band." Not everyone will agree with him, but there's a lot to be said for getting into VHF early on.

While on the subject, *M. Vincent (Cheltenham)* says he has been making a tape-recording of GW4LU/P in the various counties he has visited. The speed with which he works stations gives the impres-

sion that he is in a contest. SWL Vincent has heard enough counties for the Junior VHF certificate, but the problem is getting the QSL's in.

A. E. Beales (*Clacton*) tells us of his progress; started with a BC receiver, then a Codar Clipper, then, for nearly four years, an R.107. Now he has a home-built 12-valve double-conversion job, BC-454, BC-455, R.1132 and a 110-146 mc transistor portable. He hopes to add to the main receiver a Q-multiplier, crystal calibrator and other refinements; finally to

become a licensed amateur like his brother, who is G3MWO.

Readers are asked to note that the deadline for the next instalment (in the November issue) is earlier than usual, owing to staff holidays and other commitments. It will be *September 18*, which still gives ample time, after reading this issue, to put pen to paper. Which we hope you will do, with the latest news and views of interest to SWL's everywhere. Until then, Good Listening.

DESIGN FOR A TEN-WATT MODULATOR

HAVING FREQUENCY RESPONSE FOR RESTRICTED AUDIO RANGE

J. R. DOWSON

WHEN a new 160-metre transmitter was being built for the local Radio Society, the writer volunteered to put together the modulator for it. This was to be a separate unit with its own power supply so that, although usable as a companion unit to the Tx, when operating from transistor supplies for field day, /P and similar activities, the total weight could be kept down.

In the final design, this modulator came out to be 14in. wide by 3in. high, and 6in. deep. Because the transmitter itself was of the crystal-mixer type, it was decided to make the accompanying modulator as technically perfect as possible.

Design Considerations

As the recommended maximum audio frequency to be passed is 3 kc, the modulator response at this frequency has been made -6 dB down relative to 1,000 cycles. It is 16 dB down at 7 kc. There is also very little point in transmitting anything below 300 cycles, so the output starts to fall off at 200 cycles.

The resulting frequency response curve is shown in Fig. 1. Of course, it should be realised that though the audio response is restricted, or tailored, in this way, it is in no sense high-level clipping nor volume compression, and this modulator will of itself do nothing to prevent over-modulation.

A good signal-to-noise ratio is also very desirable in any modulator unit of this sort, and in the final version measured noise is -60 dB at 5 watts output. This result is dependent to a large extent on the earthing arrangements for each stage, and the use of good-quality high-stability resistors in the first stage.

The circuit of Fig. 2 shows that the microphone feeds into half an ECC81, functioning as a low-noise voltage amplifier. Presupposing the use of a crystal microphone, a high input impedance is provided—

Table of Values

Fig. 2. Circuit of the Tailored 10-Watt Modulator

C1	C2 = 8+8 μ F elect., dual can, 450v.	R9 = 2,200 ohms
C3, C4	= 16+16 μ F, elect., dual can, 450v.	R11 = 470 ohms
C5, C7,		R13 = 1 megohm
C8 = 0.1 μ F, 400v.		R14 = 33,000 ohms
C6 = .005 μ F, 400v.		R15, R16 = 820,000 ohms
C9 = .001 μ F, cer.		R17, R18 = 270 ohms, 3-w.
C10 = 100 μ F, cer.		R19, R20 = 47 ohms
C11, C12 = 50 μ F, elect., 50v.		T1 = Mod. xformer, ex-SCR522 (see text)
R1 = 5.6 megohms		T2 = 300-0-300v. 100 mA, 6.3v. 3A, 6.3v. 2A
R2 = 1,500 ohms*		Ch = 10 Hy 100 mA choke
R3 = 100,000 ohms*		V1 = 1/ECC81
R4 = 10,000 ohms		V2A, V2B = ECC81
R5, R10, R12 = 47,000 ohms		V3, V4 = EL84
R6 = 470,000 ohms		V5 = EZ80, or similar
R7 = 250,000 ohms, log potentiometer, gain		
R8 = 220,000 ohms		

NOTES: All resistors rated 1-watt, except as stated for R17, R18. Resistors R2*, R3* must be high-stability. For T1, any suitable modulation transformer can be used, such as the Woden UM0.

for ribbon or dynamic mikes, R1 could be reduced.

V1 must be mounted in a good low-loss type valveholder, and the necessity to use high-stability resistors in this stage is emphasised. From the point of view of hum loops, it is also recommended that the common earthing points as shown in Fig. 2 be adhered to, and it should be noted that an earth bus-bar is *not* used.

The first valve feeds into an RC-filter, C9-R6-C10, to effect the HF cut-off, and from there into the gain control R7. LF cut-off is provided by the modulation transformer and the .005 μ F coupling condenser

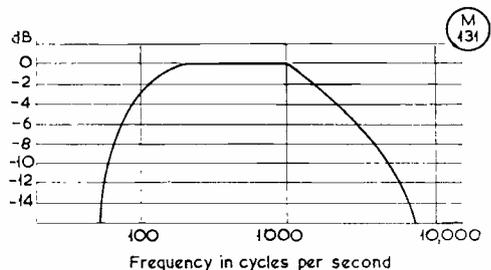


Fig. 1. Measured frequency response curve, taken at two watts audio output, for the speech-amplifier/modulator shown at Fig. 2 and described in the article. It is intended to give an adequate speech characteristic under amateur-band conditions

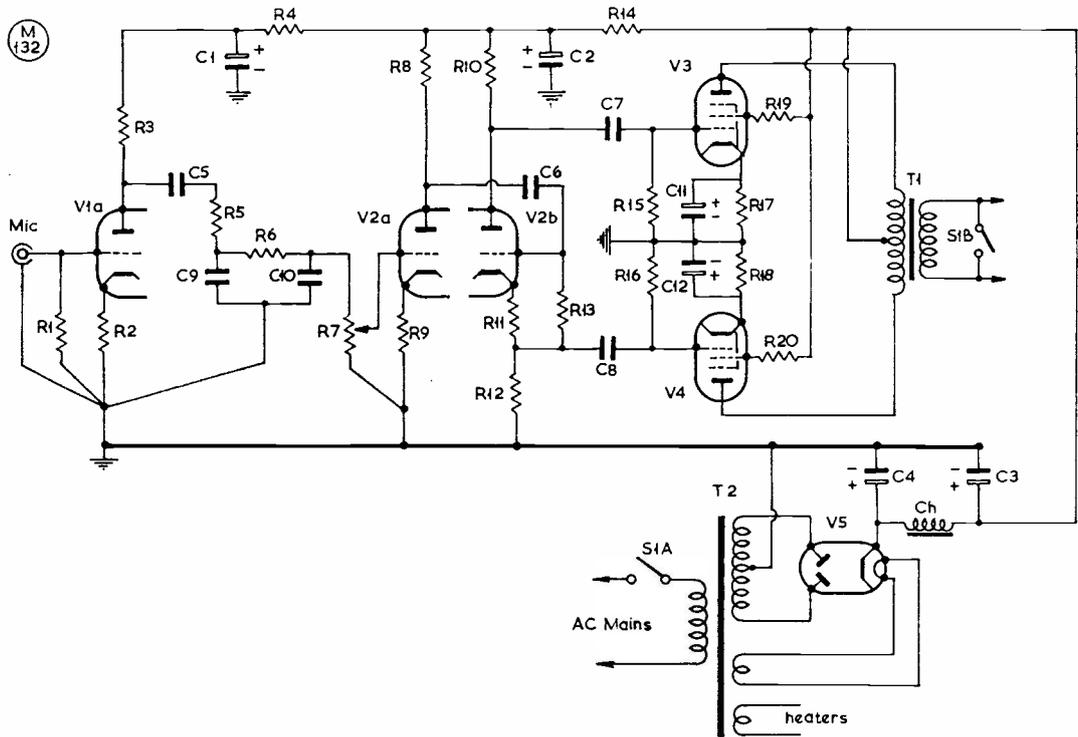


Fig. 2. Circuit of the 10-watt modulator discussed in the text and designed for a restricted audio range — see Fig. 1. This arrangement can be relied on to give a good speech characteristic for mobile, portable or Top Band working, or any other amateur-band application where only modest audio power is needed. In the switching, S1B is closed when S1A is open.

C6. The gain control R7 feeds into V2A as a second voltage amplifier, and thence into V2B as the phase-splitter. A degree of negative feed-back is obtained for V1-V2A by the action of the un-bypassed cathode bias resistors (R2, R9), and in fact the total harmonic distortion at 10 watts output is about 0.1 per cent at 1,000 cycles.

Phase-splitter V2B drives a pair of EL84's (V3, V4) in push-pull. The modulation transformer as originally used was the well-known ex-SCR522 item, but if a more modern ultra-linear C-core transformer is available, total distortion could be further reduced.

Considerable work has been put in on the development of this modulator, as it was felt that any Club equipment should set an example in terms of on-the-air results. Those who have worked

G3LRS (of the Leicester Radio Society) may agree that it does perform well.

A possible modification that would be an advantage is volume-compression or high-level clipping, as examination of the output using an oscilloscope shows that over-modulation is only too easy to obtain!

Detailed layout diagrams and so forth have not been given here because it was felt that few readers would be likely to want to duplicate the particular form of construction used in the writer's case. The point is that anyone using the circuit and adopting all the usual precautions in the construction of high-gain audio voltage amplifiers (V1, V2A in this circuit) should be able to duplicate the results this modulator is giving.

MAGAZINE CLUB CONTEST—"MCC"

What will be the 19th in the series of Top Band Club Contests organised by SHORT WAVE MAGAZINE—and attracting an increasing entry each year—will be taking place over the week-end November 14/15. The rules will appear in the "Month with the Clubs" section in the October issue. Since non-Club contacts score one point—and the number of these could decide the winner—any 160m. CW operator who fancies himself on the key is invited to join in the *mêlée*. This is a short-period contest, played off at a furious rate, and the operating standard is high.

"ONE-WATT TRANSISTOR TRANSMITTER"

G3AM (Barnstaple), author of this article in the August issue of SHORT WAVE MAGAZINE, mentions that he is still working EU's on 80m., though conditions have not been too good during the last month or so. He has now had well over 200 contacts. His colleague, G3NSC, has built a Chinese-copy and on its first test OZ was worked. G3AM suggests that those interested in the circuit would find that increasing the PA bias resistor R13 (see p.331, August) to 180 ohms and driving a bit harder results in better efficiency and a little more RF output.

A MULTIMETER IN THE IMPEDANCE TRIANGLE

FOR IMPEDANCE, INDUCTANCE AND REACTANCE MEASUREMENTS

G. A. W. PARTRIDGE

MOST experimenters have a multimeter, which is an essential instrument for serious workers. It is a good investment to spend a little extra and obtain a reliable meter. For electronic work the sensitivity should not be less than 10,000 ohms per volt DC and 1,000 ohms per volt AC.

The applications of such an instrument can be increased beyond the usual voltage, current, and resistance measurements by using it in conjunction with the Impedance Triangle illustrated in Fig. 1. For example, even an LF coil can be tested by this method.

First of all, its resistance is checked by simply applying the resistance range of the meter to it. This will reveal any breaks in the winding and if a coil-to-earth test is carried out, any weakness in the insulation will be shown up by a low reading. In the following calculations the resistance of the coil is taken as 250 ohms. The base of the triangle, (R) therefore, is now known.

The hypotenuse which represents the Impedance (Z), or the combined resistance and reactance to AC at a specified frequency, is determined with the aid of the circuit shown in Fig. 2. A non-inductive resistor of known value is connected in series with the coil and a suitable voltage at a specified frequency applied to the combination. The current I is calculated from:—

$$I = \frac{E}{R}$$

For example, the voltage (E) across R which is, say, 100 ohms is found to be 30 volts, then:—

$$I = \frac{30}{100} \\ = 3/10\text{th amp.}$$

(If the multimeter has an AC current range, this calculation can be omitted as I could be measured by connecting the meter in place of R.)

The Impedance is calculated from:—

$$Z = \frac{E}{I}$$

If E, which is the voltage across the coil is found to

be, say, 90 then:—

$$Z = \frac{90}{3/10\text{th}} \\ = 300 \text{ ohms}$$

Completing the Triangle

Two sides of the triangle are now known. The third side X_L is the Inductive Reactance, or the resistance the coil offers to AC only at a specified frequency:—

$$X_L = \sqrt{Z^2 - R^2}$$

In this particular case $Z = 300$ ohms

$$R = 250 \text{ ohms}$$

$$X_L = \sqrt{(300)^2 - (250)^2} \\ = 166 \text{ ohms}$$

This completes the triangle and thus gives three useful facts concerning the coil. There is, however, other information available.

Measuring Inductance

The Inductance (L) for example can be found from:—

$$L = \frac{X_L}{2 \pi f}$$

where

$$\pi = 3.142$$

$$f = \text{frequency in c.p.s.}$$

If the coil is connected to a 50-cycle supply, L will be:—

$$L = \frac{166}{2 \times 3.142 \times 50} \\ = 0.53 \text{ Henry}$$

(Note: The inductance of smoothing chokes may differ because they are usually tested with a DC current flowing through them.)

The cosine of the angle θ represents the Power Factor of the coil which is always less than one, but the higher it is the greater the efficiency.

$$\text{Cos } \theta = \frac{R}{Z}$$

$$\text{In this case Cos } \theta = \frac{250}{300} \\ = 0.83 \text{ P.F.}$$

Finally, the angle θ , which can be found from a set of cosine tables, is the angle of lag or the phase relationship between the current and voltage. In this case it will be 33.90° .

The impedance triangle and how it can be used. The derivation of Fig. 1 is explained in the text and from this, inductance and capacity values can be worked out using only a multimeter.

Other Measurements

A good multimeter is most helpful when the larger condensers require testing. Fig. 3 shows how a circuit for such tests is set up. It closely resembles the coil circuit in Fig. 2. (Electrolytic capacitors cannot be tested in this way as they are designed for DC working only.)

Here again, the current I is found from:—

$$I = \frac{E}{R}$$

In this particular case it is 3/10th amp.

The capacitive reactance X_C , or the resistance to AC at a specified frequency, is found from:—

$$X_C = \frac{E}{I}$$

If E is found to be, say, 95.4 volts:—

$$X_C = \frac{95.4}{3/10th} = 318 \text{ ohms.}$$

X_C can also be found from:—

$$X_C = \frac{1,000,000}{2 \pi fC}$$

where

$$C = \text{Capacity in microfarads.}$$

A 10 μF condenser connected to a 50-cycle supply would have a Capacitive Reactance of:—

$$X_C = \frac{1,000,000}{2 \times 3.142 \times 50 \times 10} = 318 \text{ ohms.}$$

The capacity gives a good idea of the condition of a condenser. Any deterioration usually affects this value. It can be checked with the circuit in Fig. 3 and then calculated from:—

$$C = \frac{I \times 1,000,000}{2 \pi fE}$$

For example:—

$$C = \frac{0.3 \times 1,000,000}{2 \times 3.142 \times 50 \times 94.4} = 10 \mu F \text{ approx.}$$

It must be remembered that the power factor of a good capacitor is almost zero, which is quite the opposite to a coil, and the phase relationship will be almost 90° lead.

(139)

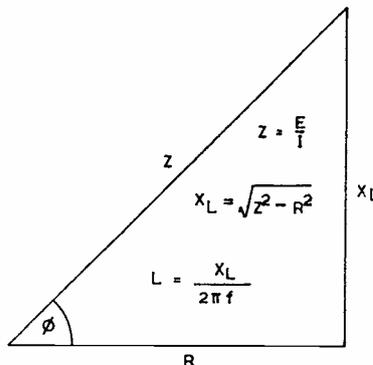


Fig.1: The Impedance Triangle

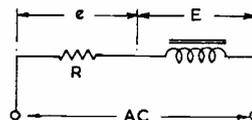


Fig.2: Impedance Test Circuit

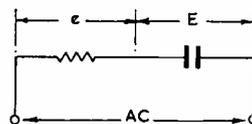


Fig.3: Capacitor Test Circuit



Jack Hum, G5UM, can be relied upon to find the odd things to photograph when he's out and about — this sign, seen on properties for sale in Hertfordshire, is used by an estate agency whose partners happen to have the initials "C" and "Q". Jack assures us that this sign is not outside his own property at Knebworth, Herts. — so there is no use anyone hopefully calling.

TRYING THE HF BANDS

BY MODIFYING AN LF-BAND TRANSMITTER

E. J. WILBY (G3RZX)

FROM observations over the past year it would seem that the average amateur begins on 160 and 80 metres using low power, the Tx being the familiar VFO, Buffer and PA.

On these two LF bands the newly licensed amateur can be heard discussing his envisaged "big rig" and plans for operating the other bands. However, as in the writer's case, these plans do not always quickly materialise as at this early stage more constructional work would mean curtailment of precious operating time.

This being the case, it was decided to investigate the possibility of operation on 40, 20 and 15 metres using the one and only transmitter—a simple 160-80 metre VFO using an EF91, an untuned EF91 buffer and a TT11 in the PA, running a maximum of 15 watts input on 80 metre Phone.

First job was to modify the *pi*-output coil which covered 160 and 80 metres. Tappings were introduced so that turns could be shorted to cover 40, 20 and 15 metres.

A 7 mc coil was wound on $\frac{1}{2}$ in. former, tuned by a small trimmer and connected between the VFO anode and earth, *via* a blocking condenser C1 to avoid shorting the HT. Using this arrangement, with the VFO grid tuning 80 metres and the PA on 40 metres, it was found that 15 watt could be obtained on this band and immediate contacts were made with G and EI, reports varying from S7 to S9+.

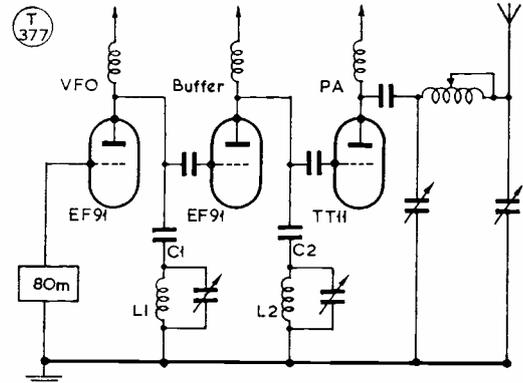
Getting on Twenty

Leaving the VFO stage in this condition attention was turned to the EF91 buffer. Another $\frac{1}{2}$ in. diameter coil tuned to 20 metres by a small trimmer was connected between the buffer anode and earth *via* a similar blocking condenser C2, the PA of course now being tuned to 20 metres as well.

Once again it was found that about 15 watts input could be obtained and a tentative "CQ 20 metre Phone" brought back IITAR with a report of 5 and 9+ for the very first 20-metre contact. Subsequently during the next few days DJ, ZB1, EA, LA, SM, OH, F and HB were worked with reports of S6 to S9+.

Would it work on 15 metres? The buffer and PA were tuned to 21 mc, but output was rather lacking. However by putting the VFO anode on 10.5 mc satisfactory operation was obtained, although due to the state of the band only local G contacts were made. G3KNA at 12 miles distance reported signals at 5 and 8.

What about 10 metres? One day while working 20 metres it was discovered that 10 metres was open



To get an LF band Tx on to the HF bands, L1 and L2 are additional tuned circuits; L1 is required only for 40m. operation, and is tuned into this band; L2 is added for 20m. and is tuned to that band; for 15m. working, L1 is tuned to 10.5 mc and L2 to 21 mc. C1, C2 are HT blocking condensers, and can be about 500 $\mu\mu\text{F}$ for any band. No screening is required, as all circuits are mainly on different frequencies.

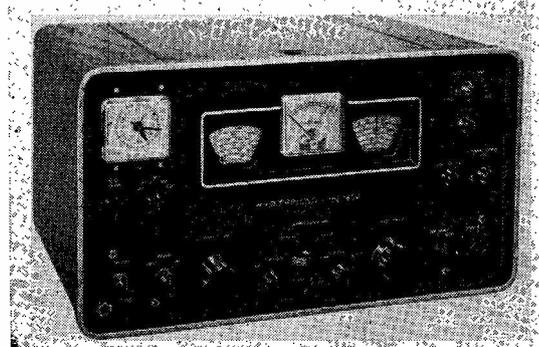
for short-skip. A 10-metre coil was promptly put in the PA, and using it as a doubler from 20 metres, contact was established with two DJ stations.

No really startling DX results were obtained, but it will be agreed that bearing in mind the simplicity of the equipment these EU contacts were quite pleasing — within a couple of hours of deciding upon this scheme contacts had been made on three "new" bands.

Incidentally the aerial used in each case was 120ft., end-fed directly from the *pi*-output, and about 24ft. high.

So there you are — go ahead and give it a try. You will have a lot more to talk about when you return to the peace and quiet of Top Band!

For Readers' Small Advertisements, see pp.440-447



The Hammarlund HQ-180A general-coverage receiver is described as "a significantly improved version of the HQ-180." This new Rx tunes 540 kc to 30 mc, and features calibrated band-spread on all amateur ranges within its coverage. It is triple-conversion from 7.85-30 mc, and dual-conversion on the LF ranges; the refinements include slot filter, sideband selection, vernier tuned IF, separate linear detector for SSB reception, variable-attack AVC, and a crystal calibrator.

COMMUNICATION and DX NEWS

L. H. Thomas, M.B.E. (G6QB)

THANKS to the many readers who have expressed their approval of the new format of this feature. At least nine out of ten have said that they consider it an improvement; the remainder are mostly "don't-knows," although a few admit to disliking the new title after all the years of "DX Commentary."

A few years back it seemed that the only bands of real interest were 14 mc and 21 mc, with a few outbreaks of 7 mc DX and some passing references to Top Band. Nowadays we have turned completely inside-out, and most of the space these months seems to be occupied by Ten Metres and Top Band. With all the short-skip nonsense so painfully evident, 14 mc has practically usurped the former position of 7 mc as the Lids' Band, and few of the DX'ers can even spare a comment on it, barring expressions of disgust.

Top Band has its own appeal—an elusive one, but mainly a matter of being able to work DX that should really be impossible, especially with ten watts. And 28 mc is a queer phenomenon, with almost a *quasi*-VHF atmosphere about it. How far does the ground-wave go, and where has the sporadic-E patch gone this time, and so on. More and more are becoming fascinated by it, but we notice that very few decent beams were in use by the large number of readers who supported the Activity Sundays. Most of them ran lowish power and a piece-of-wire; and if they had all been able to operate with the full 150 watts into a real beam, results would have been completely different.

It is also pretty obvious that quite a few receivers are not all that they might be on 28 mc; when two readers report from the same town on the same day, one having heard several African countries and some Europeans, while the other thought there was nothing on the air at all, one

doesn't have to look far for the reason!

There is a possibility that 28 mc will be a DX band again in as short a time as two years. Any time spent between now and then on livening up the gear will be well spent; likewise some activity *now* is highly desirable. Let "them" know that we *do* use this band.

Ten-Metre Activity

Although our pre-arranged Activity Sunday was 'way back in July, quite a lot of mail concerning it did not reach us in time for comment last month. (Some because of postal delays, and some from abroad.) The following is a brief summary.

5N2JKO (Zaria) started up at 1135 with ZE2JA and 5B4MO; also heard 5B4AK and YU6ZAA on AM, 5B4JF on CW. Next session started at 1645 and brought QSO's with 5B4, ZE, VQ2, and then, when the band opened to Europe, DL9VZ, I1BAT, DL7AA, I1IT, F3RG, G8KW, 4CM, 3CAZ, 3BYV, 3KEA, 3JZK and 3GKZ. (SSB, AM and CW, mixed.)

G2CDI was also heard, but nearly all those heard or worked were near London.

5B4AK, the RAF Club Station in Cyprus, worked HZZAMS at 0853; then, from 1230 onwards, YO2VA, VQ2AS and 2DT, UB5AHG, ZE3JJ, UB5DIR (all AM) and 9L1NH on CW. Not a single G heard!

VQ2GJ (Kitwe) used CW only. He heard a G as early as 0919, but could not copy. Until lunch-time, nothing but other VQ2's. At 1307, raised F3RG, then on with DJ7PW, F3AT, F8KJ, DL1EQ, HB9UB, G3KSL, DL6EY, G2DC, DL7BQ. All with a dipole and 100 watts.

VQ2WR (also in Kitwe) says that at least seven VQ2's were active. For him the band opened at 1315, first to 5B4 and then to DL7HN and DL7PW. After that, YU6ZAA, SM7ACB, DL1MI, G3OHP, 5N2JKO, HB9UB and F8KJ . . . with a Viceroy and Minibeam.

VQ2AP worked G6XH and G8UG on SSB, also 5N2JKO; apart from these, only I1, DJ and OE. VQ2BC raised G2DC on CW

ZONE-BAND TABLE

Station	Zones Worked						Total Zones
	28 mc	21 mc	14 mc	7 mc	3.5 mc	1.8 mc	
G2DC	40	40	40	36	25	5	186
G6QB	38	40	40	34	20	7	179
G3IGW	36	38	38	32	18	11	173
G3DO	39	40	40	25	24	2	170
OH3NY	32	30	40	25	10	7	144
G3NOF	34	38	39	9	8	1	129
G3PEK	2	21	35	30	17	4	109
G3OLN	2	7	11	16	3	4	42
G3RDC	3	14	38	11	3	1	71
G3PLQ	1	8	7	3	3	5	29

(Entries for this new table are invited; scores are post-war, i.e. starting from any time back to January 1946.)

for his only G, though he also heard G3KHE. Others worked were 5B4's, I1's, YO, DJ/DL, F and HB9.

VS9AMN raised other VS9's, HZ2AMS (1116) and a bunch of DL's—no G's either heard or worked. So much for the overseas logs; now for a very compressed version of a large bunch from the U.K.

G3PMR (Retford): Two locals worked on CW—nothing else heard. SWL M. Harrison (Manchester): About a dozen locals logged, nothing else. G3SGH (Canterbury): Worked locals, and heard ZD6RM at 1408. G3WP

(Chelmsford): Heard about six G's, G3GZJ on CW being the furthest.

G3PKV (Welwyn Garden City): Worked six G's with 40 watts AM, to 60-ft. wire and loft dipole. The following evening he heard CT1KK, CT1TX and 9L1HX. G3CWL (Leatherhead): worked G's and I11Z; heard several G's plus GW3AHN, DL6RM, CT1DU, VQ2BC and VQ2GJ. G3OZT (Southampton): Worked locals and heard HZ2AMS (1408) and a VQ2. G3JRL (Sheffield) worked G's, heard VQ2WR, VQ2AP, HZ2AMS and ZD6RM . . . KW-2000 and 3-el. wire beam in roof-space.

G3OHP (Rochester) worked G's on CW and SSB, plus HZ2AMS, 5B4CZ and VQ2WR (1400-1500). VS9AMN was also heard, but not a single European station. G3LZZ (Shipley) worked locals only; he remarks that 10-metre openings seem to precede TV QRM from Europe by a few hours—pity it's not the other way round.

G2ABK (Spilsby) heard only two stations, both G's. GM3OWU (Midlothian) found the band completely dead; a week later it was open to Europe via sporadic-E. G3SMM (Altrincham) worked G's on AM—nothing else heard or worked. G3OAD (Dudley) worked G's up to 60 miles, heard 9L1LJ and 5N2JKO; the following day he worked HB9SF, 9G1EI and 9L1NH.

G3GZJ (Maidstone) reported last month, but added a note to say that on the following day (July 13), from 1615 onwards, he worked PX1AI, PX1VW, I1, DL and 9L1NH; he also heard ZD3A and 9L1HX. G2DC (Ringwood) just about scooped the DX pool (on the 12th) by working ZD6RM, VO2BC, VQ2GJ, and hearing ZE3JJ and ZE3JO (all between 1315 and 1430).

A summary of all this, together with last month's reports, is a little difficult. But it seems that it was a pretty poor day, and only the unusual amount of activity made it at all worth while. African and Middle East stations were the only real DX, and their signals only fell in certain areas. Europeans, likewise, were rather

freakish, and heard only by a select few. But all very interesting and worthwhile.

Studying the Bands

Readers sometimes ask "If these Ten-Metre Activity Periods are so successful, why not arrange something similar for other bands?" The short answer is that there is no lack of activity on the other bands, anyway, and that Ten is at present unique in one particular: That a sudden rash of stations cropping up on the band is welcomed and not cursed as QRM.

All other bands up to One-Sixty suffer, at present, from over-population when conditions are good. Fifteen might just stand some special treatment, but as soon as a little DX crops up, someone is on the trail. (And think how unpopular we should be among the real devotees of Fifteen if we spoil it for them by forcing unnatural activity into the band!)

There is a lot to be said, though, for making a really detailed study, over a period, of one particular band. Some of the really wild DX'ers spend so much time changing bands in search of the elusive one that they miss a lot of interesting things. Earlier in the year, for instance, one could listen on Eighty in the early mornings for seven consecutive days and hear nothing of interest—only to find out that someone who stayed on ten minutes longer had worked some good and unusual DX nearly every morning.

It may be over-simplification, but it is nearly correct to say that each band has its peak times, which vary with the season rather more than with conditions; which don't vary greatly over a short period, from day to day; but which do vary for different parts of the world. Right through the very worst of conditions, it seems to be possible to maintain a sked with a DX station by correct choice of time . . . and, of course, nothing is such a help to making a DX contact as the certain knowledge that both stations will be on the air at that time, and on a pre-arranged frequency. (On the other hand, some people consider random contacts much more fun.)

TOP BAND COUNTIES LADDER

Station	Confirmed	Worked
<i>Phone and CW</i>		
G2NJ	98	98
G5JM	98	98
G6VC	98	98
G3GGS	98	98
G3NPB	97	98
G3REA	97	98
GM3KLA	96	96
G3LWQ	95	96
G3PLQ	92	94
GM3PPJ	86	86
GM3IKD	83	87
G3RJH	76	83
G3NTI	76	79
G3RHM	72	75
G3NOW	68	72
G3NLR	67	67
G2BP	57	64
G3PPE	56	73
G3IDG	50	54
G3SNU	37	59
GW3ITZ	35	61
G3SJJ	29	62
G3SXW	23	45
<i>Phone only</i>		
G3NPB	87	87
G5JM	67	73
G3REA	52	65
G2NJ	52	52
G3RJH	33	54

(Failure to report for three months entails removal from this Table. New claims can be made at any time.)

The 1964 Top-Band Contest

It has happened at last . . . U.K. stations at the top of the scoring list in an American contest! It was the *CQ* 160-metre Contest, held on January 25-26, 1964, in the best conditions of the whole winter, as far as Top Band was concerned. To come to the point: **G3GRL** led the whole world with his score of 43,824 (205 contacts in 15 countries); second was **GM3IGW/A** with 39,015 (269 contacts in 12 countries). Hearty congratulations to both!

Next in order were **K2DGT** (37,100), **DL1FF** (36,904), **W9EWC** (35,208), **W0AIH** (31,588) and **VE2UQ** (31,518). Other high-scoring U.K. stations were **G3RBP** (20,800), **G5ZT** (13,618), **G16TK** (23,382), and **GW3JI** (17,532). Though overshadowed by the leaders' figures, all these scores represent pretty terrific Top Band achievement.

An amazing feature of this contest was the breakdown of stations, country by country, which shows the following levels of activity: W/K stations, 904; G, 348; GD, 2; GI, 10; GM, 31; GW, 22. The only other entries of any size worth mentioning were from VE (40), DL (17) and OK (90). But that total of 348 G's still shakes us . . . especially after the notoriously poor response from G-land in other contests, including the *CQ* Worldwide affair each year.

GM3IGW/A just missed making the highest number of QSO's—his total of 269 was beaten (by **W0AIH**) by *one!* The reason why **G3GRL** won the contest with his much smaller number of contacts was that he worked a fantastic number of W/K and VE stations at ten points a time. Not one of the U.S.A. stations could possibly have worked a similar number of G's.

Altogether a pretty gratifying result, and we are wondering what next January will bring. There is an even chance that conditions will be still better, but that might mean that the QRM assumes more



Ken Randall, **G3RFH/VP8HF**, of H.M.S. "Protector", well known for his sterling work /MM on the 10-metre band, was at Tristan da Cunha (ZD9) when the ship called there during April this year. The picture shows him checking over some of the Island's radio gear. The local operator, one Bill Evans, also acts as postmaster and spends much time sending sets of ZD9 stamps to all parts of the world—but he has no interest in Amateur Radio. Because of fuel supply difficulties, the use of electricity is severely restricted, to about two hours each evening.

punishing proportions. The main thing, we would say, is to have a vertical aerial, certainly not less than 80 feet high . . . and the gear and operator to go with it!

The Overseas Mail

G6MK—better known as **ZS8MK**, and later as **5H3MK**—is now awaiting a **VS9** call in what may turn out to be a new country. To be exact, he is in The Quati State (which describes itself on its stamps as Qu'aiti State in Hadhramaut). Despite the **VS9** call, this is an independent state with its own flag, its own army, customs, government and Sultan.

Nearby is the Kathiri State, similarly independent. **G6MK's** work, as a doctor, covers both states, also that of Mahra (further east, towards the Omani border) and the island of Socotra.

But there are snags . . . next door is a signals office, with a TCS-13 tied up to a weird wire contraption; and a mountain ridge "ends in the back precincts" (which can hardly be called a garden). The mountains almost screen off the U.K., and the **TX** next door seems to have a special click-accentuator circuit built in. However, we hope to be hearing from **VS9MK** (?) soon.

G3SHH recently arrived in Queensland, and was delighted to find that one has just to produce a G licence or a PMG Certificate at the Radio Services section, and then can choose one's own call.

[over

Reporting the HF Bands

He chose VK4JS and hopes to be active soon. But he wishes he had taken much more gear out, because it seems to be almost non-existent in VK4-land.

LRO E. McPheat (an operator of G3BZU and GB3RN) writes from HMS *Afrikander*, about 10 miles off Capetown, to say that G's fairly romp in there on 80-metre CW! He sends a long list of Europeans heard (1900-2250) and the G's on that particular day, from 2210 onwards, were G2QB, G3REX, G3OFT and G3EYN. Considerably outnumbered by YU's, YO's, OK's and DJ's, but there just the same. Mac says "If I had a ZS call I'd have a go"—and if anyone especially wants a contact he will try to get one of the locals interested.

WA2WOR (New York City) admits to having been a faithful reader for several years, though he has been inactive on the HF bands. Now he is keen to modify the rig for One-Sixty, and would like to correspond with Top-Band enthusiasts over here—especially those with experience of "limited space" antennae suitable for city conditions.

5N2JKO says that most of the Nigerian stations are on SSB now. Active are 5N2CKH, 2JEB, 2JSC, 2JWC, 2RJO and himself. And "simmering" are 5N2FEL, 2RFB, 2EGL, 2EBL, 2AAK, 2JWB. QRT are 5N2DFT, 2LJM and 2RAM. Mike adds that DX/TV is possible down there, and on a recent occasion he beamed his TA-33 on Europe and got a recognisable picture of a dance band on Channel 2. Since then he has seen a test card and an Italian football match. What next? A QSO on four metres?

VQ2WR finds Forty open to Europe most evenings and worked a long list of G's on SSB during the first fortnight in July. On Eighty he manages to get into Europe on either SSB or CW most Saturdays. And, on One-Sixty, VQ2W, VQ2DT, VQ2AS and ZS9G are all standing by; VQ2W makes regular transmissions between 2030 and 2115 every Monday.

Antenna Farmer

One overseas letter of special interest is from VK3BM (Quamba-



View of Lord Howe Is. from the flying-boat, the only way of getting to the Island by regular service. It is a 430-mile trip from Sydney and Lord Howe, at 159° E. and 31° S., is visited by about 200 tourists each year. The Island is 7 miles long by 1½ miles at its widest, and has an indigenous population of 250 people. The commercial installation includes a radio beacon, on which the F/B can home. Any amateur operating from Lord Howe takes the VK2 prefix, because the Island is under the administration of the Govt. of New South Wales, who supplied this picture.

took), who gave 80-metre SSB quite an injection back in 1961-62, when the DX stuff was almost a rarity. Now his interest has switched to Top Band, and his CW has been heard in England already. He has worked W6VSS on SSB for the first VK/W Phone contact on 160m. and now his ambition is to work G on SSB—no less. He asks "Do you know any folks who have what it takes to run skeds?" At present he uses a converted Swan transceiver, but is building a separate receiver.

VK3BM started in 1919 and has held his present call since 1935. After much experimenting with aerials, he finally settled for the present set-up . . . eleven 840-ft. Vee-beams around a central pole 75ft. high with 40ft. poles at the far ends. Feeders selected by rotary switches, indicated by pilot lights on an azimuthal map, separate tuner for each band, 80 to 10 metres. (And how would you like *that* in the backyard?) Oh, yes—for Top Band he has a full-sized ground-plane, 126ft. in height, with sixteen 126ft. radials, the base of the whole thing being 10ft. above ground (for obvious reasons). Needless to say, he is a

farmer with an interest in crops other than antennae. Top-Band specialists, forward, and write to VK3BM if you want skeds during the favourable period, September-October. (SSB much preferred, as his CW has "gone rusty.")

More Aerial Work

G2DC's usual summer check on his equipment, to bring it up to concert pitch for the contest season, has been spent almost entirely on the aerials. Every bit of the original Quad has now been thrown out; the new three-bander works fine and seems to be so robust that Jack will almost welcome a gale to see how it fares; and a new 45ft. vertical is base-loaded for 3.5 and 1.8 mc, leaving the 7 mc ground-plane for its real purpose. No Zepps or dipoles any more—in fact no *wire* aerials at all. G2DC passes on a word of thanks for the help he has had from members of the Lymington A.R.S.—"a small club of only twelve in strength, but they are all as keen as mustard."

DX in General

Continuing with G2DC's letter: he found conditions "reasonable"

during the WAE Contest, except to the U.S.A. Not a single W was heard on 21, 28 or 7 mc, only a few on 3.5 mc and a greatly reduced number on 14 mc. These usually make up the "bulk" score to which one later hopes to apply a nice multiplier. The 7 mc ground-plane did its stuff to the tune of QSO's with VK, CP5, VS1, KC4 and UAØ, most of the DX on that band being between 2000 and 2300. The usual complaint about 14 mc remains—too much short skip, exposing all the "crude operating tactics of the mid-EU gangs." Commercials are also on the increase, and there is a "vacuum-cleaner" type of QRM in the early mornings that seems to blanket most of the CW end of the band. All we can do, it seems, is to wait for those sunspots to show up.

GW3AHN (Cardiff) thinks that W6HVN's condemnation of dishonest DX'ers (reported in the July issue) is a bit too sweeping. Some of the "big guns" may operate in the manner he complains of, but most of them, according to Tom, are pretty considerate in their operating. Just another case of the whole suffering for the sins of a minority! And he adds that we seem to have an upsurge of petty dictators at present, telling us that one should not do this or that . . . our licences tell us what we can or can't do, and if we conform to these regulations and the normal human courtesies, surely that is all that is required of us?

"One of the delights of Amateur Radio (after sampling service or commercial radio) is the lack of regimentation . . . we are, after all, only like a crowd of youngsters 'playing' at radio; in other words, AR is of no great importance, except perhaps to ourselves . . . let us participate without interference from petty dictators who have an exaggerated idea of their own importance."

GW3AHN says that the new DXCC list now shows a total of 340 countries (314 current and 26 deleted). No one has yet worked them all, and no USA station can work Cambodia or Indonesia, both on the banned list, as far as they are concerned.

G3NOF (Yeovil) found 14 mc

carrying nearly all the DX, with very little in the early mornings since July. But the South Africans have started coming in during the early evenings, with South America later and (occasionally) VK's and ZL's around 2300. AP2MI and 9X5GG, both on SSB, were new ones for him. Other snippets from his letter: The IARC, in addition to the well-known 4U1ITU in Geneva, hold the following calls—FØMM, DJØITU and HB9AEQ/M . . . 9Q5CM is a keen philatelist, and appreciates a good selection of different stamps on direct QSL's; he will reciprocate . . . FH8CD is on 14275 kc SSB, around 1745 . . . G3IZD (H.M.S. *Mohawk*) and G3NIR (H.M.S. *Dido*) both operate /MM on 28 mc . . . SSB heard on 7 mc from 7Q7PBD, VK's and PY's . . . YK1AA operates daily, 14268 kc, 1300-1600; Fridays 0300-0600.

Top Band Doings

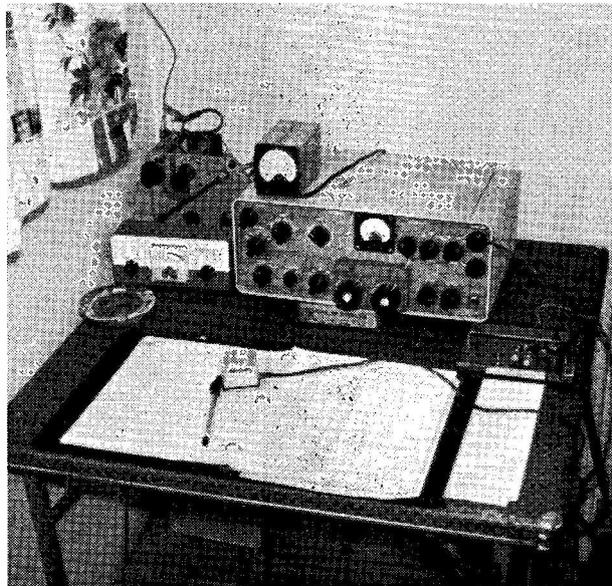
A friend remarked that it was the boys with no space who would carry off the Top-Band DX this season—because if they couldn't manage a half-wave they

would make real efforts to put up a good vertical, which is liable to be much better. Certainly the half-wave at a height of 20ft. isn't all that good for low angle radiation; even 60ft. isn't really high enough. So—out with those sky-hooks for the upwards part, and those oil-drilling rigs to match them in a downward direction. (No space means no radials, too!)

Meanwhile, new ones show up from time to time. GW3FSP and G2CUZ both worked LA2VF on August 9; G2NJ got OZ1JB, and heard OZ7BL, on July 24. G3PMR raised OY7BS on August 7, and didn't hear anyone else even call him.

Meanwhile, on the super-DX front, Stew of W1BB has been carrying off the honours again. He raised ZS6BCT for the first summer DX of this season on July 15; then came a First, with 9L1HX, on July 26 (Stew thanks G3PLQ for this one, as it was he who worked on 9L1HX when he made port at Freetown). On July 29 came another First, when VQ2AS got on the band and worked W1BB.

Another major event was on



As reported here in August, Graham Hall, VK2AGH, operated from the guest-house on Lord Howe Is., for a fortnight at the end of April last. He had a 90w. transceiver on the 15-20-40-80m. bands, with a Hy-Gain 14AVS multi-trap vertical aerial for the HF bands, and a long-wire on 80m. Some 650 contacts in all were made, of which 430 were on CW. Conditions during his stay were indifferent and only a few EU's broke through for contacts.

June 27, when JA3AA, using the Japanese spot frequency of 1880 kc, worked VS1LP. This is believed to be the first JA contact with *anywhere* on One-Sixty!

VE2UQ was on a long trip, and carried out tests from near the North Pole and, later, from Thule, Greenland. No luck from either, but from Prince Edward Is., as VE2UQ/1, he worked quite a bunch of W's and VE's, and also GM3OUV/P, who was at Black Isle (Ross and Cromarty).

G3OUV himself reports that the trip was very successful, and he made 245 contacts, with 107 stations (VE2UQ/1 was, of course, the best DX). He worked from eleven counties in GM, found the standard of operating good, and wants to thank all concerned for making his holiday enjoyable . . . and especially GM3EGW, who helped them out of a tight corner!

G3SJJ (Nottingham) asks whether the G3S-- stations are going to have their own ladder for Top Band counties. It was planned to start one towards the end of the year, when activity really gets going, and when there are a substantial number of G3T-- stations also on the band. So watch for the G3S/T ladder in due course.

G3REA (Warrington) joins the select band of those who have worked all counties, thanks to GM3OUV/P (but he hasn't got the 98th card yet!). Kirkcudbright was the last one, and, for good measure, he got it *again* (from GM3KEP/P). The whole lot took nearly two years, and G3REA wants to thank all the portables who made it possible.

G5JM (Colwall) has been in the "98 spot" before, and now rejoins the ladder. He says "Seekers after Hereford will find me almost daily—QSL's strictly reciprocal." He is now well up on the Phone ladder, too.

G3PLQ writes from the m.s. *Perang*, still on the West Africa run. Having enticed 9L1HX on to the band (see note about W1BB), John is now working on 9G1 and TU2. His July log, which just missed last month's issue, shows a load of G's heard at various

points down the Africa coast, but when he got to a distance of about 1,600 miles from London the log reads "Where have they all gone?" Nothing left but DHJ! G3PLQ will be back in the U.K. early in September, then off again on the same ship for her next trip.

Strays

SWL Derek Poulter (Morden) logged four W's on *Ten*, between 1440 and 1500 on August 2—all on AM. The reason for these rare openings is still in doubt. Then, on Twenty, he heard 6O6BW put out a call; an unidentified voice shouted out "DX on the band!" and W's appeared from everywhere. (Seems they now have a Private Ear on the job!)

G3IDG (Basingstoke) likes the idea of a Ten-Metre Contest, and also, possibly, a Ladder for Counties and Countries worked. And he suggests bonus points for CW contacts, to encourage a little more key-punching on the band (good thing!). We are seriously considering some such idea, to run through the six winter months . . . scores to be published month by month. And then, as G3IDG says, in two or three years the band will be jam-packed with W's, and everyone will wonder what all the fuss was about.

G3NPB, really a keen Top-Band man, monitors *Ten* pretty often, and has heard no DX recently, but says he was "staggered" at the amount of European activity on July 13—DJ, CT and the like until well after midnight, all at 9 plus.

Harmonic Trouble

G3ORP (Maidstone) says that locals in the Medway district are thoroughly fed-up with the strong harmonic on 1960 kc of "Radio Invicta," a pirate station off the Kent coast which works on 980 kc. The fundamental is S9 plus 20, but the harmonic is a good S9. ("When they ask for requests they'll get a strong one from me, and it won't be for a record!")

Newcomer

G3TGE (Studham, Beds.) is about the newest of the "new boys" to report. He says that all his equipment has been more or

less copied from *Magazine* designs; and with a Top Band rig feeding a 120ft. wire, he worked 27 counties in his first three weeks on the air. A 60-watt multi-band job is now on the way, and the DX will doubtless follow. We shall be glad to report on it.

DX News from All Over

Gus, the Globetrotter, will soon be in the news again. On his way out to AC3-land he proposes to join forces with HZ2AMS for some operation from 8Z4 and 8Z5 . . . and another stop-off in AC4 is now being mentioned. He is possibly linking up with Hammarlund in their popular "DX-pedition of the Month" scheme.

The following rarities are known to be on the air—perhaps not too regularly, but at least sporadically:—FB8WW (Crozet), mostly 14050 kc CW; FB8YY (Adelie), 14025 CW; VKØPK (Macquarie), 7020 kc CW at 0730; ZS2MI, 14270 kc SSB almost daily, 1500; FH8CD (Comoros), 14275 SSB, week-ends; 7G1L, 7G1IX and 7G1EZ, all 14 mc CW, 1800-2200 GMT most days.

Possible forthcoming DX-peditions include these:—PYØ, not to Trinidad Is., but to St. Peter and St. Paul Rocks, and to Las Rocas Islands—probably in October . . . Sardinia—IS1 calls will appear from I1CWN and I1NU, September 4-7 . . . Rodrigues Is., by the 5Z4 gang—imminent or already completed.

A prefix change is forecast for the Faeroes; the OY's are expected to become XP's this winter, when a new government takes over the administration from Denmark. Faeroes postage stamps will then be issued.

WPX-Hunters, who become practically phosphorescent when a new prefix crops up anywhere, can generate their own aurora over these: UW4HZ, 4X8JU, HZ3TYQ, DU3DO, 9M4LX (ex-VS1LX), DMØHAM, FØAF.

VK9DR (Christmas Is.) is reported as putting strong sigs. into W5-land on 7 mc (1130 GMT) . . . VK9WP is said to be *en route* for that rare spot Nauru, for a two-year tour of duty . . . YA4A is reported on 14110 kc CW, almost

daily at 1700-1800 GMT, looking for SSB replies on the same frequency.

There are now at least seven active stations in Saudi Arabia—HZ1AB, 1AM, 1HZ, 1SS, 2AMS and 3TYQ, and 7Z2KE . . . VR4AO is said to be very active on 14025 kc CW, best times for Europe being 1400 (short path) and 2000-2200 (long path) . . . XE4 (Socorro): This expedition which has been on and off for months, is now postponed until November on account of the hurricane season.

HB9GW is said to have a licence for operation from Bear Island, whence he will show up as HB9GW/LA/P . . . OZ4FF is active from Bornholm Island . . . and SMICXE is on Gotland Is.

All Those Islands

Talking of islands, that proposed award which was mentioned last month under a fantastic set of initials has now settled down as the "Islands-on-the-Air" Award, with the neat abbreviation of IOTA. The starting date for the race is to be January 1, 1965, and copies of the Iota Directory will be available before then.

Strong points in its favour are as follows:—The geographical boundaries are permanent, not man-made and subject to alteration; the political situation will have no effect upon them; "local trips" by amateurs from a nearby country will become feasible, but world-wide DX-peditions will still have lots of scope; and those who become island-chasers in a big way need never retire, even as conditions improve. More of this from time to time, as it is an award we most definitely approve of (unlike most of them!).

VK/ZL Contest

Don't forget the dates for the VK/ZL/Oceania Contest, which will be under way immediately after the next issue appears. October 3-4 for the Phone event, and October 10-11 for the CW,

starting and finishing at 1000 GMT for the two 24-hour periods. The rules were mentioned last month.

The 25th YLRL Anniversary Party, open to YL's and XYL's anywhere in the world, will run on October 21-22 (1700-2300 GMT) for the CW half, and November 4-5 (same times) for the Phone half. And the 16th YL/OM Contest takes place on February 20-21 (1800-0500 GMT) for its Phone half, March 6-7, same times, for the CW.

Operating Notes

It has been suggested that the occasional paragraphs appearing under this heading should be described as "Lids' Corner," but we have (so far) managed to resist the temptation. Last month some space was devoted to VQ2W's plea for full break-in on CW, giving the operator the full consciousness of what the others on the same frequency are up to. G3REA disagrees violently with VQ2W's suggestion that "you can listen to the competition, know exactly when they stop, and then sign with your own call on a clear frequency." He says "I thought we favoured *short* calls, not this game of last-across which exasperates so many of us . . . if we all do as VQ2W suggests, any DX station might as well read a good book for all the QSO's he'll get."

Maybe he has scored a point there, but in the present state of the art the DX station need not worry—there will *not* be a score of "full-BK" stations on his frequency, all calling after the others have finished. Probably, from the DX man's point of view, the first period of the heavy pile-up is pretty good waste of time, and the odd single call sticking out at the end, so to speak, is the only readable one. But the plan only remains good as long as there are few people who are equipped to do it. Conversely, when we *all* work full BK there will be no excuse for a multiple pile-up, anyway.

One of our current hates is the

DX'chaser on SSB who is not content with breaking-in with a short, snappy call, but has to give (a) his bare callsign; (b) full phonetic version; and (c) for good measure, a completely different phonetic version. The whole thing takes far too long—to the impatient listener on the frequency it sounds like about ten minutes—and lots of them do it all the time. But we mustn't get worked up again on this business of phoney phonetics—it's bad for the blood-pressure. The finest exponent of the art that we have heard for years was KJ6BZ—"like Kay Jay Six Bee Zed." What a treat to copy after all the Zanzibars, Limas and Sierras!

We have enough natural-born lids all over the place, who will never learn. What a pity if people who have become good operators should start back-sliding with some of these awful modern habits.

Late Flashes

GM3IGW says that G3RBP has worked ZE3JO on Top Band, and confirms that VQ2AS, ZS6BCT and ZS9G are all QRV around 1809 kc. G3IGW himself has worked PY and LU on Eighty (2300) and CP5EZ, VS1LP, VK5NO and UJ8 on Forty . . . ZL4JF (Campbell Is.) is on Forty CW again (0615) . . . 4WID (HB9AAW) is on 14005 CW and 14110 kc SSB . . . KB6BP is now active as KB6BP/KS6, 14330 kc SSB (0700) . . . HZ2AMS is home-bound and will later be an HZ3.

Sign-Off

That's it for now, then, until the next deadline of **first post on Monday, September 14**. We imagine that conditions will be on the up-grade between now and then, and hope for lots of news for the next offering. Address everything to "Communication and DX News," *Short Wave Magazine*, 55 Victoria Street, London, S.W.1. We wish you a good month of DX-ing (and communicating!) 73 and—BCNU.

• • • The Mobile Scene • • •

RALLIES AT BARFORD, NEWQUAY, DARTMOUTH AND SOUTH
SHIELDS REPORTED IN PICTURES—ALL WELL ATTENDED—
SOME VERY GOOD EQUIPMENT SHOWN

IT is getting towards the end of the Rally season which—in terms of attendances, the enthusiasm for /M working and the excellence of much of the mobile gear shown—has been the best on record since we first started writing about Mobile, ten years ago. There are now nearly 1,600 U.K. amateur operators licensed /M, covering between them all bands from two metres to 160m. It would probably be accepted as fair comment that too many of them are on Top Band, and that not nearly enough /M's are exploiting the possibilities of four and ten metres. The latter, in particular, will become very interesting as a mobile channel when, during the next year or so, 28 mc opens for regular DX. It will then be possible to sit in your car and work into VK2 or W6.

The 4-metre band is just about ideal—as 10 metres is at the present moment—for general working round the U.K. As things are now, on either of these bands it is simply a matter of getting out on to high ground with a quarter-wave vertical whip, worked against the vehicle in the ground-plane mode, to make very satisfying GDY contacts with relative QRP. The popularity of Top Band as a /M channel rests solely upon the fact that, at any given time, there is more U.K. activity on it than on ten or four metres.

While much of the gear to be seen in G/M installations is very good—and includes all-band and SSB rigs—far too much is pretty bad, with slap-happy disposal of units and crazy aerial systems. A mobile station in a van or an old car is too often the sort of outfit at which one does not want to look too closely. This is not to say that *all* mobiles in vans or old cars are bad—some of the smartest /M rigs we have seen at Rallies are in elderly vehicles which are obviously in first-class mechanical condition and the pride of their owners. But if you see a dirty, bashed-about van with an untidy protuberance on the roof, you can be sure that the gear inside is equally unsafe to operate. It would help to clean up this situation if, next season, Rally organisers were to give a booby-prize for the worst installation seen on the ground, selected by a tour round the car-park, without entries being invited! Never mind whose feelings are hurt—with so many licensed mobiles on the road, it is essential that (a) Their vehicles and their outfits should be safe, and (b) There should be no accidents which would bring amateur mobile radio to the notice of the sensation-press—the *Daily Yell*, the *Evening Screech* or the *Sunday Dirt Sheet* could (and would) make a Big

Thing of any accident in which an amateur working /M could be said to be involved.

THE MOBILE RALLY CALENDAR

Events now scheduled are dated below, and bring us to the end of a very successful Rally Season. Note that the Reading meeting is a change of date, to avoid a clash, and that the Harlow rally is a new event brought in since last month. And if any reader should be making the Dutch affair during September 12-13, we would be glad to have a report, with pictures.

September 12-13: International Mobile Rally Weekend organised by the Dutch amateur group, full details of which were given on p.366 of the August issue, it now being too late to apply for the special PA/M licences.

September 13: RSGB Mobile Rally at Woburn Abbey, Beds.

September 20: Annual Mobile Picnic, Reading Amateur Radio Club, at the Childe Beale Trust Pavilion, Lower Basildon, nr. Pangbourne, Berks. Talk-in stations will be operating on 160m. and 2m. Car screen stickers and any further details can be obtained from: R. G. Nash, G3EJA, 9 Holybrook Road, Reading. (Visitors should provide their own refreshments.)

September 27: Harlow and District Radio Society Mobile Rally, at Magdalen Laver Village Hall, near Harlow. Talk-in will be on 160m., by G3ERN/A, opening at 10.0 a.m. A full and interesting programme has been arranged.

May 30, 1965: Date booked by R.N. Amateur Radio Society for a major Rally event near Petersfield, Hants.



The prize-giving at the Cornish Mobile Rally, Newquay. G3NVJ watches G3NBR/M getting the trophy for the safest mobile installation.

A G3GMN print

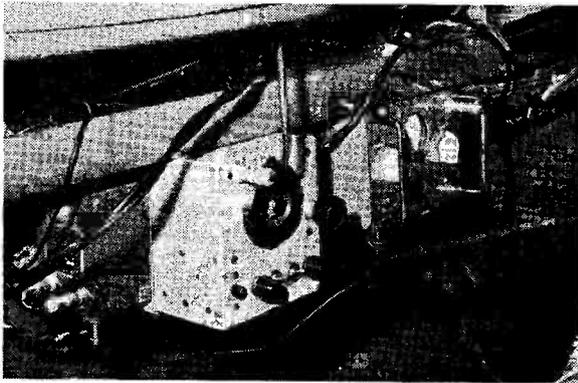


Scene at the South Shields Mobile Rally on July 5, with the sea in the background. They had an attendance of 300 or so in about 75 cars, of which 28 had mobile installations — only one of which, G3NAO/M from Dewsbury, was on two metres. The weather was cool and showery but in spite of that a number of events were run off — including a test on knowledge of the rules about /M operation and safety; driving and parking competitions; and a transmitter test involving accurate frequency setting. Another competition was a Morse test! Among the attractions was a surplus-gear stall, which did very well.



For the Torbay Mobile Rally at Dartmouth on August 9, the prizes were presented by old-timer G5SY, seen at centre in this picture.

A G3GMN print



For the Torbay Mobile Rally, G3LMG/P provided the VHF talk-in and was located at a high point about 5 miles from the site. The gear consisted of a Withers 2m. Tx (the earlier pattern), a CC converter into a BC-454 and a 4-ele Yagi.



Among other conveniences, bar facilities are provided at Barford. This year's A.R.M.S. Rally was somewhat down on attendance, due probably to other big events also taking place on July 5.

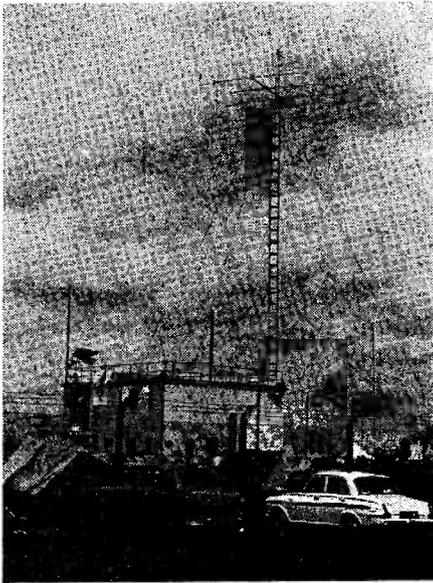
A G3NAU print



They also had a QSL tree at Dartmouth.

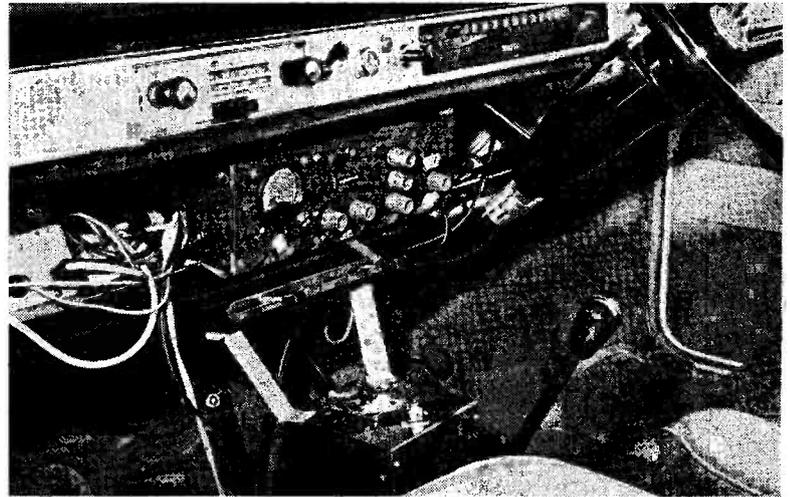
A G3GMN print

More Rally pictures overleaf



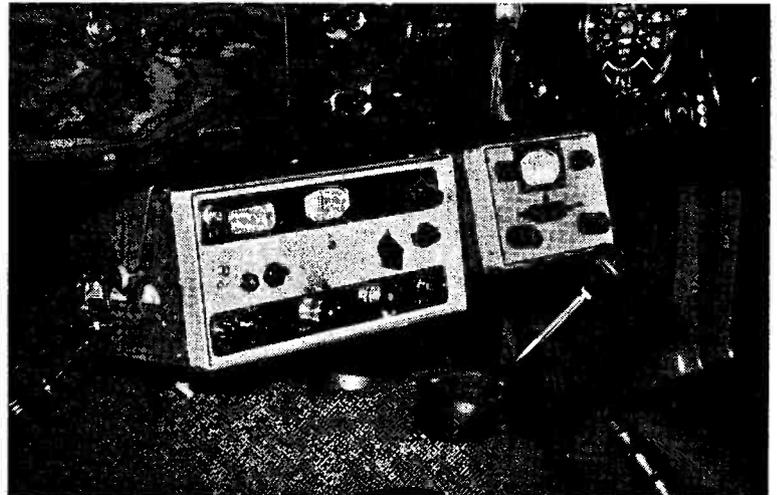
An impression of the aerial layout at Barford, viewed from the rear of the Rally enclosure. The lattice mast carries the beam for the local MARS station AJ1AH.

A G3NAU print



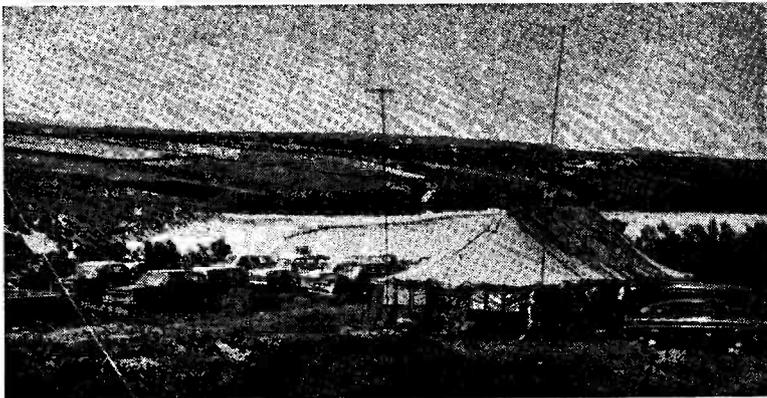
At the Torbay Mobile Rally, at the Royal Naval College, Dartmouth, on August 9, the prize for the best home-constructed /M rig went to G3NBT (Sidcup, Kent). It is a 160m. job, with the modulator as a separate unit (above the gear box) and the car is a Morris 1100.

A G3GMN print



G3GMN of Cheltenham, who takes so many of our Rally photographs, has a very nice /M rig of his own — an SSB transceiver covering all bands 10-160 metres. It won him the prize for the best home-built installation at the Cornish Mobile Rally.

A G3GMN print



General view of the car park for the Cornish Mobile Rally, Pentire Head, Cornwall, on July 26, when they had a total attendance of about 200 people in hot and sunny weather — in fact, it is described as “little short of tropical.” Some 45 of the cars were fitted /M, of which eleven were on two metres. The talk-in was by GB3CRC, specially installed for the occasion, and working three bands simultaneously.

A G3GMN print

WELL, quite a number of interesting things have happened since last we met. For one thing, EDX/GDX conditions have been quite good, even if variable, and for another the G3BA/G4LU expedition round those Welsh counties was not only a great success, but sparked off considerable activity.

Then, during the evening of August 11, one of the big tankers was moving up-Channel for Rotterdam, with LA2PH/MM on 144.43 mc and making a number of QSO's, which were as unexpected as they were interesting for the G's concerned; however, conditions were such that his coverage did not extend much beyond the Midlands, with G3SIC (Worcester) as probably his best GDX contact.

Some keen chaps are hoping to catch the last of this glorious summer weather by going off on expeditions. GM3OHH/P plan to be giving Bute from the Isle of Arran during September 5-14, on four metres (70.443 mc) and two meters (145.925 mc). The party is to consist of G3NNO, G3OHH and G3RWE, and they will be operating from a good site 2,100 ft. a.s.l., with a clear take-off in all directions. (And for any Top Band types who may chance upon this item, GM3OHH/P will be on 160m., too.)

For the VHF contest over September 5-6, the Cornish VHF group are going to make a big effort on the 70-cm. band. They will be on a frequency near 432 mc, signing G3OCB/P, running about 20w. with a good beam, and they have an excellent site at 1,000ft. a.s.l.

As regards the DX-peditions that have already fallen into history, GW3BA/P-GW4LU/P will be long remembered. Putting out a good signal from all sites in seven counties—with the possible exception of Cardigan, says Tom—they came out of it with the very fine total of 712 QSO's, making an average of over 100 contacts per site for the week's working; and anyone who knows about /P on VHF would agree that this represents a considerable effort, taking all the driving and site-finding into account. At each

site (except when in Merioneth, when the Wx was so bad as to make it impossible) they pitched a tent and put up a beam. They travelled in two cars, with two-metre intercom., which worked very well with short verticals on the vehicles. Many of our correspondents this month testify to the success of the expedition, to the slick operating, and the interest they got out of following G3BA/G4LU round—and quite a number of G's worked them in all seven counties. G3BA remarks that they were rather surprised not to have raised a single EI, GI or GM station, though quite often the beam was headed for them.

The Tabular Matter

A while back (p.302, July) your A.J.D. made one of those loose statements that almost always land one on the putty—to the effect that "G3LTF is an almost unassailable position in Countries Worked." Well, just too late to catch August, in comes a letter from Gaby Felix, ON4FG (Bornem) giving details of his EDX contacts with GC2TR (GC at last), the EA4AO encounter by MS (already reported), and a new first-time QSO with LZ1DW via the Geminids on July 12, which took them four hours (after five different MS tried). This means, of course, that Gaby goes to 25C in Countries, putting him right in the hot seat—and with our congratulations, too. The loose ones between G3LTF and ON4FG are now EA, GD and YU. So both Peter and Gaby will have to work hard to decide that lead position.

As regards the Two-Metre Annual, it is not shown this time because, as usual, we shall have the final placings for the year in the October issue—this is because new counties could have been worked between the deadline for this issue (August 21) and the year-end, August 31. So please let us have any final claims in time for the next "VHF Bands." (Those already made are being held for the final listing.)

And, of course, the new Annual Counties worked table, for the year from September 1 to August

VHF BANDS

A. J. DEVON

31, 1965, has already opened—if enough work has been done during the first fortnight or so of September, we may even have sufficient claims in to start the New Annual with October.

In the 4-metre All-Time, for which there were several new claims this month, G3IUD and G3OHH are doing very well—incidentally, this shows how things are moving on the 70 mc band, on which G3OHH has now worked 169 different stations; he started when the band opened, and has been consistently active.

Attempts to make space for the Two-Metre All-Time seem always to be balked—but it will appear and, indeed, it must, for there is now a very large number of claims in hand, and we can tell you that E12W is in front with 94C. Other tables for which space must be made are the Seventy-Centimetre and the Two-Metre Firsts, which have not been shown for a long time and need bringing up to date. (This should all be possible when we finish with "The Mobile Scene," after October. *Editor.*)

News and Gossip

G2JF (Ashford, Kent) reveals that he has been running tropo-scatter skeds with DJ2BE (Hanover) for the past 15 months, which have been very successful in that over their 400-mile path signals are usually there, even if only readable with difficulty. Jim

says that what it comes to is that with a good location, plenty of urge (400 watts CW, in his case) and patience, communication is possible. He is interested in such long-range schedules with stations that are suitably equipped.

One of the quietly-efficient stations in the northern part of the country is G3LRP (Wakefield, Yorks.) who has got to 67C in the Annual. But his operating time is somewhat limited, and for an odd reason—he took in some more land to accommodate aerials and now finds that having to put down a large lawn to make the place

look respectable involves such a lot of work . . . need we go on! Talk about being hoist with your own petard!

G3PKT (Rainham, Kent) says that his "exercise since Easter" has been testing 20w. of NBFM on the stations previously worked on AM—so far, he has re-worked 162 of the original 433S. In general his findings are: (a) FM is adequate down to about S6, then AM is preferable; (b) Most operators are willing to try resolving his FM by the slope-detection method (which on most receivers means "tuning off") and (c) Some people have been downright rude to G3PKT about the whole business! This is a bit hard because—apart from it being a serious investigation which has given most interesting results—his Tx is so arranged that he can change over from AM to FM or vice-versa at the distant station's request.

G3SAR (Sevenoaks) worked GW3BA/P-GW4LU/P on schedule in all seven counties, and also reports interesting QSO's with F1DC/P, using only 1w. from near Caen; EI2A, GW3JSQ/P for Montgomery, and PAØFB on SSB. And when F8VN was heard working GM's, earlier in the period, G3SAR swung round to the north but could find only a weak signal from GM3HLH, and so concluded that the GM's "were ducting over his head." This is an interesting observation, and is an entirely possible phenomenon, though rare and difficult to prove. Under the right sort of Wx conditions, one can visualise a wave-guide effect being created in the lower atmosphere by a double temperature inversion. It could well be that this was what was happening when G3SAR missed those GM's.

G3GWL (Bletchley), G2BJY (Walsall), and G2CDX (Cambridge) all report briefly with claims, as does G2DHV, who also operates /M and /P whenever an opportunity presents itself.

For those wanting Hunts, and a new station to work, G3TEJ is at Godmanchester and has already got to 24C for the Annual; he offers skeds to anyone who is interested, (7, The Close). G5JU (Birmingham) has claims for all

FOUR METRES

ALL-TIME COUNTIES WORKED LIST

Starting Figure, 8

From Home QTH Only

Worked	Station
49	G3IUD
47	G3OHH (169)
43	G3EHY
38	EI2W
37	G3PJK
33	G2OI, G5JU
32	G3NUE, G5FK
30	G3JHM/A
28	G3PMJ
26	G3LQR
25	G2BJY, G3AYT, G3OWA (138)
23	G3BOC
22	G3LZN
20	GI3HXV
19	G3BNL
16	G3BJR, G3FDW, G3HWR
14	G3OKJ
13	G2AXI
12	G5CP, G5DS
11	G3SNA, G5UM
10	G2BDX, G3OJE
9	G3EKP
8	G3PRQ

This Table records Counties Worked on Four Metres, on an all-time basis. Claims can be made as for the other Tables, e.g. a list of counties with the stations worked for them, added to from time to time as more counties accrue. QSL cards or other confirmations are not required. Totals in excess of 100 different stations worked should be claimed and will be shown in brackets after the call.

the current tables, and is one of the Sunday-morning operators on 4m. G3PMJ (Abbey Hey, M'cr.) reports the local 4-metre activity, and mentions G3TEY (a YL, only sixteen!) as coming on the band. There are several 4m./M's regularly active in the Lancs. area, some using the B.44 Tx/Rx outfit, which seems to be very suitable for mobile—though your A.J.D. would think that the Tx output is a bit low—and GI3HXV/M is also running one.

G3OJE (London, S.E.20), G3PSL (Loughborough), G3DVQ

TWO METRES

COUNTRIES WORKED

Starting Figure, 8

- 25 ON4FG (DL, EA, EI, F, G, GC, GI, GM, GW, HB, HG, LA, LX, LZ, OE, OH, OK, ON, OZ, PA, SM, SP, UA, UR, YU)
- 24 G3LTF (DL, EI, F, G, GC, GD, GI, GM, GW, HB, HG, LA, LX, LZ, OE, OH, OK, ON, OZ, PA, SM, SP, UA, UR)
- 21 G3HBW, G5YV (DL, EI, F, G, GC, GD, GI, GM, GW, HB, HG, LA, LX, OE, OH, OK, ON, OZ, PA, SM, SP)
- 19 G3CCH
- 18 G2JF, G6NB, ON4BZ, OK2WCG
- 16 G3BA, G3BLP, G3CO, G3GHO, G3KEQ, G5MA, G6RH, G6XM, PAØFB
- 15 G2CIW, G2XV, G3AYC, G3DKF, G3FZL, G3HRH, G3RMB, G4MW, GM3EGW
- 14 G2FJR, G2HDZ, G3AOX, G3FAN, G3FAZ, G3IQO, G3JWO, G3KPT, G3LAS, G3NUE, G3PBV, G3WS, G4LU, G5BD, G5DS, G6LI, G8OU
- 13 G2HIF, G2HOP, G3AOS, G3DMU, G3DVK, G3EHY, G3GPT, G3GWL, G3IIT, G5NNG, G3OHD, G6XX, G8VZ
- 12 EI2A, EI2W, F8MX, G2BJY, G2CDX, G3BNC, G3GFD, G3GHI, G3JAM, G3JLA, G3JXN, G3OBD, G3WW, G5CP, G5JU, G5ML, G8DR, GW2HIY
- 11 G2AJ, G2CZS, G3ABA, G3BDO, G3BOC, G3GSO, G3IUD, G3JYP, G3JZN, G3KU/H, G3LHA, G3PSL, G4RO, G4SA, G5UD, G6XA, G2FZC, OK1VR, PAØVDZ
- 10 G2AHP, G2AXI, G2FQP, G3BK, G3DLU, G3GSE, G3JHM/A, G3KQP, G3LAR, G3LRP, G3LTN, G3MED, G3OSA, G3OXD/A, G5MR, G5TN, G5UM, G8IC, GW3ATM, GW3MFY, GW5MQ
- 9 G2BHN, G2DHV, G2DVD, G2FCL, G3BOC, G3BYY, G3FLJ, G3FUR, G3OJY, G3PTM, G4LX, G8GP, GC3EBK, GI3ONF, GM3DIQ, GM3LDU
- 8 G2BDX, G2DDD, G2XC, G3AEP, G3AGS, G3AHB, G3CCA, G3EKX, G3GBO, G3HCU, G3HWJ, G3KHA, G3PKT, G3MPS, G3VM, G5BM, G5BY, G8SB, GM3JFG

(Purley), G3SML (Earl Shilton, Leics.), G5UM (Knebworth, Herts.), G3LAS (Berkhamstead), G3AHB (Slough) and EI2W (Co. Dublin) put in claims for the various tables, all of which have been taken in.

There is a small but enthusiastic group of stations active on 70 cm. in the Ches./Lancs. area; they include G3EKP, G3KMS, G3LJO/T, G3OTA and G3SXC/T. G3EKP (Belthorn, Lancs.) is also on two and four metres.

G3KQF (Borrowash, Derbys.) reports that he was able to work the GW boys in six counties out of the seven without a schedule; he says that from his point of view the interesting thing was that he had no difficulty in getting good reports with 25w. of NBFM—whereas other stations, much nearer, appear unable to find, or to resolve, his signal. (He and G3PKT had better get together about these problems.)

G3OWA is now on from a new QTH at Coulsdon, Sy. and says he finds 4m. activity much increased; consistent signals with him are G3BNL, G3IUD and G3OHH, all well to the north. G3OWA has 138 different stations accounted for on the band.

From Dartford, Kent, G3CO, having worked the GW/P party all through their tour, says he would "like to see what they could do from GM"; Jack found their signals tended to be better during the morning sessions. Having now booked in everything south of the border except Alderney and Sark, he hopes the GB2GC boys will help him with them during their September 5-7 visit.

G3PBV has got going from Northampton, and has made a good start from the new QTH; the beam is to be a 10-ele long Yagi at 40ft., so he should be a pretty potent signal. G3IOE (Newcastle) reports that generally things have been pretty good on two metres up North, with a number of new stations worked; he finds G2JF and G3NUE (Worcester) to be very consistent signals.

From Coventry, G3LHA reports that his new 16-ele colinear stack is doing very well on two metres, and quite a lot of GDY has been worked. On 70 cm., the locals run Thursdays as their night-on-the-air, with about eight regular supporters, one of whom is G2CIW (Birmingham) who remarks that in general things have

been disappointing as regards DX openings on two metres, though he has heard a certain amount of GDY; Jack keeps going on 23 cm. with G3KFD and G3NBQ, but it needs a spell of good conditions to get them outside the local area on that band, too.

G8VN (Leicester) divides his time between two metres with the indoor beam, still doing very well, and 4-metre mobile, which is getting more interesting. In the 2m. Annual, he is at 29C, with only the 16w.

We are very sad to have to record the passing of GM3OL, Kippford, Kirkcuds., who was one of the pioneering Scottish amateurs on VHF in the early 5-metre days, and had kept to VHF ever since.

In Conclusion—

Your A.J.D. will be off on a few days' leave by the time you see this—but will be back again for the October deadline which must be **Friday, September 18**, with everything addressed: A. J. Devon, "VHF Bands," *Short Wave Magazine*, 55 Victoria Street, London, S.W.1. Allah be with you till we meet again on October 2. 73 de A.J.D.

SPECIALLY ON THE AIR

Following are the special-event arrangements as notified to us by close of press. If there are any more to appear in the October issue, information should reach us by September 11 latest.

GB3CRC, September 5: Cheshunt & District Radio Club phone field-day, at Goffs Lane Playing Fields, Cheshunt, operating on 80-160m., looking for local-station contacts and requesting SWL reports, which will be QSL'd by special card. QTH: B. B. Charge, 64a High Street, Waltham Cross, Herts.

G3OJE-G3PIZ/A, September 11-13: Operating from Chalfont Heights Scout Camp, Bucks., for a Scout activity week-end, on 40-80-160m. QSL address: M. D. Bass, G3OJE, 42 Clevedon Road, London, S.E.20.

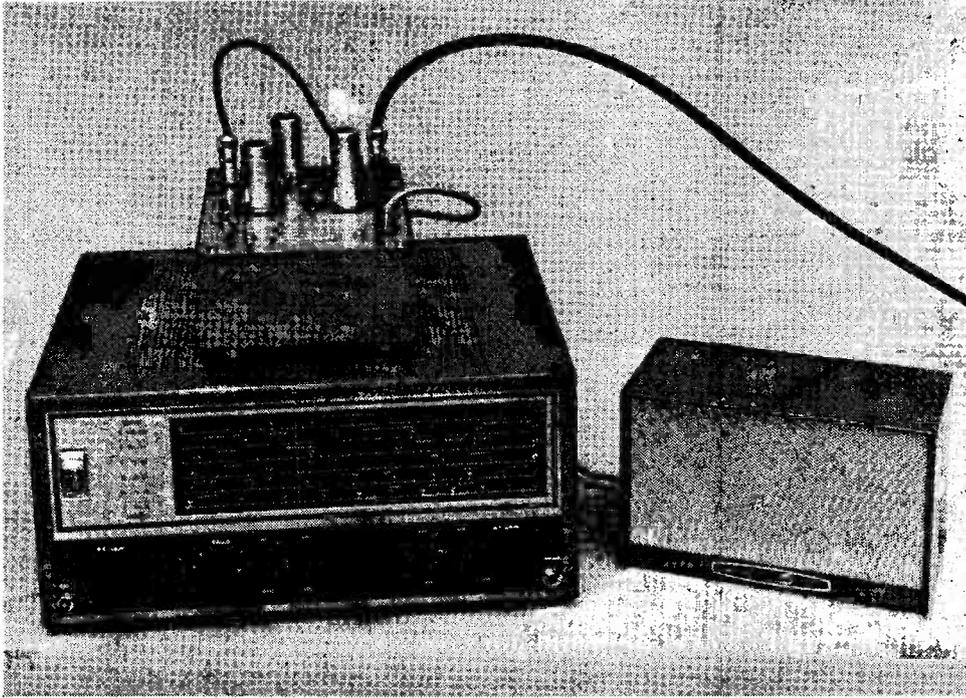
GB2ASH, September 19-20: Echelford Amateur Radio Society (Ashford, Middx.) will be operating an exhibition station on behalf of the Staines & District Boy Scouts Association. Information from: L. Seaman, G3AFT, 40 Park Road, Ashford, Middlesex.

GB3UCL, October 5-15: Operated by the University

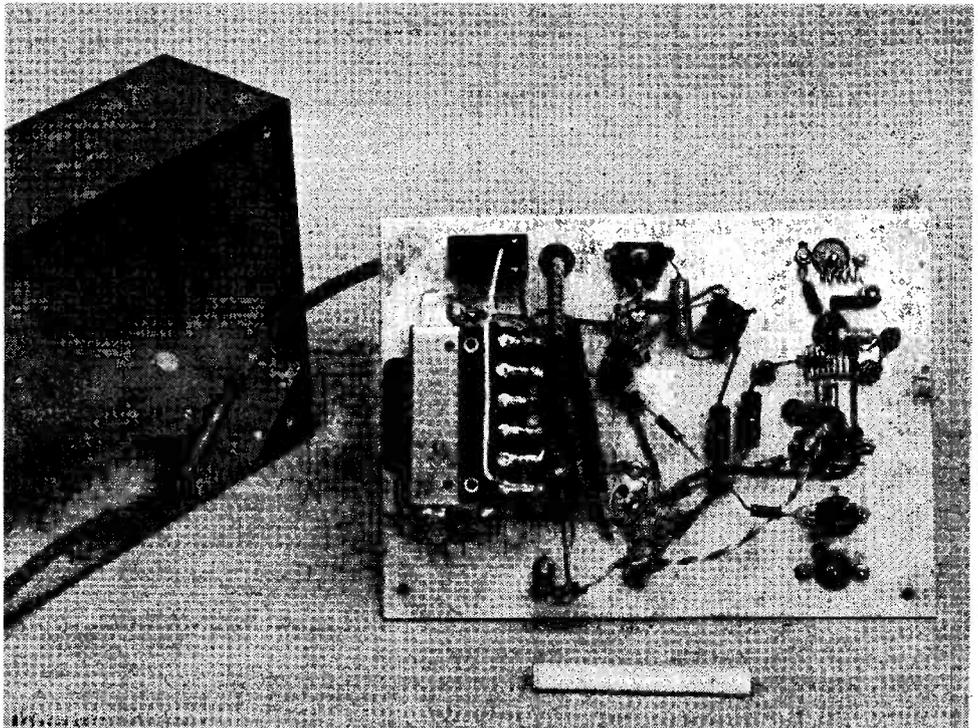
College, London, Amateur Radio Society for the College Freshers' Conference, running all bands two metres to Eighty. Contacts with other College and University stations will be particularly welcome. A special QSL card is being issued, and the QTH is: D. J. Bradshaw, G3SUX, Amateur Radio Society, University College London Union, Gower Street, London, W.C.1.

G3COY, October 10: Station to be put on in connection with the University of Keele Students' Mart. Freshers are invited to contact either G3COY or G3SMD, at the University, as to what facilities the Radio Society has to offer.

HB9RAS, till October 25: Amateur station installed specially for the Swiss National Exhibition, Lausanne, operating all bands 10-80m. U.K. contacts and visitors will be specially welcome and, for those likely to be in Switzerland during the period, there is an Amateur Radio gathering every Friday evening, 8.30 p.m., at the Hotel de l'Europe, Lausanne, at which HB's will be glad to meet visitors. Further information from: B. H. Zweifel, HB9RO, Chemin Levant 123, Lausanne.



Above, left, the Heathkit RG-1 and matching speaker working with the new Green & Davis 2-metre converter, having an IF of 24-26 mc, this being tuned on the RG-1 Band F position. It has proved a very effective combination, since the G. & D. converter is sensitive and gainy, having a 6CW4 RF stage, while the RG-1 as the main Rx has all the necessary tuning refinements. GB3VHF at 75 miles is a strong and reliable signal using only a Turnstile omni-directional aerial. Below, right, the G. & D. converter out of its cabinet. It is very well designed, mechanically and electrically, with the RF and mixer circuits kept "in the air" above the chassis plate, and is self-contained for power.





THE OTHER MAN'S STATION

G3MEF

THIS is the station of G3MEF, Thomas Wylie, M.I.R.E., 17 Manor Park, Barnstaple, Devon — who has had an extremely varied and most interesting career in radio.

Starting in 1912, in Glasgow, with spark-coil and coherer, he has been through it all, including some early experiments with spark telephony! Gaining a 1st Class PMG Ticket in 1917, he went to sea as a wireless operator in a ship fitted with a Telefunken $\frac{1}{2}$ -kW quenched-gap spark Tx and crystal Rx. later becoming chief operator on the old *City of Lahore*. Remaining at sea till 1927 (and loving every minute of it), sailing all over the world in all sorts of ships, he resigned from the Marconi Co. and went to Canada to take charge of the Toronto BC station CKNC. The next step was an appointment with the Canadian Government Radio Administration, leading to varied responsibilities, such as radio aids to marine navigation and the control of a frequency monitoring service. Continuing ill-health, the result of war strain, and several severe operations, meant resignation in 1956 with a sickness pension, and retirement to England.

While in Canada during 1927-'56, G3MEF held VE3WI and VE3WY, and was very active with gear always up-to-date for the period; his main interests at that time were high-speed traffic handling (CW

operation) and aerial experiments, for which he had exceptional facilities — 5 acres of land, three 100ft. towers, six 60ft. poles, and six 30ft. poles! His reference-aerial was a full-wave 80m. array, 100ft. high, with 129ft. feeders.

The picture shows the present G3MEF layout, at Barnstaple in North Devon, involving a good deal of Heathkit gear (DX-100U Tx, RA-1 Rx, Sig. Gen. and Valve Voltmeter) and another receiver he describes as a "HRO Special"; this is a hotted-up HRO, with modern valve types and an internal 100 kc xtal calibrator. A Codar PR-30X Preselector is also used, modified for automatic by-passing and protection against RF. All the unit inter-connecting wiring is in shielded coax.

As might be expected, the aerial installation is pretty elaborate: A Mosley Tri-Bander; a set of multiple dipoles for 10-80m., with a common feeder; a 3-ele 10m. beam fixed to fire on Boston, Mass.; and a multi-match doublet on a 30ft. swing-up mast, with the two aerial ends sloping down to 9ft. poles, which can be used on all bands and gives excellent results.

Readers everywhere will join us in wishing G3MEF a happy retirement, sweetened by the active interest in Amateur Radio which has held him for more than 50 years.

NEW QTH's

This space is available for the publication of the addresses of all holders of new U.K. call signs, as issued, or changes of address of transmitters already licensed. All addresses published here are reprinted in the U.K. section of the "RADIO AMATEUR CALL BOOK" in preparation. QTH's are inserted as they are received, up to the limit of the space allowance each month. Please write clearly and address on a separate slip to QTH Section.

- G3SNK**, P. Draycott, 66 Windermere Avenue, Kirk Hallam, Ilkeston, Derbyshire.
- GM3SRV**, R. M. Tatton, 1 Hillview Drive, Corstorphine, Edinburgh, 12.
- G3SUS**, S. Jacobs, 41 Queenborough Gardens, Ilford, Essex.
- G3SVQ**, A. H. Yallop, 10 Farley Hill, Luton, Beds. (Tel. Luton 22977.)
- G3SXB**, D. G. Buckman, 61 Canterbury Walk, Cheltenham, Glos.
- G3SXN**, Amateur Radio Club, R.A.F. Station, Newton, Nottingham.
- G3TAQ**, N. H. Bullock, 37 Kent Road, Stowmarket, Suffolk.
- G3TBB**, J. B. Marsden, 14 Ash Grove, Horsforth, Leeds, Yorkshire.
- G3TBJ**, C. J. Webster, Nut Tree Cottage, Ibsley, Ringwood, Hants.
- G3TCT**, G. F. Kimbell, 36 Tormead Road, Guildford, Surrey.
- GW3TCV**, J. H. Edwards, Offa, Montgomery, Montgomeryshire.
- G3TCX**, H. V. Morris, 321 Bromford Road, Castle Bromwich, Birmingham, 34. (Tel. STE 4906.)
- G3TDQ**, M. C. Morris, 60 Corinne Croft, Kingshurst, Birmingham, 34. (Tel. MAR 2913.)
- G3TEV**, M. J. Mills, The Bungalow, Randalls Green, Chalford Hill, Stroud, Glos.
- G3TEY**, Miss Patricia Stansfield, 33 Countess Road, Weston, Macclesfield, Cheshire.
- G3TFD**, R. Youngs, Holm Close, Toft Monks, Beccles, Suffolk.
- G3TFF**, G. W. Fuller, 17 Baden Street, Haworth, Keighley, Yorkshire.
- G3TFM**, R. Scadden, 38 Court Orchard, Bridport, Dorset.
- G3TFN**, E. Rowland, The Elms Bungalow, Whitfield, Lancs.
- G3TFR**, J. C. Hardstone, 192 Streetsbrook Road, Shirley, Solihull, Warks.
- G3TFS**, F. J. Sweeney, D.F.M., 58 Grosvenor Road, Epsom Downs, Surrey.
- G3TFZ**, D. T. Legg, 6 Sycamore Grove, Knowbury, Ludlow, Shropshire.
- G3TGB**, B. W. Ely, 275 Fold Croft, Harlow New Town, Essex.
- G3TGL**, A. J. Fantham, 92 Grange Farm Drive, West Heath, Birmingham, 30.
- G3TGO**, B. W. Vaughan, 368 Fulbridge Road, Paston, Peterborough, Northants.
- G3TGR**, J. Woods, 24 Woodhouse Road, North Finchley, London, N.12.
- G3TGW**, E. Wilders, 28 Highbury Street, Peterborough, Northants.
- G3THC**, D. R. Stimson, 108 Cambridge Street, Wolverton, Bucks.
- G3THF**, B. McHugh, 27 Slade Grove, Longsight, Manchester, 13.
- G6RAX/T**, L. D. Woolf (ex-G3RAX/T), 25 Parkside Gardens, Wimbledon, London, S.W.19. (Tel. WIM 8554.)
- G8AAA**, B. H. Green, 31 Monivea Road, Beckenham, Kent.
- G8AAF**, F. B. Blake, 2 Fair View, School Lane, Seer Green, Beaconsfield, Bucks.
- G8AAG**, B. Carter, 14 Falmouth Road, Whitley Wood, Reading, Berkshire.
- G8AAL**, P. K. Hamblett, 234 Shenstone Avenue, Norton, Stourbridge, Worcs.
- G8AAZ**, L. D. Woolf (ex-G3RAX/T), 25 Parkside Gardens, Wimbledon, London, S.W.19. (Tel. WIM 8554.)
- G8ABC**, P. L. Hovenden, Inchfield, The Way, Reigate, Surrey.
- G3ECC**, A. G. Martin, 17 The Forstal, Pembury, Tunbridge Wells, Kent.
- G3GJL**, Worcester and District Amateur Radio Club, Hut 35, Perdiswell Park, Droitwich Road, Worcester.
- G3HS**, D. T. Boffin, Longcot Road, Woolstone, Faringdon, Berks. (Tel. Uffington 627.)
- G3JLF**, L. Beevers, c/o Crown Hotel, Central Promenade, Morecambe, Lancs. (Tel. Morecambe 177.)
- G3JSW**, D. K. Clarke, 250 Burringham Road, Scunthorpe, Lincs.
- G3JTW**, Marconi Apprentice Association Radio Club, c/o The Education Office, Marconi House, New Street, Chelmsford, Essex. (Tel. Chelmsford 51539).
- G3KFE**, E. P. Essery, 8 Willowfield, Passmore, Harlow, Essex.
- G3KYM**, H. Stamper, 66 South Close, R.A.F. Station, Medmenham, Marlow, Bucks.
- G3LGC**, F. Collinge, 62 Surrey Avenue, Shaw, Oldham, Lancs.
- G3MCS**, W. R. Hawthorne, 12 Roundlands, Lacey Green, Aylesbury, Bucks.
- GM3MHG**, J. Enderby, 71 Moorhouse Avenue, Glasgow, W.3.
- G3NJF**, M. Knights, 56 Mill View, Waltham, Grimsby, Lincs.
- G3NKC**, L. G. Tonkinson, 8 Little Warton Road, Warton, Tamworth, Warks.
- G3NRB**, N. H. Kempt (ex-GM3NRB), 7 Raffin Green Lane, Datchworth, Knebworth, Herts. (Tel. Knebworth 3438.)
- G3NYV**, E. H. Coxon, 32 Moss Street, Chadsmoor, Cannock, Staffs.
- G3OAH**, P. R. Whittlestone, No. 1 Flat, 43 St. Swithun's Road, Bournemouth, Hants.
- G3ODH**, S. B. Smythe, 4 Hall Drive, Mottram, via Hyde, Cheshire.

CHANGE OF ADDRESS

- EI2W**, H. L. Wilson, 23 Rathgar Road, Dublin, 6.
- G3BNI**, D. L. K. Coppendale, 18 Charlbury Road, Shrivenham, Swindon, Wilts. (Tel. Shrivenham 640.)

AMENDMENT

- G3SAZ**, J. Barker, 34 Village Way, Ashford, Middlesex.

THE MONTH WITH THE CLUBS

By "Club Secretary"

(Deadline for October Issue: September 11)

(Address all reports for this feature to "Club Secretary")

EVERY now and then an item of club news, or a comment in a club periodical, seems of such unusual interest that it is singled out for a special mention.

This month we note, in particular, that "Sid Warren passed his R.A.E."—a terse comment in *QSP (South Birmingham)*. Hardly noteworthy, one might think, but the facts prove otherwise. Sid Warren had the misfortune to suffer a long and painful illness, followed by the amputation of both legs, and long and depressing periods of treatment. He became interested in listening on the amateur bands, and was fortunate enough to come to the notice of G3PJU and G3JAO (although they consider themselves fortunate to have met him.)

These two amateurs helped Sid right along the path culminating in his passing of the R.A.E., and even managed to obtain permission for him to operate, as G3PJU/A, under their direct supervision. As a result of this, Sid Warren's cheerful voice, despite his handicap, has already become very well known in Midland Top-Band circles.

We are told by the South Birmingham people that dozens of local amateurs and SWL's were more worried than Sid himself during the waiting period for R.A.E. results; however, all is well, and now they await his voice under his own call sign.

This has been quoted at some length because your "Club Secretary" feels that *this* is the sort of thing that more than justifies the existence of an enthusiastic and active club, anywhere. Our congratulations, to South Birmingham.

Another comment arises from the Third Quarter Programme published by *Slade*. From this we quote: "Slade has a new look—a streamlined look. In future our lectures will commence at 8 p.m. promptly and terminate at 9.30 p.m. The remaining time until about 10.30 p.m. will be available for ragchew and discussion. All formal business will be restricted to the absolute minimum." Many other clubs we can think of might well take this to heart.

ACTIVITY REPORTS

Cray Valley (Newsletter, August) have planned a full programme. Their September meeting (on the 3rd) has already been held, and was to feature G2MI with some reminiscences. On October 7 G3GJW and others will present "My Shack," with colour slides. Every Friday night at 9 p.m. the local net meets on 1970 kc, and there is a "Natter-Nite" on September 16 at the Coldharbour Community Centre, Eltham (normal

meetings are at the Congregational Church Hall, 1 Court Road). The club plans to hold an "Activity Week-End" on October 3 and 4, when all licensed members, as well as the club station G3RCV, will be active on the eight upper amateur bands. Call "CQ Cray Valley" and see who comes back!

Guildford will be busy at the Guildford Show on September 4-5; and then on September 19-20 they will be in action with their club station at the local Model Engineering Society's Open Day (the two clubs share a headquarters now, at Stoke Park, and the Radio Society's Friday meetings begin there at 7.30 for 8 p.m.). On September 11 the speaker will be Mr. S. W. Smith, of the GPO Radio Interference Branch.

Blackpool and Fylde announce a Junk Sale (and tidy-up afterwards!) on September 7; on the 14th, Questions and Answers; and on the 21st a talk and demonstration on SSB, by G2DAF. September 28 is an Open Night. All meetings at Pontins, Squires Gate Holiday Camp.

Acton, Brentford & Chiswick have their monthly meeting on September 22, when G3IGM will give a talk entitled "Application of Theory to Practice." 7.30 p.m. at the Hq., 66 High Road, Chiswick.

Reading, whose August meeting was devoted to a description of members' pieces of gear "for use around the shack," will meet next on September 26 to see a demonstration of Green and Davis' gear, followed by a discussion. At the Palmer Hall, West Street, 7.30 p.m.

Surrey (Croydon) hold their Junk Sale on September 8 (Blacksmith's Arms, South End, Croydon); on Sunday, the 20th, their annual Two-Metre D/F Hunt will take place. Rules and entry forms are available from the secretary (see panel for OTH).

Wimbledon had a talk on the Joystick, by G3LRO, at their July meeting. On September 11 there will probably be a talk about Transistors, and on October 9 a Junk Sale.

[over

START PLANNING NOW

For MCC, the Club Event of the Year. Dates are November 14/15, 1700-2100 GMT each day. Rules in full in the October Issue. Clubs never having taken part previously should ask for identification letters—see p.443, October, 1963 issue. All other Clubs will receive identification automatically, and will be listed next month.

Kingston, who gather at 8 p.m. at the YMCA Annexe, Eden Street, Kingston-on-Thames, have meetings on September 3 and 17; on the latter date there will be a Junk Sale. **Echelford**, at the Grammar School, Church Road, Ashford, Middx., start their R.A.E. Course for juniors on September 16, and on the 30th they have a talk on Micro-miniaturisation and a Special General Meeting—7.15 p.m. They will be busy on September 19-20 with GB2ASH, under special-activity conditions.

Manchester have now acquired an all-band 60-watt Tx, and hope to enter for various contests. It has already proved its worth in contacts on Ten Metres with locals who seemed rather vague about the club's location and even its existence! On September 2 the group paid their annual visit to the Northern Heights A.R.S. for a "Pea and Pie" supper.

Midland, whose August meeting was devoted to a demonstration of modern transmitting equipment, hold their A.G.M. on September 15—at the Birmingham and Midland Institute, Paradise Street, for 7.45 p.m.

Spenn Valley, once more, have issued a printed syllabus carrying them right up to their A.G.M. for the following season (in July, 1965). They open this one on September 17, with a Junk Sale, and thereafter meet fortnightly. On October 1 they have a talk on Transistors, by Mr. M. Taylor of Baird TV, Bradford. All meetings are at 7.30 p.m. at Heckmondwike Grammar School.

Norfolk, who report a rapidly increasing membership, meet every Monday, when working parties

organise the shack and clubroom (at 140 Oak Street, Norwich). The club Tx, G3PXT, is on Top Band and Eighty, particularly at mid-day on Sundays. An R.A.E. Course and Morse practice sessions are on the way (the latter for licensed amateurs as well as novices). Regular lecture-meetings started on July 20 with a talk on Aerials.

Lothians is another club believing in forward planning, and their meetings are arranged right up to June, 1965. The two September events will be on the 10th and 24th, and they will continue thereafter on the second and fourth Thursdays, 7.30 p.m. at the YMCA, South St. Andrew Street, Edinburgh.

Reigate have a special meeting on September 10, and their normal evening will be on the 19th—both at the George and Dragon, Redhill. Their July meeting was a "most informative evening," provided by members of the British Amateur Television Club.

WAMRAC (*Circular Letter* No. 45) continues to flourish, but the guiding figure behind it (Rev. Arthur W. Shepherd, G3NGF) has been "posted" from Melton Mowbray to Crewe. A new manse is being built, and offers "plenty of antenna-space"—and, doubtless, a room suitable for a shack. Meanwhile the nets continue on 3665 kc (Sundays 1300 and Tuesdays 1800, also Saturdays 0800); and on 1865 kc, Sundays 2100-2145 (all times GMT). Another WAMRAC Get-Together will be held during the Radio Communications Exhibition on October 31, 2.15 to 3.15 p.m. at the Seymour Hall.

Basingstoke are running an R.A.E. Course, which will begin in the Technical College in mid-September

Names and Addresses of Club Secretaries reporting in this issue:

ACTON, BRENTFORD & CHISWICK: W. G. Dyer, G3GEH, 188 Gunnersbury Avenue, W.3.
 AINSDALE: N. Horrocks, G2CUZ, 34 Sandbrook Road, Ainsdale, Southport.
 BADEN-POWELL HOUSE: A. Watts, G3FXC, 8 Thornycroft Court, Kew Road, Richmond, Surrey.
 BASINGSTOKE: P. Jackson, G3ADV, 11 Oaklands Way, Basingstoke.
 BLACKPOOL & FYLDE: J. Boulter, G3OCX, 175 West Drive, Cleveleys, Blackpool.
 BRADFORD: E. G. Barker, G3OTO, 63 Woodcot Avenue, Baildon, Shipley.
 CAMBRIDGE: F. A. Porter, c/o 37 Metcalfe Road, Cambridge.
 CRAWLEY: R. G. B. Vaughan, G3FRV, 9 Hawkins Road, Tilgate, Crawley.
 CRAY VALLEY: S. W. H. Harrison, G3KYV, 30 Plaistow Grove, Bromley, Kent.
 CRYSTAL PALACE: G. M. C. Stone, G3FZL, 10 Liphook Crescent, London, S.E.23.
 DERBY: F. C. Ward, G2CVV, 5 Uplands Avenue, Littleover, Derby.
 DURHAM: M. Allenson, G3TGD, Physics Dept., Durham University, South Road, Durham.
 EAST WORCS.: M. J. Nicholas, 12 Crabtree Close, Lodge Park Estate, Redditch.
 ECHELFORD: L. Seaman, G3ATF, 40 Park Road, Ashford, Middx.
 GRAFTON: A. E. Bristow, 37 Tyndale Mansions, Upper Street, London, N.1.
 GUILDFORD: H. Mead, G3OXI, 41 Egley Road, Woking.
 KEELE UNIVERSITY: V. J. Reynolds, G3COY, Dept. of Communication, Univ. of Keele, Keele, Staffordshire.
 KINGSTON: A. G. Wheeler, G3RHF, 22 Meadow Road, Ashford, Middx.
 LEEDS: S. Tomlinson, 31 The Quarry, Alwoodley, Leeds 17.
 LOTHIAN: T. Spears, GM3OWI, 24 Priestfield Road, Edinburgh 9.
 LOUGHTON: A. W. Sheppard, G3JBS, 11 Barefields, Loughton.
 LUTON: D. J. Pinnock, G3HVA, 265 Chesford Road, Luton.
 MANCHESTER: D. H. Poole, 215 Greengate, Middleton Junction, Manchester.

MELTON MOWBRAY: D. W. Lilley, G3DFD, 23 Melton Road, Asfordby Hill, Melton Mowbray.
 MIDLAND: C. J. Haycock, G3JDJ, 360 Portland Road, Birmingham 17.
 NORFOLK: A. W. Preece, G3TCO, School of Biological Sciences, Wilberforce Road, Norwich, NOR.54.H.
 NORTHERN HEIGHTS: A. Robinson, G3MDW, Candy Cabin, Ogdens, Halifax.
 NORTH KENT: B. Dawson, G3RMI, 16 Derwent Close, Dartford.
 PRESTON: W. K. Beazley, G3RTX, 9 Thorngate, Penwortham, Preston.
 R.A.I.B.C.: Mrs. F. E. Woolley, G3LWY, 10 Sturton Road, Saxilby, Lincoln.
 READING: R. G. Nash, G3EJA, 9 Holybrook Road, Reading.
 REIGATE: F. D. Thom, G3NKT, 12 Willow Road, Redhill.
 SCOTLAND: A. Barnes, GM3LTB, 7 South Park Terrace, Glasgow.
 SLADE: D. Wilson, 177 Dower Road, Four Oaks, Sutton Coldfield.
 SOUTH BIRMINGHAM: A. E. Bishop Jr., 40 Cecil Road, Birmingham 29.
 SOUTH HANTS.: G. J. Meikle, G3NIM, 34 Victoria Road, Netley Abbey.
 SPEN VALLEY: N. Pride, 100 Raikes Lane, Birstall, Leeds.
 STOCKPORT: S. J. Scarbrough, G3MBQ, 95 Cavendish Grove Stockport.
 SURREY (CROYDON): S. A. Morley, G3FWR, 22 Old Farleigh Road, Selsdon, South Croydon.
 SUTTON COLDFIELD: K. H. Varney, G3DMV, 149 Whitehouse Common Road, Sutton Coldfield.
 TORBAY: Mrs. G. Western, G3NQD, 118 Salisbury Avenue, Barton, Torquay.
 W.A.M.R.A.C.: Rev. A. Shepherd, G3NGF, 1 North Street, Crewe. (Tel: Crewe 2558).
 WIMBLEDON: E. N. Hurle, G3RZN, 156 Monkleigh Road, Morden, Surrey.
 WORCESTER: G. W. Tibbetts, G3NUE, 108 Old Hills, Callow End, Worcester.
 YEOVIL: D. L. McLean, G3NOF, 9 Cedar Grove, Yeovil.

details from the Principal or from G3ADV). Next meeting of the club will be on September 12, at Emmanuel Hall, Wate Street; this will be the A.G.M., and new members will be welcomed. On October 10 there will be a Constructors' Competition (at the same place).

South Hants. held their Southampton Area meeting on August 8, which took the form of a Junk Sale. We also learn from *QUA* (August) that their part in the big Southampton Show was a great success—more than 40,000 people attended the Show, and many of them must have seen G3SOU/A in operation.

Crawley reports a quiet time during the holiday period, but plans are afoot for a full season to come. On September 23 they will have a film show, and a visit from members of the Southampton group. After the R.A.E., a number of members are happily trying their new rigs out . . . for the others, a new R.A.E. Course starts in September, with G3PHG in charge!

Radio Club of Scotland continues to produce its very lively *GM Magazine*, from which we gather that lots of activity is afoot—but there are no details of forthcoming meetings, for which reason we cannot help by publicising them.

Preston will meet on September 8 and 22 at St. Paul's School, Pole Street. On the first date they will cover the subject of Transmitters, and on the second they will be visited by G2AMV of Birkenhead.

Northern Heights will be running a demonstration station at the Percival Whitley College of Further Education during the signing-on week for the new R.A.E. Course (on September 7, 8 and 9)—and what an excellent idea! On the 16th they will have a lecture on Oscilloscopes (Craven Electronics) and on the 30th a Ragchew and Committee meeting.

Crystal Palace (*Newsletter* No. 105) held an Informal Evening on August 15, and go into top gear again in September, with a talk by G3TR on Air Traffic Control; this will be on the 19th. There is also a suggestion that the club should combine with Clifton for a joint Christmas function.

Slade are putting on a very special "Television Spectacular" on September 18, when G3JZF will present a closed-circuit TV show, full of interest for both the technical and the non-technical. Three or four cameras, telecine equipment, and a separate viewing room in addition to the large studio, make this sound a very ambitious venture. Visitors welcomed, but please contact G3JZF for full details. On October 2 there is to be an exhibition of members' gear, and October 17 is the date for the Annual Dinner.



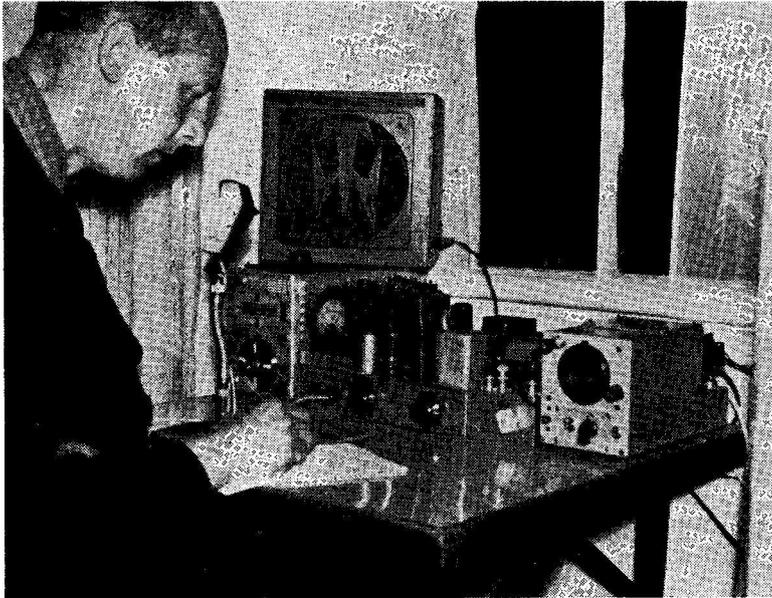
G3TBK operating GB3NRC, assisted by SWL's Hull and Fryer, at Magnus Grammar School for the Newark (Notts.) Rotary Club, in connection with their recent Hobbies Exhibition. Under severe QRM conditions about 150 stations were worked in 15 countries, though this total might have been better had there not been a slight misunderstanding, amounting to a permanent technical hitch, in the matter of aerials! This made it difficult to raise even EU/Klub stations on 20m. However, all went well on 80m., for which the gear consisted of an HRO and a K.W. Vanguard. An equipment display completed the School exhibit, and the cards issued for GB3NRC contacts were produced by the School's own art department. Operators were G3JNK, G3SHY, G3TBK, and G3TBM, assisted by a team of SWL's for the logging and QSL-control duties.

Melton Mowbray give notification of their A.G.M., to be held on September 24 at 7.30 p.m., St. John Ambulance Hall, Asfordby Hill. **Leeds** re-commence activities on September 23, at Swarthmore Adult Education Centre, Woodhouse Square, Leeds 3. On the 30th they will have a Junk Sale, and during the following week a visit to a local airport. New members are sought—they describe themselves as "an informal mixed crowd," with two or three transmitting members.

Yeovil reports "three entered R.A.E.—three passed"—nice going. Recent happenings have included visits to the rallies at Newquay and Dartmouth, and the Dartmoor mobile picnic. A party enjoyed the Mullard film show and a lecture, held at Taunton, and members recently heard a tape lecture on Electron Tubes.

The inaugural meeting of the **Baden-Powell House** Scout Amateur Radio Group was held on July 23. A permanent station, G3TGS, will be established there, to demonstrate Amateur Radio to visiting Scouts and to encourage those who are licensed to contact each other. They will meet at 7.15 p.m. on the third Thursday—Baden-Powell House, Queen's Gate, London, S.W.7. Meanwhile they will be busy organising GB3BPH for the Jamboree-on-the-Air, October 17-18.

Luton have arranged their programme for the coming quarter. On September 8 they have a Test Gear Demonstration; on the 15th a Mullard Film Strip; on the 25th (a Friday) a visit to the Cambridge Group; and on the 29th an SSB evening. October 1



Alastair Fraser, GM3AXX, produces the "GM Magazine" for the Radio Club of Scotland, a strong and active Amateur Radio organisation North of the Border. The Club is very keen on /A, /P and contest working generally, and here we see GM3AXX operating GM3RCS/A from Glen Urquhart, near Inverness, during a recent trip, when the object was to work as many Club members as possible on 80m. phone. Many QSO's were made, including, in one afternoon, GM3SBI/P on Skye, GM3IGY at Benbecula, and GM3HXC on Orkney, all island stations. Command-type gear was used, and the aerial, badly screened, was a dipole for 3.5 mc.

is fixed for a visit to the club at Shefford.

Bristol report eight or nine passes in the R.A.E.; G3TGU is already on the air, and others will be joining him very soon. Morse classes are going well, also the weekly lectures. In August the club arranged an expedition to Wales, where half a dozen operators combined to activate GW3TAD/P. A long description of "happenings" (unfortunately much too long for this small space) indicates that the proposed kite aerial met a sad fate after a few hours, but plenty of contacts were made with 280ft. of wire suspended between—two sand dunes! Another visit is planned for September 12.

Durham held their first A.G.M. on June 18 and elected their new officers (see panel for secretary's QTH). A Junk Sale, an aerial design competition, and a talk and demonstration on Printed Circuits have filled the time at recent meetings, which are now held on alternate Thursdays at the Bridge Hotel, North Road, Durham. On September 24 there will be a talk on Transistors by one of the younger members; on October 12—note this—a five-day *all-band CW* contest starts; and the first Club Dinner will be held on October 22.

Stockport ask that secretaries of other clubs within 20 miles should get in touch concerning possible exchange visits, lectures and so on. Future events include a Junk Sale, a Sunday get-together, a Hotpot Supper, and the R.A.E. lectures given by G3FYE at the local evening institute. G3MBQ has taken over the job of secretary (see panel).

North Kent (Newsletter No. 81) recently welcomed Peter Windle (G3HVG, 6Y5XG, etc.), who gave a talk on his experiences in Jamaica. September meetings will be on the 10th and 24th, at the Congregational Church Hall, Bexleyheath. (Note change of secretary—see panel).

Ainsdale have continued through the summer without a break—for the first time, and with good attendances. G8QC and G3PDU recently gave a talk on the wire and-rope aspect of radio—halyards, guys and so on; and G2DQX spoke on 4-metre operation with surplus equipment. Future meetings (all 8 p.m. at 77 Clifton Road, Southport) will be on September 16 and 30.

Bradford, after holding an informal meeting on September 1, will be opening their new session on September 15—7.30 p.m. at Cambridge House, 66 Little Horton Lane, Bradford 3. **East Worcs.** will have a visit from G3GVA on September 10, when he will talk about Self-Tracking Units (this was the talk formerly announced for July). Old People's Centre, Park Road, Redditch.

Cambridge recently visited the Luton club, held a Picnic Rally at Houghton Mill, St. Ives, and are now planning their AT and ATV demonstrations for Bottisham Fete. On September 4 there is a Junk Sale; the 11th and 18th are Activity Nights (Antennas and "Brush and Scrub"); and the 25th will be "Any Questions?" with visitors from the Luton club.

Sutton Coldfield, having held their first meeting at the new Hq. on September 2, will now continue to enjoy the extra facilities. In co-operation with the 17th Sutton Coldfield Scout Group, they now use their headquarters (behind All Saints' Church), where they have a room about 30ft. by 60ft. and ample space for permanent aerials. Meetings will be on the first and third Wednesdays, possibly augmented by instructional nights on the second and fourth Wednesdays, open to both club members and Scouts. October 7 is booked for aerial erection and putting the club station on the air.

TO WHOM IT MAY CONCERN

It has been brought to our notice that certain firms and organisations are using our Secretaries' Address Panel to circularise Clubs with offers and inducements. This is being done without reference to us and any mention of "Short Wave Magazine" in these circulars should be ignored, as we can accept no responsibility in circumstances over which we have no control.

Cheshunt will have a lecture-demonstration by Messrs. Green & Davis on September 4, and on the following day they have a Field Day, operating GB2CRC from Goffs Lane Playing Fields on 160- and 80-metre Phone. On the 11th, a social evening at the CD Centre (8 p.m.). Members and friends from Harlow and Southgate have been invited.

Grafton open the new season on September 11, after which they go ahead with talks, visits, practical evenings and demonstrations every Friday (7.30 p.m. in Room 35, Montem School, Hornsey Road, Holloway). R.A.E. and Morse tuition are also catered for, on Monday and Wednesday evenings. Full details of all the activities of this old-established and very successful London club are available from the secretary, and visitors are always welcome.

Loughton recently had a very satisfactory session operating four complete stations during Debden Community Week, at the end of which they held their first Mobile Rally—a small “experimental” one which turned out to be most successful. A full-scale affair is being aimed at for next year, and splendid facilities have been offered by the local community centre at Loughton Hall.

R.A.I.B.C. (Radial, August) continue to welcome new members and supporters. R.A.E. successes among their members are also reported. All amateurs enjoying normal health, who feel that they might be able to help the handicapped in any way (periodicals, junk, or in a multitude of small matters) should contact the secretary. An issue of *Radial* would open their eyes to some of the possibilities, to say nothing of how daunting difficulties are overcome by the disabled.

At **Worcester** they are busy getting the new Club Hq. to rights; the surrounds have been tidied up and the station gear installed, with various antennae.

INTERNATIONAL DISTRESS FREQUENCIES

Distress calls made in any mode on 500, 2,182 or 8,364 kc on the MF/HF bands, and on 121.5 mc VHF, are accepted by any land, ship or aircraft station, anywhere in the world, that may hear them. These are the international distress and calling frequencies. The oldest, common to all services throughout the world and open to friend-or-foe alike, is the 500 kc channel (600 metres). During the Hitler War, it was usual for the recovery of shot-down aircrew, of either side, to be negotiated by arrangements made on 600 metres. Of course, nobody in authority knew that this was how it was done!

WAMRAC CHANGE-OF-ADDRESS

We are asked to say that the Rev. Arthur Shepherd, G3NGF, who has done so much for the World Association of Methodist Radio Amateurs and Clubs—of which he was the founder member nearly seven years ago—is now at his new QTH at 1, North Street, Crewe, Cheshire, where he will be glad to hear from members.

They are running a draw—under Lotteries Act rules—to raise funds, a figure of £60 being needed to clear initial expenses. Of the six members who took the May, 1964, R.A.E., five passed, a very satisfactory result. Meetings are at 7.30 p.m. on Saturdays and slow Morse practice is being given (on two metres). All details from the hon. secretary.

Keele University Radio Society will resume regular meetings w.e.f. the first Monday of term—October 12, 7.30 p.m. in the Sneyd Annex. The moving spirit of the K.U.R.S. is G3COY who, with G3SMD, works hard for the success of the group. They hope that this year's batch of freshers will include a few licensed amateurs—who will find a station in action all day on October 10, when the new entry reports.

One of the oldest and strongest Amateur Radio clubs in the U.K. is **Derby**, where they are very well organised (G2CVV has been their secretary for many years now) with an interesting programme taking them through September—this includes visits, lectures and a VHF field day. Their meetings are at the Derby & District College of Art, Green Lane, Derby.

MORE R.A.E. COURSE CENTRES

Further to the courses for the Radio Amateur's Examination—City & Guilds Subject No. 55—notified on pp.374-375 of the August issue of *SHORT WAVE MAGAZINE*, below is a further listing.

It is not supposed that this is in any way complete, as there are many such courses arranged locally—at technical colleges and evening institutes up and down the country—which are not publicised outside the district. As explained on p.374, August, an enquiry should be made at the local Education Authority office. Additionally to the suggestions made in August, the reading we recommend for the R.A.E. is *A Guide to Amateur Radio* (4s. post free) and the *Radio Amateur's Examination Manual* (5s. 6d. post free) both obtainable through our Publications Dept., from stock.

For information as to the conditions and regulations under which U.K. amateur licences are issued, apply to: Radio Services Department, Radio Branch, General Post Office, London, E.C.1.

Birmingham: At the Lea Mason Centre, Central Evening Institute, Bell Barn Road, Birmingham, 15, enrolment during the week commencing September 7. Details from: M. A. Brett, G3HBE, 55 Chestnut Drive, Erdington, Birmingham, 24.

Brighton: At the Technical College, starting on September 21, evening courses are being offered for the R.A.E. and the GPO Morse Test. It is intended to have G3TCB (the College station) on the air for the winter session, operated by G3SKI and G6YJ. For the prospectus and enrolment forms apply: Head of Electrical Engineering Dept., Brighton Technical College, Richmond Terrace, Brighton, 7.

Bury: At the Bury Technical College, on Friday evenings, commencing late September; last year's course produced a 100 per cent pass. Apply for

details: J. Bennett, G3PVG, 21 Harwood Drive, Elton View, Bury, Lancs.

Corbridge, Northumbs.: At the County Secondary School, on Wednesday evenings. Apply: D. W. Blackford, G3NPB, Springfield, Haydon Bridge, Hexham, Northumberland.

Crawley: At the Sarah Robinson Evening Institute, Ifield, on Monday evenings. Enrolment details from: A. J. Gibbs, G3PHG, 6 Dairyfields, Gossops Green, Crawley.

Farnborough (Hants.): At the Technical College, Boundary Road, enrolment September 8-10. Apply for details to: The Principal, at the College.

Glasgow: At the Allan Glen School, Montrose Street, under the Corporation's Department of Further Education, on Tuesday and Thursday evenings, course fee £1, enrolment September 7-10, session commencing September 15, with GM3AXX, GM6MS and GM8MJ as instructors; no previous knowledge of radio is required to start these courses, which have been very successfully run for several years.

London (Beckenham): At the Evening Education Centre, 28 Beckenham Road, on Thursday evenings, commencing on September 24. Full details from: M. D. Bass, B.Sc., G3OJE, 42 Clevedon Road, London, S.E.20.

Norwich: Under Norfolk Education Committee, at the Thorpe Evening Institute, St. Andrew's School,

Longfield's Road, Thorpe St. Andrew, on Tuesday evenings for Morse and Wednesday evenings for R.A.E. theory. Apply to: P. J. Gowan, G3IOR, at the Institute, or *QTHR*.

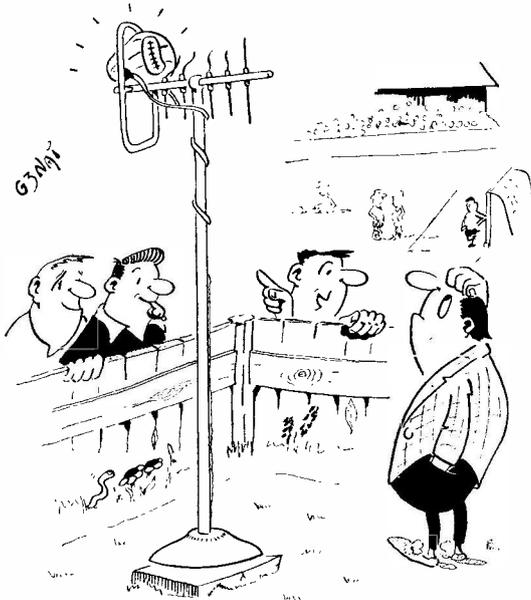
Plymouth: At the College of Technology, starting on September 17, enrolment any evening 6.0-8.0 p.m. during the previous week. The course instructor will be G3HSP. Further details from: R. Hooper, G3SCW, 2 Chestnut Road, Peverell, Plymouth.

Sheffield: At the Western Road Evening School, Sheffield, 10; starting date and period to be fixed. Apply: J. Bell, G3JON, 25 Edale Road, Sheffield, 11 (Tel. 61281) for details.

Stockport: At the Avondale Evening Institute, commencing September 10. Apply immediately to: R. Phillips, G3FYE, 6 Ross Avenue, Davenport, Stockport.

Stoke-on-Trent: At the North Staffs. College of Technology, College Road, Stoke, starting on Monday evening, September 21, 6.30-9.0 p.m., under G3EHM as instructor. Details from: K. H. Parkes, G3EHM, 28 Grove Road, Heron Cross, Stoke-on-Trent.

As normally all courses start when the winter educational session opens during September, there will be no point in our listing any further centres of instruction—though we shall be glad to give details for any actually commencing after about October 12.



“... Please can we have our ball back ...”



A new wide-range Sine-Square Generator, offered by KLB Electric, Ltd., and available in kit form. It covers 7 c.p.s. to 750 kc for sine, and 7 c.p.s. to 300 kc for square waves. The waveform characteristic is extremely good, and the output on sine is 0-10 volts across 600 ohms, the square wave output being 20v. peak-to-peak on no-load. The outputs have coarse and fine adjustment and the instrument is designated as the PACO G.34.

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SHORT WAVE (HULL) G5GX

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NATIONAL NC105.	550 kcs. to 30 mcs. bandsread	44	0	0
EDDYSTONE 670.	Marine	17	10	0
EDDYSTONE 740.	550 kcs. to 30 mcs.	25	0	0
HALLICRAFTERS S.108.	550 kcs to 32 mcs. Amateur bandsread.	45	0	0
HALLICRAFTERS SX140.	80 to 10 amateur bands.	30	0	0
BRT 400.	150 kcs. to 33 mcs. Immaculate condition	80	0	0

Second-hand Transmitters		£	s.	d.
MINIMITTER 2-7 TX.	Little used. 24 watts...	25	0	0

New Equipment		£	s.	d.
NATIONAL NCX3.	SSB transceiver, 80, 40, 20—200 watts	148	8	4
NATIONAL NCX/A.	AC Speaker Console P.S.U.	46	7	1
NATIONAL NCX/D.	DC P.S.U.	50	8	11
HALLICRAFTERS SX111.	Amateur bands	120	0	0
EDDYSTONE 870A	...	34	5	8
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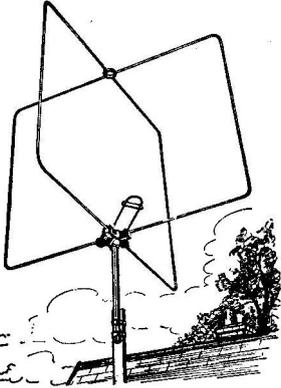
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WANTED: E.M.I. R.A.E. Postal Course, in good condition.—G3JML, 28 Banks Avenue, Golcar, Huddersfield.

SMALL ADVERTISEMENTS, TRADE—continued

WANTED: Most types of second-hand communications receivers, transmitters, etc., especially AR88D, BRT400, 888, 680X. **FOR SALE:** AR88, CR-100, 640, SX-28, DST-100, R.206, HRO, BC-221, R.1155, R.1392, CR-200, etc. Most types of brand new equipment also supplied. Hire Purchase. Generous part exchange allowances.—Write for full details to new address: Brian J. Ayres, 21 Victoria Road, Surbiton, Surrey. (Elmbridge 5164/2833 or Lower Hook 2000.)

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VFO Heathkit VF-1U, Geloso Converter, coax TR switch; wanted by Spencer, G3TEZ, 29 High Petergate, York.

FOR SALE: Eddystone 888A including mounting blocks, immaculate condition, nearly new, £90.—Bagby, 129 Enfield Road, Hunt End, Redditch, Worcs.

R.206, 10-60 mc, old but working, wood case, £5. OS1 'scope, nearly new, mumetal screen, perfect, £20. RF-27, needs attention, 10s. Quantity good components, cheap to club or school who can collect. Carriage extra all.—Haylock, G3ADZ QTHR, or Havant 5861 after 8 p.m.

HEATHKIT Mohican, 9 months old, little used, good condition, buyer arranges carriage, £35 o.n.o. G3HSC Morse record, virtually unplayed, 30s.—Davis, G3TDL, 91 Harbury Road, Dorridge, Solihull, Warwicks. (Tel. Knowle 2413.)

K.W. Match 50-ohm, new, £4. Pair 805's, new, £1. Heathkit RF signal generator, £9 10s. FL8A Filter, 10s. Commercial LS intercom. unit, mains operated, write further details, £7 10s. All carriage extra. **WANTED:** Burnell Model S-15000 50 kc SSB Filter.—Airey, G3GEJ, 14 Brandles Road, Letchworth, Herts.

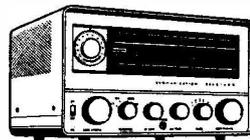
SALE: TCS-13 Tx with Mains PSU, screened cable, S modified for two extra bands, £7 10s. Buyer collects or carriage extra.—Yallop, G3SVQ, 10 Farley Hill, Luton. (Phone 22977.)

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WANTED: R.209 and R.216 Reception Sets and Manuals. Must be excellent. Also Pierson Mobile and TR10 9R59.—Box No. 3069, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

FOR SALE: Eddystone 680, £50.—Havers, Pine-ridge Farm, Wokingham, Surrey. (Tel. Crowthorne 2050.)

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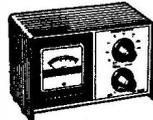
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500µA	25/-	50mA	22/6	1A	DC 22/6	150v DC	22/6	150v AC	22/6
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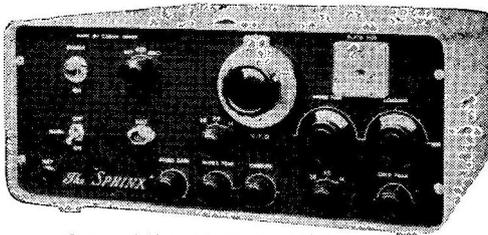
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SALE: Two-metre Halos, made of alloy, price 25s. 6d. including postage. Please state approximate crystal frequency for accurate alignment.—Cochrane, G3RVC, 81 Martyn Avenue, Sutton-in-Ashfield, Notts.

WANTED: ARRL Handbook, 1962 and 1963 Editions, please state price to: Danske Boghandlers, Bogimport A/S, Esplanaden 6C, Copenhagen K, Denmark.

SALE: HRO, all coils, PSU, speaker, £17 o.n.o.? Heath Q-multiplier, £4 10s. Miniature 160-metre Tx (August 1962 *Short Wave Magazine*), £6. 144 mc CW Tx, £8. Xtal Calibrator Type 10, 30s. Carriage extra or collect.—Marshall, G3RKH, 11 Rosyl Avenue, Holcombe, Dawlish, Devon.

SALE: Collins TCS Rx, good condition, £5 o.n.o.? Carriage extra.—Bensley, G3PTZ, 25 Wimborn Avenue, Grimsby, Lincs.

FOR SALE: R.107, £8; Command Receiver, £3; RF24, 25s.; *Short Wave Magazines*, May 1959-February 1964, 1s. 6d. per copy plus p. & p. *Practical Wireless*, May 1957-February 1964, offers?—Day, 21 Drovers Way, Dunstable, Beds.

WANTED: The matching power supply unit for VHF Receiver R.216.—G. McGinley, 43 Lake-side, Taunton Road, Bridgwater, Somerset.

SALE: TR1986 Transceiver, all cables, plugs and control unit; requires slight attention, £5 or exchange for R.109 or R.1132.—Lloyd, 15 Fieldway, Hoole, Chester.

WANTED: Good portable 'scope, Heathkit, Serviscope, etc.; will examine, collect 50 miles London.—Box No. 3070, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

REPLIES Box 3037, July: Advertiser regrets that due to large number of offers and enquiries received and confusion caused by postal delays during July, it has not been possible to answer every letter. Except for negotiations in hand as at August 10th, all major items have now been sold.

SALE: HQ170 Hammarlund Receiver, unmarked, £80. Two G3HSC Morse records, beginners and advanced, £2 pair.—Box No. 3071, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

KW-77, as brand new and used few hours only, bargain at £75 for cash-and-carry sale.—Telephone Newcastle 662490, or write G5LH, Thompson, 12 Lyndhurst Road, Benton, Newcastle-on-Tyne 12.

FOR SALE: R.1155B, requires new IF coil and wiring repair due to removal D/F components, otherwise working. Also speaker/power pack for above, all working, £6 (worth this for components).—Whitehead, 91 Blackpool Road, Ansdell, Lytham, Lancs.

MINIMITTER Mobile Tx and PSU for 160, 80 and 40 metres, mint condition, £20 o.n.o.? Carriage paid.—G13PLL, Phone Limavady 2158.

HEATHKIT SB-10U single side-band adaptor, latest unused, £30; OS.1 Oscilloscope, mumetal screen, ditto, £12 10s. Both perfect.—G2BD, 19 Alford Road, Purbrook, Portsmouth.

FOR SALE: Halson mobile whip antenna with coils for 80 and 20 metres, little used, £5.—McKaig, 52 Beverley Gardens, Bangor, Co. Down, N.I.

SMALL ADVERTISEMENTS, READERS—continued

VANGUARD 160-10 metres, £35.—Worthington, 43 Mount Road, Penn, Wolverhampton.

URGENTLY REQUIRED, October 1961 CQ. your price paid.—M. Whelan, 44 Synge Street, South Circular Road, Dublin 8, Eire.

SALE: K.W. Vanguard Tx, FB performance and condition, £35.—Box No. 3072, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SALE: 150w. Tx, amateur built, 20-15-10 metres, SCW/Phone, 813 final, offers?—Box No. 3072, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

WANTED: SSB Tx and Rx, such as Hallcrafters, Collins or similar, also Vanguard. Cash.—Box No. 3073, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

WANTED: 20 and 80 metre bandsread coils for HRO.—Fabricant, 5 Benscliffe Drive, Loughborough, Leics. or Phone Loughborough 5118 after 6 p.m.

FOR SALE: Viceroy Mk. III Transmitter with PSU and $\frac{1}{2}$ -lattice filter, brand new, never been used. Also BC-221 meter and AVO No. 7 meter.—Edgar, 46 Merry Street, Motherwell, Scotland.

FOR SALE: Labgear Topbander, £15; Labgear LG.50 with Labgear LP Filter, £25. K.W. Geloso converter, £15. HRO-5T power pack, spare valves, 8 coils, 40m. BS, £20. All FB condition. Buyers collect.—G3NNS, 48 Abbotsford Gardens, Woodford Green, Essex. (Buckhurst 0306 evenings.)

G4ZU (Minimitter) Tri-Band Beam complete with CDR Rotator AR.22 and desk indicator; both nearly new. Neighbour trouble. Dismantled for transit. Exchange for complete Mobile Station, commercial for preference, must be good. Buyer to collect.—Phone evenings Wokingham 2698. Lewis, West Winds, Arbor Lane, Winnersh, Berks.

888A, AR77E, R.109T, R.220, T.W. 2-metre Converter, T.W. 4-metre Converter, A.R.M.S. "Courier" 20-metre SSB Transceiver, 2m. Tx, 4m. Tx, 25w. Modulator, AVO Res/Cap. Bridge, mains packs, 12v. rotary PSU, 6 and 12v. Vib. packs. Selling up station; s.a.e. details. Surrey.—Box No. 3074, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

DX-40U Transmitter kit, 50 per cent assembled, complete with all components, plans and handbook, £17—or EXCHANGE for good HRO.—Box No. 3075, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SALE: Hammarlund HQ-180 in unmarked and perfect working condition, £110 o.n.o.?—Box No. 3076, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

WANTED: 23 cm. Tripler or Converter or parts, also aerial.—G3SGS, Rope Cottage, Pepperdon, Moretonhampstead, Newton Abbot, Devon.

WANTED: Labgear coax aerial switching unit.—Box No. 3077, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

EXCHANGE: 8mm. Ciné-Projector, battery-operated, and 50ft. film and batteries (as-new value £6), for R.220 VHF Rx, unmodified (i.e. 60-100 mc), must be 100 per cent OK.—D. Watts, 52 Edgell Road, Staines, Middx.



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SMALL ADVERTISEMENTS, READERS—continued

BRAND-NEW Eddystone EC-10, 4 months' old. Mint TCS-12 Rx with separate power pack/speaker unit. Top Band Tx. New 78A coax relay. R.114 converter. Valves, components, s.a.e. list. Offers to—Woodward, G3GYR, 77 Sandbach Road, Rode Heath, Stoke-on-Trent, Staffs.

SALE: A complete Mobile Station. DX-40U with high-level plate modulation; with single-switch control, silver and blue front, external 30-watt modulator with pair of KT77's and also the VF-1U VFO. All done by Tiger's Ltd., never been used, factory-built. Also RA-1 Receiver, 10-160 metres with Q-Multiplier, crystal calibrator and speaker. Will exchange for radio servicing instruments or take the best cash offer.—James Ash, 9 Craigpark Street, Faifley, Clydebank, Scotland.

SALE: R.107 with S-meter, excellent condition, £13. BC-342N with separate power pack, £10. Will deliver 30 miles Epsom. Assorted transformers, chokes, crystals, etc., s.a.e. for list.—G. J. Knights, Ashar, Cross Road, Tadworth, Surrey. (Tadworth 3247 after 7 p.m.)

MARCONI ELECTRA with PSU, £65. Also Marconi CR-100/8, fitted 6SG7 RF stages and S-meter, £25. Both Rx's in pristine condition and with manuals. Buyer collects, no offers.—Monkhouse, Pinner 9124.

WANTED: K.W. "Valiant" Tx, with or without PSU.—A. Taylor, 24 Emroch Street, Goytre, Port Talbot, Glam., South Wales.

SALE: Little used G2YH (Tiger) 5-crystal QRO 2-metre Tx, £50; listed £84. Little used G2YH 28 mc IF "Nuvistor" 2-metre converter, £10; listed £16. G2YH overhauled, good AR88LF, £30. Buyers test, collect.—G2NS, 31 Cranleigh Gardens, Bournemouth.

RADIOVISION "Commander," new valves, BS approximately 10in. scale, case, S-meter, perfect, manual, £15, all amateur bands. Eddystone 358X, S-meter, crystal, PSU, 10 coils, case, manual, perfect, £12 10s. Buyer collects.—Box No. 3078, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

WANTED: 80-10 metre AM/CW QRO Tx, good quality, efficient, TVI precautions and reasonable price essential. All replies answered, postage refunded.—Box No. 3079, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

HRO-60, 10 coils, plug-in calibrator, plug-in product detector, with crystal osc., in very good condition, £110 o.n.o.? WG-44 TV pattern gen., £20. 92-A TV Sweep osc., £10. 31-A 'Scope, £18. TF144G, £15. QST, R.S.G.B. *Bulletins*, etc., s.a.e. details. Radiovision "Commander" manual, 15s. Various new spares for AR88D; HRO tuning condenser, new, £1 5s.—Burns, Mews Lane, Kirkcudbright, Scotland.

WANTED: Mosley TA-33 Jr. compact mobile transceiver, reasonable. SALE/EXCHANGE: AR88LF working; needs alignment, £25.—Box No. 3080, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

HALLICRAFTERS SX-24, has RF, two IF, noise-limiter, crystal variable selectivity, frequency and S-meters, coverage 540 kc to 43.5 mc, with speaker, AC 230v., good condition, £15. Surplus new 32ft. mast aerial ZA/29961, see p.208 June *Short Wave Magazine*, complete, £2 10s.—Wilcock, 19 Cavendish Avenue, Cambridge.

SMALL ADVERTISEMENTS, READERS—continued

COLLINS 30L-1 Linear Amplifier, £175. Heathkit **CHO-10** Monitor 'Scope, £30. Hammarlund **HK1-B** Electronic Keyer, £12. G. & D. Falcon 144 mc Transmitter, 230v. and 12v. PSU, mike and set spare valves, £40. Mark IV converter, £11. Jennings Vacuum Variable Capacitor, 5-100 $\mu\mu\text{F}$ with dial, £10. Sundry books, valves, components.—Wake, GSRP, Old Gaol House, Abingdon, Berks.

EXCHANGE: 2-QQV06/40A, brand new in original Mullard boxes, with guarantee. **WANTED:** UM2 and SCR-522 mod. trans., or £5 cash.—Box No. 3081, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SALE: B.28 and BC-342, HRO coils B/S (4) and G/C (2). Prefer buyer(s) collect Rx's. Write or call—Walder, 10 Whyke Road, Chichester, Sussex.

WANTED: K.W. Vanguard, works assembled, 160-10 metres, preferably Mark II (new styling). Particulars—GW3LSB, Holcombe, Vicarage Avenue, Llandudno, Caerns.

FOR SALE: Hallicrafters Super Skyrider communications receiver, complete with matching speaker, manual and various spares, £17.—S. Gregory, 38 Gaer Park Drive, Newport, Mon.

RF26B, brand new, 30s.; Command Set 1.5-3 mc, new and boxed, £9; Pye "Reporter," high band, new, unmodified, with manual, £8 10s. Collins TCS-14 Rx, brand new and mint, fitted with manufacturer's noise limiter, £9 10s. Carriage extra all items. **WANTED:** CT-53 Signal Generator, complete with calibration charts; R.216 Rx with or without PSU; also CDR Rotator, all must be in new condition.—Box No. 3082, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SALE: AR88D, S-meter, manual, £35. HRO, 9 coils, PSU, £15. Both excellent condition. Geloso converter, new, £12. Oscilloscope, 3in. tube, little used, £10.—Carver, 13 Southborne Road, Folkestone, Kent.

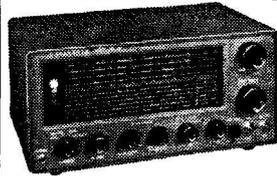
EXCHANGE: AR88D in first-class condition, as new, for amateur-bands-only receiver.—G3LNG, 35 Sunlight Street, Liverpool 6, Lancs.

SALE: Minimitter Tx 150w., excellent condition, with Minimitter low-pass filter, Ronette B.110 crystal mike, Eddystone bug key and spare valves, £40, carriage paid. Minimitter MR-37 Rx, needs little attention, spare valves, £10, carriage paid. Owner going SSB Overseas.—Flt.Lt. Pain, Flat 2, Alexandra House, Beadnell, nr. Chathill, Northumbs.

SALE: Hallicrafters SX-140 Receiver, 80-10 metres, £30 o.n.o.? HT-40 Transmitter, 80-10 metres, £30 o.n.o.? Both together complete with auto-transformer, £60 o.n.o.? Semi-automatic key, as new, £3 10s.—T. Ford, 23 Hill Close, Ballykelly, Limavady, Co. Derry, N. Ireland.

HALLICRAFTERS SX-100 Mk. II. General coverage and amateur bands bandspread, xtal controlled second conversion oscillator, temperature compensated first, very stable, selectable sidebands, notch filter, 100 kc calibrator, in new condition, with handbook. Hallicrafters HT-37 144w. plate input (p.e.p. two-tone), five-band output 80-10 metres, CW, AM or SSB; precision VFO, full VOX, excellent CW keying, little used, with handbook. Best offer over £80 for either, will deliver up to 100 miles.—Thompson, G3EFD, Hillcrest, Leazes Lane, Hexham, Northumberland.

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SMALL ADVERTISEMENTS, READERS—continued

EXCHANGE: 605A 8mm. Cine Camera, with normal and telephoto lenses, or "Aldisette 3" fan cooled, 300w. 35mm. slide projector, both as new, for R.206 Mk. II and PSU in good working order; or either item plus £15 for R.216 and PSU.—Box No. 3083, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

FOR SALE: AR88D aligned for amateur bands, manual, freight paid U.K., £33.—Fournier, 15 Hill Close, Ballykelly, Co. Derry, N. Ireland.

WANTED: RTTY Receiver Adaptor Field C.F.S. ZA 39384. Also supply unit DC/AC No. 3, ZA 39385 and connectors.—Lt. M. G. Taylor, H.Q. Mess, Dorset House, BFPO 45.

FOR SALE: AR88LF, S-meter, speaker, £27. LM-14 spot on, £14. American 'scope, £5. Jason Audio-Oscillator, £6. RTTY, two FSR1/1, less relay, £4 each. One FSR1/1 complete, £6. Two FSR1 2B power supplies, £5 each. One matching AFC/BFO unit FSR4/1, £6. Cossor 339 'scope, C-core EHT, £7 10s. E.M.I. WM3 'scope, £15. Marconi TF-144, £15. TF-410 Video Oscillator, £5. TF-340 output meter, £3. All above prices o.n.o.? Cash-and-carry basis only, West London.—Box No. 3084, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

EDDYSTONE 888A Receiver, 1962 model, new condition, little used, complete with matching speaker, S-meter, mounting blocks, all in good condition. Exchange for best general coverage receiver offered.—M. Gallet, 36 Ashlone Road, London, S.W.15.

WANTED: AR88D in good condition, full details —any mods.? Possible collection; Plymouth.—Box No. 3085, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

WANTED: Panda ATU and Woden DTI transformer. All letters answered.—Sharratt, 12 Pebblemoor, Edlesborough, Dunstable, Beds. (Tel. Eaton Bray 297.)

WANTED: Labgear PSU/Modulator unit for LG.300 transmitter, also bandspread coils for HRO.—Littles, 45 Rupert Street, Reading, Berks.

COLLINS 51J-4 Receiver with 1.4, 3.1 and 6 kc mechanical filters, price £450 (list £760). Genuine enquiries—Box No. 3086, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

A R88D with S-meter and manual, recently purchased brand-new (now have 75A-4), £60. Marconi CR-150 with manual, £22. Creed 7B page printer, £15. Siemens Tape Printer with governed 230v. AC motor, £9. Signal Generators I-222-A, 8-15 and 150-230 mc, £4. Cossor type 52, 6-52 mc, £5. Wavemeter W.1310, 160-220 mc, £2. W.11 Audio Teletype Converter, £3. CFS IF type teletype converter, £5. 7B Teleprinter power unit, £2 15s. **SPECIAL ITEMS.** R.390A IF strip, two crystals and four mechanical filters, with new temperature controlled permeability tuned VFO, £75. Commercial 100 kc Sideband filter unit, crystal controlled input at 455 kc, in handsome table-top cabinet, with a total of 37 sealed crystals, £75, or £125 the two units, including Sideband amplifiers, detectors, etc. Collins 250 kc by 3.1 kc wide special Sideband filter, new, £12. Collins 500 kc by 6 kc wide mechanical filter, new, £12. Very large audio amplifier, 30w., every possible refinement, £20. **WANTED:** Hallicrafters R-48 or similar speaker.—A. Fletcher, 62 Moorbridge Lane, Stapleford, Notts. (Tel. Sandiacre 3446.)

SMALL ADVERTISEMENTS, READERS—continued

HEATHKIT RG-1 general coverage communications Receiver, as new, handbook, good performance, factory checked, £29 10s.—Edwards, 244 Ballards Lane, London, N.12. (Hillside 4321.)

FOR SALE: KW-77 Rx, as new, speaker, £90; Eddystone 870A, new, £20; Labgear Topbander, £15; Tx Top Band SSB, xtal phasing, £20; Wurzel Valve Voltmeter and diode probe, £8. Wavemeter R.502 and coils, £7; Elizabethan Tape Recorder, £12; 19 Sets, complete power pack, £2 10s.—A. Thomson, G3ORT, Sunnyholme, Fairview Road, Basildon, Essex.

WANTED: AR88D or Eddystone 840C Receiver. State full details and price. **F**OR SALE: MCR1 Receiver, £6 10s.—Box No. 3087, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SALE: Eddystone 870A, 14 months old, mint condition; has jack plug for phones/tape, £20 o.n.o.?—Sqn. Ldr. T. H. Sheppard, R.A.F. South Cerney, Cirencester, Glos.

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FOR SALE: Complete Station. K.W. Vanguard (160 metres)) as new, £45; AR88D, £28; Green & Davis 2-metre converter, £7. Will deliver London and S.E.—Box No. 3088, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

WANTED: CDR AR22 (240v. AC) rotor and control unit.—Davidson, 49 Honeycroft Hill, Uxbridge, Middx.

SALE: R.107, mint inside, excellent outside, PVC wired, only mod. S-meter, £13. T/P PSU 14/LU24/A including 80 + 80 volts, £5 10s. R.208 needing attention, £3. Mains Fonadek telephone amplifier, £5. All carriage paid.—Box No. 3089, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

FOR SALE: Geloso R.209 Amateur Bands Rx, converted for Top Band, first class condition, £45. Buyer collects.—Write: A. Picton, 9 Farm Cottages, Battlers Green, Radlett, Herts.

SALE: 36 Set, complete, good condition, £12 o.n.o.? Buyer collects.—Secretary (Radio Society), c/o Training Office, G.E.C. Telephone Works, Stoke, Coventry.

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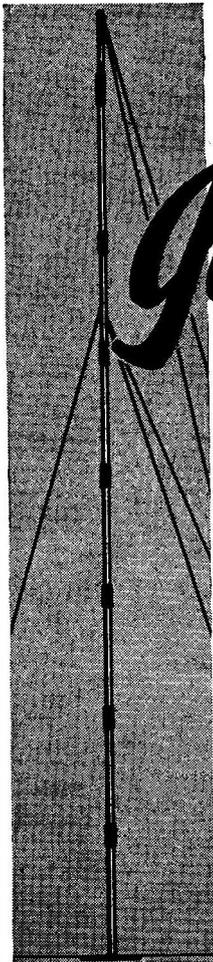
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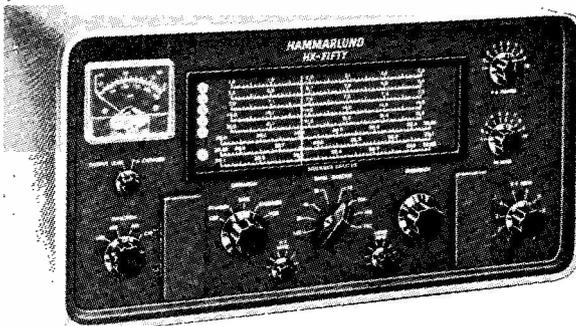
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