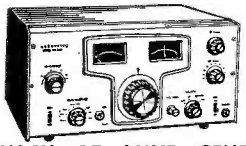
3/6

The SHORT WAVE Magazine

VOL. XXIII FEBRUARY, 1966 NUMBER 12

SUPERB LAFAYETTE AMATEUR EQUIPMENT



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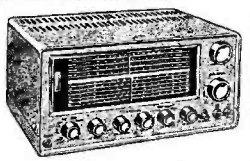

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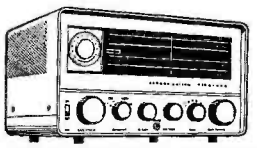

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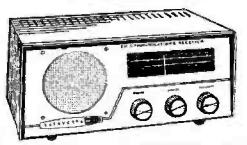

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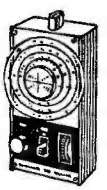

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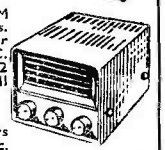

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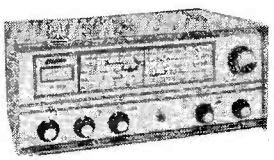

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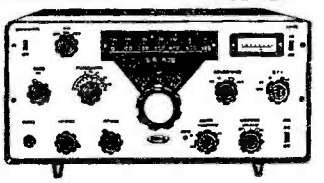
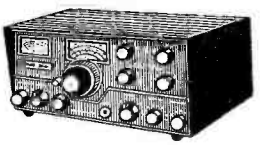


SWAN-350 10-80 METRE Amateur Transceiver



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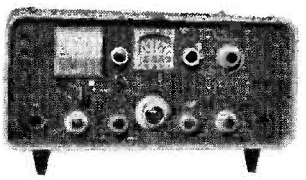

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200μA	27/6	5mA	22/6	500mA	22/6	20v DC	22/6	15v AC	22/6
500μA	25/–	10mA	22/6	750mA	22/6	50v DC	22/6	50v AC	22/6
50-0-50μA	29/6	20mA	22/6	1A DC	22/6	100v DC	22/6	150v AC	22/6
100-0-100μA	27/6	50mA	22/6	2A DC	22/6	150v DC	22/6	300v AC	22/6
500-0-500μA	22/6	100mA	22/6	5A DC	22/6	300v DC	22/6	500v AC	22/6
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INDEX TO ADVERTISERS

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CONTENTS

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E. & O. E.

FOR THE RADIO AMATEUR AND AMATEUR RADIO

The SHORT-WAVE Magazine

EDITORIAL

Attack *The subject touched upon in this space last month was first raised and ventilated in general terms nearly three years ago, in the editorial series entitled "Political" (August 1963), "Consequences" (September) and "Foreseen" (October), certain conclusions being drawn under the heading of "Remedy" in the November 1963* SHORT WAVE MAGAZINE.

Since then, nothing has happened to change the picture very much—except that more and more thinking amateurs have come to see where the real difficulties facing Amateur Radio lie, and we have found ourselves subjected increasingly to the influences and policies of pseudo-States and bogus democracies.

While on the world scene Amateur Radio is of comparatively small consequence in the ocean of affairs, nevertheless it is an increasingly important minority interest with a long record of service and achievement. It was already an international force when even the League of Nations had scarcely taken shape, let alone the United Nations, under which the I.T.U. functions as the arbiter of all matters touching the international organisation and control of telecommunications.

The present situation is that no matter how strong or well-directed what might be called the "frontal organisation" of Amateur Radio may be at the I.T.U. conference tables, it is still necessary for the amateur interest to be prepared to scheme and intrigue in every way possible to maintain the status and rights of the radio amateur—not so much in face of the enlightened and the civilised, but against, in particular, the emergents, who (to be fair) are largely uninformed as to what it is all about. It is also fair to say that some of the newly-independent states have maintained a tolerant and entirely proper attitude towards radio amateurs already licensed in their territories.

However, the fact remains that an attack must be made on the elements of ignorance, and they must be shown how a concept like Amateur Radio can even help their own technological development and advancement. This is, admittedly, a very difficult idea to get across to, say, the Minister for Posts & Telegraphs in the Republican Government of Ngomboland—with, of course, a full vote at any I.T.U. decision-making conference.

Fortunately for us all, there are small but influential groups bent on doing just that—and with the resources to make their influence felt where it will do most good. The point is that this has very little to do with "putting up a united front at Geneva."

Austin Forsyth, G6FO.

WORLD-WIDE COMMUNICATION

MINIATURE TOP BAND TRANSMITTER

STRAIGHT FOUR-VALVE DESIGN FOR FIXED, MOBILE OR PORTABLE WORKING

B. HAYES (G3JBU)

THE transmitter described here was originally built in a 6-volt heater version for /M operation. After trying various types of tunable oscillator/buffer/PA arrangement and being unable to get one that was really stable (as regards frequency shift whilst on the move) it was decided that a crystal oscillator/PA circuit was the only answer. The trouble with the tunable oscillator/PA was that however "loose" the coupling between stages, the vibration of the whip when the car was in motion still had a tendency to shift the frequency. When a new car was purchased, it was decided to "miniaturise" wherever feasible and, of course, change to 12-volt operation, but still use as many of the original components as possible.

In the 6-volt version the valves were 6SN7 VFO buffer into a 5763 PA, and to make the transmitter even smaller, thoughts were turned to valves in the B9A range. It should be pointed out that should one wish to use this transmitter with 6-volt input—as in the case of some Continental cars—it is just a matter of rewiring the valve heaters in parallel. In the LT circuit on p.716, you will see that the heater leads are insulated from chassis so that either the positive or negative lead of the battery can be earthed, as some of the newer cars are now using *negative* earthing. It was also designed so that during the winter months it could be "unplugged" from the car and operated with an associated mains power pack by the fireside for local 160m. nattering. Due to its smallness it will stand on the parcel tray of the average family saloon, or can be fitted in the glove compartment.

The transmitter is used in conjunction with a Top Band Command Receiver and the switching is so arranged. But this is to be replaced very soon by a crystal controlled converter using the car BC Rx as a tunable IF/AF amplifier, which in most cases is either transistor or transistorised and so economical in heater current consumption.

Circuit Description

Referring to the block diagram Fig. 1, it will be seen that the transmitter follows the usual pattern. Fig. 2 is the circuit with V1 (12AU7), one half of the double triode operating as the crystal oscillator. This is coupled to the second half, acting as a buffer, effectively isolating the crystal oscillator from V2, the EL84 PA valve. Trimmer C6 on the anode of V1A is tuned to peak the centre frequency of the four crystals chosen. It was found that the circuit would oscillate quite satisfactorily without this trimmer, but in the case of 10X crystals it does ensure that they oscillate reliably should they be a little sluggish. Other types of CO circuits were tried —such as the Colpitts, using two fixed capacitors across the crystal, which was connected from the grid of V1A to ground. But although this was quite satisfactory, the circuit shown with the crystal connected between grid and anode of V1A through the 330 $\mu\mu$F capacitor C2 was used.

As the transmitter was also to be operated from the shack with a mains power supply, it was found desirable to include a provision for CW working, so a key jack was fitted. A separate toggle switch shorts out the primary winding of the modulation transformer, and at the same time disconnects the HT supply to the modulator. Various methods of keying the transmitter were tried, and the one that gave the cleanest note was breaking the cathode of the oscillator V1A. No stabilisation of the HT supply to the oscillator was found necessary.

As most of the mobile operation seems to be in the 1900-1930 kc region of Top Band, a search for crystals in this range was made, so that one could switch to another frequency to avoid QRM. Some large 3-pin 160m. crystals were found in one of the London surplus stores, and these were fitted into 10X 2-pin cases which plugged into a socket on the front panel of the transmitter. However, this did make the Transmitter rather ugly looking and in the present version they are mounted inside the case with just a four-position switch on the front panel.

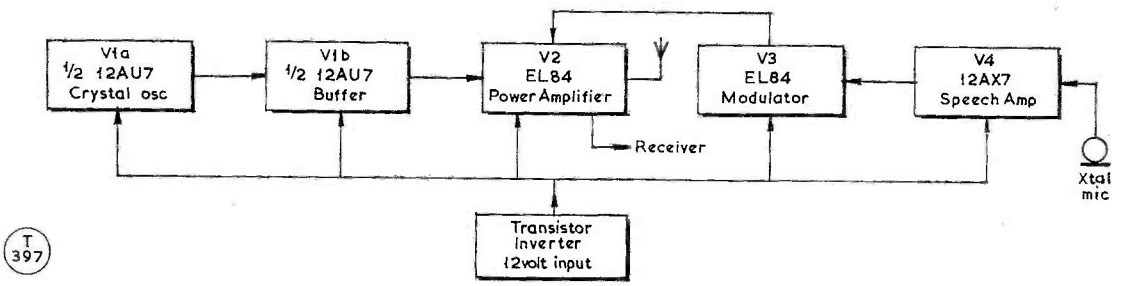


Fig. 1. Block diagram of the complete 160-metre transmitter and modulator, as described by G3JBU. It is a perfectly straightforward arrangement (and therefore sure-fire), and the crystal oscillator driver can be switched to give a choice of several spot frequencies in the Top Band area.

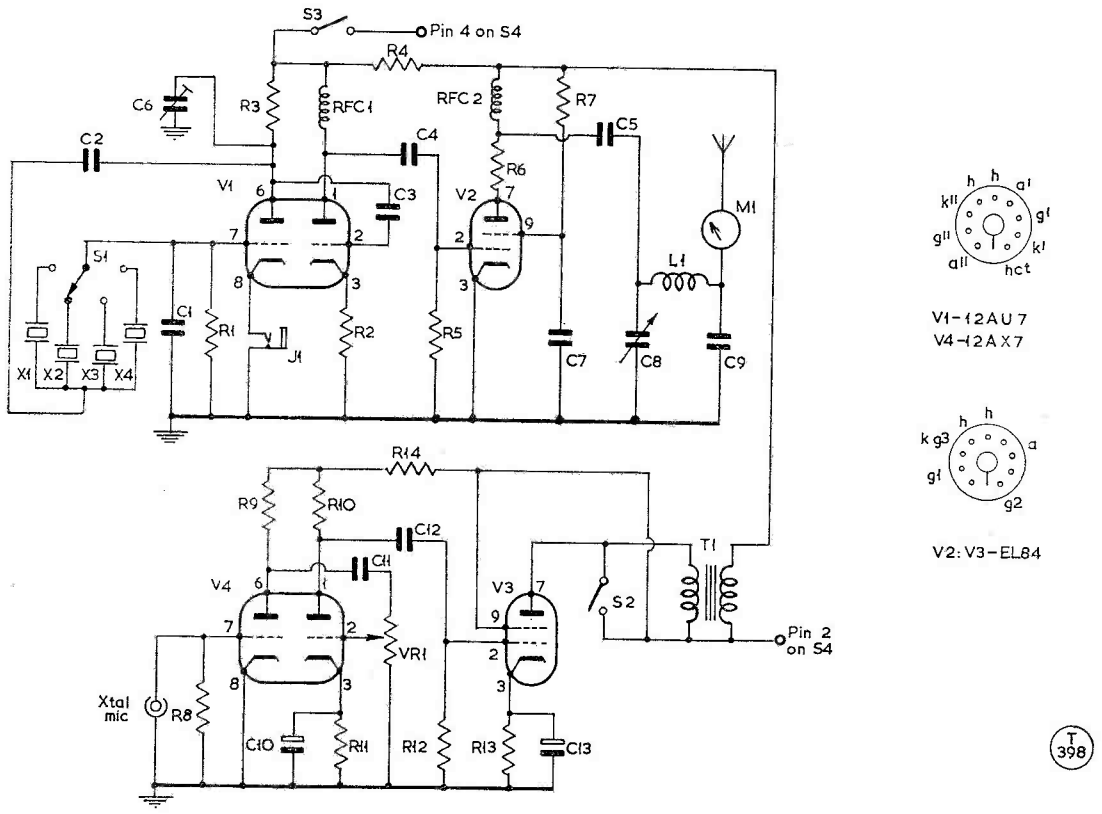


Fig. 2. Circuit complete of the G3JBU 160-metre transmitter and modulator, suitable for use either in the shack, or out portable or mobile. The PA takes an EL84, an efficient valve giving the maximum RF for ten watts DC input, and is modulated by another EL84. The transmitter can be run from a 250-volt HT line, obtained either from the mains (for fixed-station operation) or from a 12-volt DC/DC inverter for portable working. In this circuit, the left-hand side of V1 is V1A, and the right-hand V1B. Inter-connection is shown in the separate sketch on p.716.

If these crystals cannot be obtained today, then the modern style D fitted into FT-243 holders can be used and these have, in fact, been incorporated in another version of the transmitter. These crystals can be purchased from most of the usual crystal manufacturers at a reasonable price, and one can be assured of frequency stability and readiness to oscillate in this type of circuit. The choice of spot frequencies is, of course, left to the individual when buying new crystals.

The PA stage is V2, EL84, although in the original 6-volt version a 5763 was used, but, so as to equalise heater current (which, incidentally saved juggling with low-value resistors) an EL84 was chosen. As can be seen from the heater circuit diagram, it was connected in series with V3 modulator valve. The PA stage is coupled to V1B by means of a 100 $\mu\mu$F capacitor C4 and the value of the bias resistor R5 was chosen to allow up to 100 per cent modulation, which is possible with the high gain modulator circuit. The output tuned circuit comprising L1, C8, C9 is a *pi*-network which matches

Table of Values

Fig. 2. Circuit of the Transmitter and Modulator

C1 = 17 $\mu\mu$F, s/m
C2 = 330 $\mu\mu$F, s/m
C3 = 47 $\mu\mu$F, s/m
C4 = 100 $\mu\mu$F, s/m
C5 = ·001 μF, mica, 1000v. wkng. (*see text*)
C6 = 75 $\mu\mu$F comp. trimmer
C7 = ·001 μF, mica
C8 = 120 $\mu\mu$F, var.
C9 = 300 $\mu\mu$F, fixed (*see text*)
C10, C13 = 25 μF, elect.
C11, C12 = ·03 μF, 350v.
R1, R9, R14 = 100,000 ohms
R2 = 150 ohms
R3 = 50,000 ohms
R4, R10 = 220,000 ohms
R5, R7 = 10,000 ohms
R6 = 47 ohms
R8 = 1·2 megohms
R11 = 2,200 ohms
R12 = 500,000 ohms
R13 = 330 ohms
VR1 = 500K potentiometer, gain control
T1 = Mod. xformer, ex-SCR522 (*see text*)
V1 = 12AU7, CO-buffer
V2, V3 = EL84, PA and Mod.
V4 = 12AX7

Notes: Coil L1 is 50 turns 26g. enamelled wire on 1¼in. diam. former. RFC1, RFC2 are 2,5 mH RF chokes. S1, 4-pos. SP wafer; S2, S3, SPST toggle; S4, DPDT toggle, phone-CW. J1, closed cct. jack. X1-X4, 160m. crystals to choice. M, aerial ammeter, 0-350 mA, RF thermo.

the loaded whip fed through 72-ohm cable. Instead of using a variable condenser for C9, as is usual with *pi*-network circuits, a fixed value of 300 $\mu\mu$F was chosen, which, apart from reducing the number of front panel controls, gave the correct loading capacity. However, if the Tx is used on a random length of wire, as when operating portable, the value of this capacitor may have to be experimented with. When used in the shack through the ATU, which is matched to take 72-ohm output from a K.W. Vanguard, the value used is correct.

The capacitor C5 used to isolate the *pi*-network from the HT supply must be of good quality and rated at least 1000v. working. At this particular point, *do not* use an ex-Government item because should this break down, the 250 volts is sufficient to give one quite a nasty shock !—apart from blowing the fuse in the transistor power supply.

It is possible to use link coupling on the tank circuit, in which case C9 will not be required. This was tried, but was abandoned in favour of a *pi*-network. To link couple, about four turns was wound on the earthy end of L1. Instead of the usual anode current meter, a 350 mA thermo-ammeter was fitted in the aerial output. The method of tuning is to adjust C8 for maximum current in the load. The 350 mA meter was found sufficient to read aerial current into a 70-ohm load, but if coupled to a random length of wire, it may be necessary to shunt the meter, depending on whether it comes at a voltage or current point.

Modulator Section

The modulator comprises V3 and V4, and gives ample power fully to modulate the PA. The circuit was based on the popular *Mullard* "3-3" circuit without the refinements of tone controls and so forth which, of course, are not required in a modulator. The values of coupling condensers were chosen so as to limit the frequency response in the upper spectrum. It was found desirable to cut the upper back to about 3000 to 4000 cycles, so as to make the bandwidth as narrow as possible. After all, one is not concerned with quality on a mobile transmitter —the main concern is maximum intelligibility. A crystal microphone was chosen as this gives a good output, and fixing it on the sun visor means that the voice pickup is sufficient with the modulation control only advanced about two-thirds of its travel. It was decided at one time to dispense with this control and use a fixed resistor, but after various experiments, the variable control was retained, so that one could vary the amount of modulation if the crystal microphone was used for close talking. The modulation transformer used was one taken from the SCR-522 transmitter/receiver, and its main reason for use was that it was available ! If one cannot get hold of one of these transformers, then a *Woden* UMØ transformer can be used, but this will increase the size of the transmitter. Another suitable one is manufactured by *Ajax Electronics*, and although this is intended for push-pull operation, it can be used quite satisfactorily in single-ended operation. If one wishes to use a carbon microphone, then only one-half of V4 need be used and the polarising voltage can be obtained from the cathode. It must be added however, that this has not been tried with this transmitter.

Power Supply

The HT supply for the transmitter and receiver is obtained from a transistor inverter of commercial manufacture, giving the 250 volts at 100 mA. Switching between transmitter and receiver is by means of a toggle switch on the front panel, thereby omitting the use of any expensive and sometimes unreliable relays.

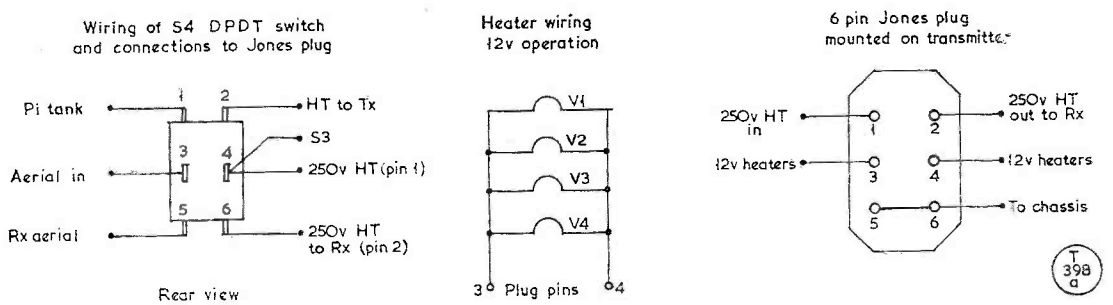
So as to make the transmitter easily removable from the car, a 4 or 5 pin Jones plug (miniature) is used, or if one of these is not available, a B7G valve-holder and plug can be substituted.

A series resistor is inserted in the supply to the receiver so as to limit its HT to 200 volts. Several circuits have appeared in previous issues of the SHORT WAVE MAGAZINE for transistor inverters, and these could be used with this transmitter. They are to be preferred to vibrator packs, which, apart from the size and weight, are grossly inefficient.

An SPST toggle switch is fitted to the front panel, which allows "netting" when the changeover switch is on "receive". The switch applies 150 volts to the crystal oscillator section alone.

Construction

The transmitter was built into a cabinet 8in. long x 4½in. high x 3½in. deep. The chassis used was 1¼in. deep. The layout of the chassis is shown in Fig. 3.



The HT/LT and plug connector wiring for the Mobile transmitter.

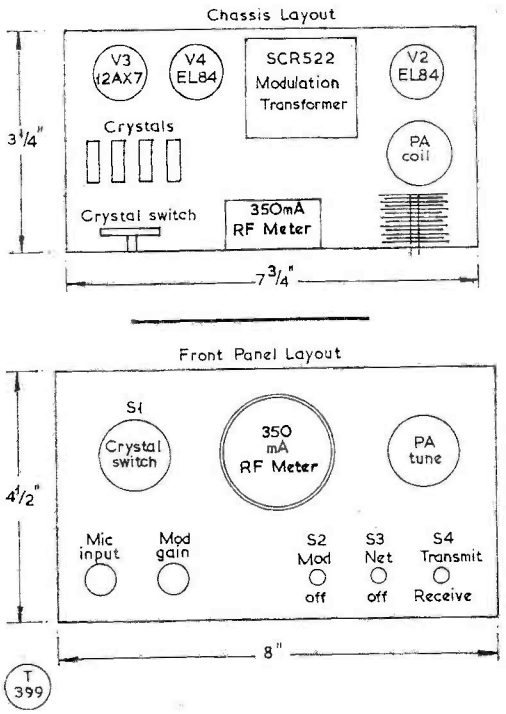


Fig. 3. Suggested panel and chassis layouts for the 160-metre transmitter described by G3JBU. Other arrangements are, of course, possible but with a valve-type Tx, this is as economical of space as any.

The cabinet was built from 16g. aluminium, and in the sides of the cabinet two holes were cut with an octal chassis punch and these were covered with gold anodised expanded metal, fixed with 6 BA bolts and nuts. A 5in. x 2in. hole was also cut in the top of the cabinet and covered with expanded metal. The amount of heat dissipated by the four valves is quite considerable and adequate ventilation must be provided in the small cabinet. The cabinet can either be made up by one of the firms who specialise in this type of work, or constructed at home with the aid of some ½in. aluminium angle, 18g. sheet, and a supply of self-tapping screws. When the transmitter was finished the whole cabinet was sprayed, using one of the popular Aerosol packs made by *Holts*, and as these are produced in over 90 factory matched colours, it should be possible to get one to tone in with your car !

Operation

The transmitter as described has been in constant use over the past twelve months, both during the Mobile season and from the shack in the winter. Good results have been obtained both with the base-loaded whip on the car and the 85ft. end fed aerial for the shack. Once the transmitter has been tuned up, you can switch to any of the four crystal frequencies without retuning.

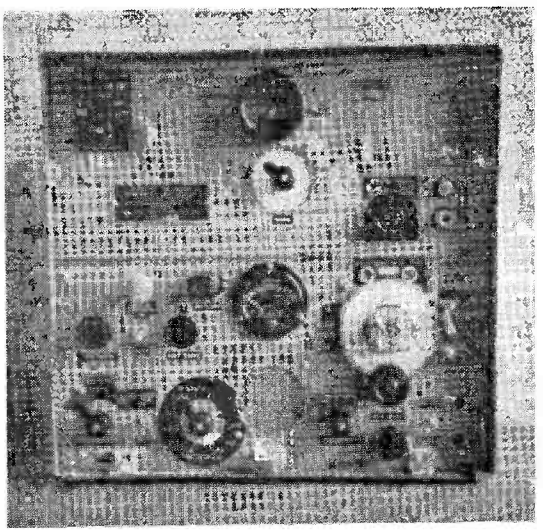
BANDSPREADING THE CANADIAN 52

SIMPLE MODIFICATION TO IMPROVE A GOOD RECEIVER

W. FARRAR, B.Sc. (G3ESP)

THE "Wireless Set Canadian No. 52" receiver has recently been on the surplus market in brand-new condition at a very reasonable price. It is very well built, does not take up too much table space, and its performance it quite impressive. It has, however, one serious fault from the amateur's viewpoint: The tuning is excessively sharp. Even with the 70 : 1 slow-motion drive it is difficult to tune a station, especially on 14 mc where the *whole band* occupies *one-eighth of an inch* on the dial, and one turn of the slow-motion knob covers this.

As delivered, the receiver has three bands: 1·75-4, 3·5-8 and 7-16 mc. A study of the possibilities indicated that some small capacity in series with each tuning capacitor section would restrict the tuning to the HF end of each range, thus spreading the 80, 40 and 20-metre amateur bands. Since the three-gang tuner has identical sections, a small air-spaced trimmer of 64 $\mu\mu$F maximum capacity was wired in the lead from each set of fixed vanes on the main tuner. A little adjustment of these trimmers and the three bands were spread, becoming 3·5-4, 7-8 and 14-16 mc, with a little spare at the edges. With this arrangement, the band 3·5-3·8 mc occupies some 2¼in. of the dial and needs 20 complete rotations of the tuning knob; 7-7·1 mc is spread



General appearance of the Canadian 52 Receiver, now available on the surplus market, which can be modified for band-spreading in the manner described by G3ESP in his article.

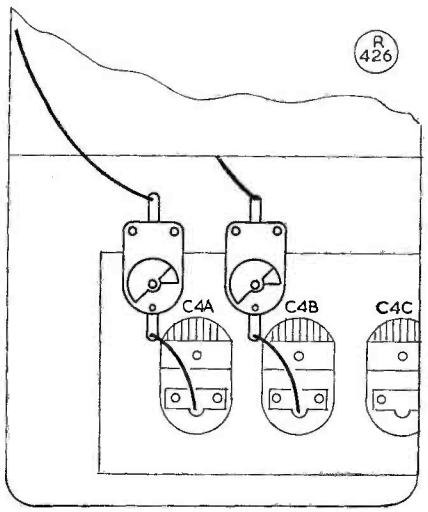


Fig. 1. Side of the 52 Receiver chassis, showing two of the additional trimmers required for bandspreading.

over ½in. of dial, needing six turns of the knob; 14-14·35 mc takes a little over 2in. of dial, needing 17 turns. This is a decided improvement, making tuning much simpler. Since the writer's intention is to use the receiver mainly as a tunable IF on 3·5-4·0 mc, with converters ahead, it was considered that the spread was perfectly satisfactory.

Modification Details

The modification was simply done. If the set is removed from its case, the tuning capacitor will be seen on the lower deck on the right (*see* Figs. 1 and 2). Oval holes in the side of its screening box are labelled C4A, C4B and C4C. A wire with a black p.v.c. sleeve goes from a tag at the bottom of C4A and C4B and out through the top of the box. The wire from C4C is coloured blue, and comes out of the opposite side of the 3-gang unit. The black leads from C4A and C4B are cut where they leave the box. The sleeving is pulled a little from each part and a ¼in. snipped off. The sleeving is then pushed back. A 64 $\mu\mu$F trimmer is soldered in series with each wire. On the other side of the tuner, the blue wire is unsoldered from its tag. (Grip it firmly with fine-nosed pliers or surgical forceps, apply a narrow soldering bit to the tag, and a bit of tugging and wriggling will see the wire out.) This wire is then brought over the top of the screening box, towards the rear. One-and-a-half inches of fresh wire is poked between the side of the gang and the screening box and soldered to the recently vacated tag. A piece of sleeving is then slipped over it. The final trimmer is soldered in between the two wire ends.

It will not do to have the trimmers floating in the wiring, as mechanical stability will suffer, so they are fastened respectively to the sides and rear of the tuning capacitor box using a little impact adhesive *(Evostik)*. This avoids drilling and the possibility of metal chips getting into the inaccessible vanes of the tuning condenser.

Retuning the Set

With the band-switch for the 7-16 mc range, set the tuning dial at "7." Turn on the crystal calibrator to the 1,000 kc position, with the RF and AF gains full up. (Have no aerial connected.) Set all three extra trimmers to full capacity, the CW/RT switch to "CW.MAN.," selectivity to "Sharp," and the noise limiter and CW note filter to "Out." Carefully reduce the capacity of the trimmer connected to C4B (this tunes the receiver local oscillator) until a beat note is heard in the speaker. Switch the calibrator off momentarily to check that you are on its beat. The trimmer will be about three-quarters of full capacity. Likewise adjust the remaining extra trimmers for maximum audio output. All three bands will now be set up. The 7 mc edge will appear at about "4" on the 3·5-8 mc scale, while 3·5 mc will be at about "2" on the 1·75-4 mc scale.

Recalibrating the Dial

Take a piece of good quality paper and draw two concentric circles lightly in pencil, 3in. and 1⅞in. in diameter. Using a ball pen, draw on the same centre a circle 2in. in diameter, and a straight line through the centre of the circles. Carefully cut round the pencilled lines and stick the paper "washer" on the dial, covering the coloured portion. The straight line on the paper should correspond with the straight line across the original dial. The new dial can then be marked out using the built-in crystal calibrator.

On the 3·5-4 mc range, turn the dial to the stop (turn the tuning knob clockwise, the dial moves anticlockwise). Switch the calibrator to the "1,000 kc" position, turn the CW/RT switch to "CW.MAN.," and the "Het. Tone" control to mid-travel. Tune down the scale a little until a strong beat note is heard and reduced to zero beat. Switch the calibrator

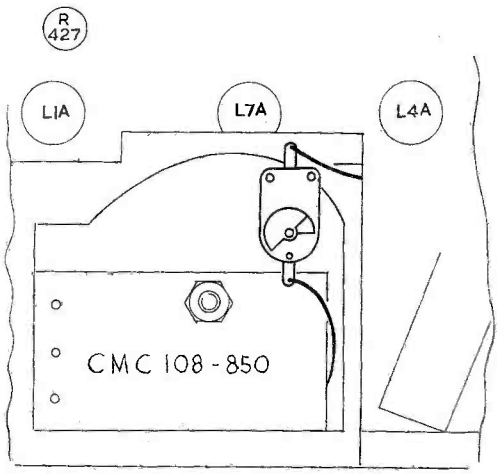


Fig. 2. Rear of the 52 Rx chassis, with the position of the third trimmer for bandspreading indicated — see text.

momentarily off to check that the signal is the correct one. Put a mark (4·0) on the dial. Switch the calibrator to 100 and tune further down until another beat note is heard and zeroed. (Switch to "1000" and back to check.) Mark this point 3·9 mc. Continue thus down the dial to 3·5 mc. Next, set the calibrator to "10." Tune from your 3·5 mark to 3·6, counting the number of times you get zero beat. There should be ten (excluding the one at 3·5 mc). If you get nine or eleven, remove the top panel of the receiver (twist the wing-nuts) and carefully turn the screw-driver-slotted control below the middle one of the three black valves. This will, with a bit of fiddling, set the 10 kc calibrator correctly. Then you can fill up the intermediate points on the scale.

With the dial at the 3·5 mc end, switch to the middle range and, using the 1,000 kc crystal, fix the 7 mc mark, and near the other end the 8 mc mark. Divide this range into smaller divisions using the 100 and 10 kc calibrators. Repeat the process on the high-frequency range, starting at 14 mc. This range will go beyond 16 mc. When the dial is fully inked in, it can be coated with clear lacquer (but test the fastness of the ink on a spare piece of paper first—it would be a pity to spoil the calibration marks after so carefully marking them).

On the writer's revised dial, the LF range is marked on the outer portion of one half of the dial. Alongside on the inner space, beside the 3·5 to 4·0 mc markings, are written ·000, ·100 through to ·500, to assist when using the receiver as a tunable IF with a crystal-controlled converter in front.

The actual conversion takes very little time—modifying the dial takes longer. There is no need to touch the battery of inductance and capacity trimmers on the coil pack at all. So it should be within the capability of the veriest beginner.

ABOUT THE HRO RECEIVER

OBTAINING MORE SELECTIVITY —SUITABLE Q5'ER FOR THE NATIONAL HRO—GENERAL OPERATING CONSIDERATIONS

Part III

E. P. ESSERY (G3KFE)

This concludes our contributor's exhaustive treatment of the National HRO as an amateur-band receiver for modern conditions. Part I of his article appeared in our issue for November, 1965, and Part II in January last. Anyone owning an HRO, and following this series of articles in detail, will agree that the treatment has been pretty thorough.—Editor.

TO make a "special" bandspread coil the coilset will usually need to be revamped. A trustworthy GDO will be needed and a reasonably reliable coilset covering the range to be dealt with—or, better a spare receiver, against which to check the GDO.

Let us assume we wish to make a coil to cover 5 to 5·5 mc, for use with a converter as proposed in Part II. In the first place, we have to provide a coilset that has general-coverage characteristics, the HF end of which is at 5·5 mc. Using the ABAC, find the value of inductance which will resonate at 5·5 mc with 55 $\mu\mu$F in shunt with it. Find the frequency to which this coil will tune with 270 $\mu\mu$F, by projecting back from the inductance through the frequency line to the capacitance line. Next, calculate with the ABAC the inductance required, with 15 $\mu\mu$F across it to tune about 100 kc below the LF end of the coil range as just found. Then, from the ABACs design the coil L2 to have this inductance, make it, fit it and check with GDO that with 15 $\mu\mu$F in parallel it does indeed hit the desired frequency. Alternatively, just wind the coil up and prime it with the help of the GDO until you get the same result (usually more rapidly!). Repeat for each of the L2 coils—one per RF stage and mixer grid, three in all. Next deal with the L1 coils in the same three stages, in rather similar manner; the swing of the condenser (including strays and half the trimmer capacitance) was guessed at earlier on in this article, and the swing of frequency has since been found (in the process of making the L2's). All you have to do is to wind a coil, shunt it with first the minimum and then the maximum C, and see that the GDO indicates resonance at the right frequency each time, with whatever method of inductance trimming you use set at mid-position.

As indicated in the earlier article (November, 1965, SHORT WAVE MAGAZINE) there are several ways of adjusting inductance found on HRO coils, and the system you are using will depend on what coilset you are cannibalising. It is essential that the three L1's all have the same coverage, and the GDO therefore needs careful checking in frequency against the HRO or some other receiver, as close coupling always results in the GDO pulling to some extent.

All that now remains in the way of coils is of course the oscillator. The oscillator frequency is always 455 kc above the signal; hence in the example our oscillator at the signal frequency of 5·5 mc will be of course 5·955 mc, and a coil must be wound up to hit this with 55 $\mu\mu$F shunted across it. If we were going to make this into a wide-coverage coil we would have to calculate the padder condenser value, which can be done by noting that oscillator frequency which corresponds to the lowest frequency to which the signal circuits tune (as found earlier) and then to use the invaluable ABAC to tell us the inductance of the oscillator and to find what

capacity tunes the specified inductance to the lower-limit oscillator frequency. Knowing the total capacity needed and the estimated stray capacitance, we can then say what the gang maximum capacity ought to be to meet our requirements. From this information, *Eq.1* (p.656, Jan.) gives the value of the padder. However, in general, bandspread coils covering relatively narrow segments will not need the padder, as a calculation will show that it has become so large as to be replaced by a direct wire, without harm to our bandspread calculations.

Having carried out the above work all that is now required is that the values of the bandspread padder be found as described earlier in Part II and the whole box of tricks assembled, wired, tested and aligned.

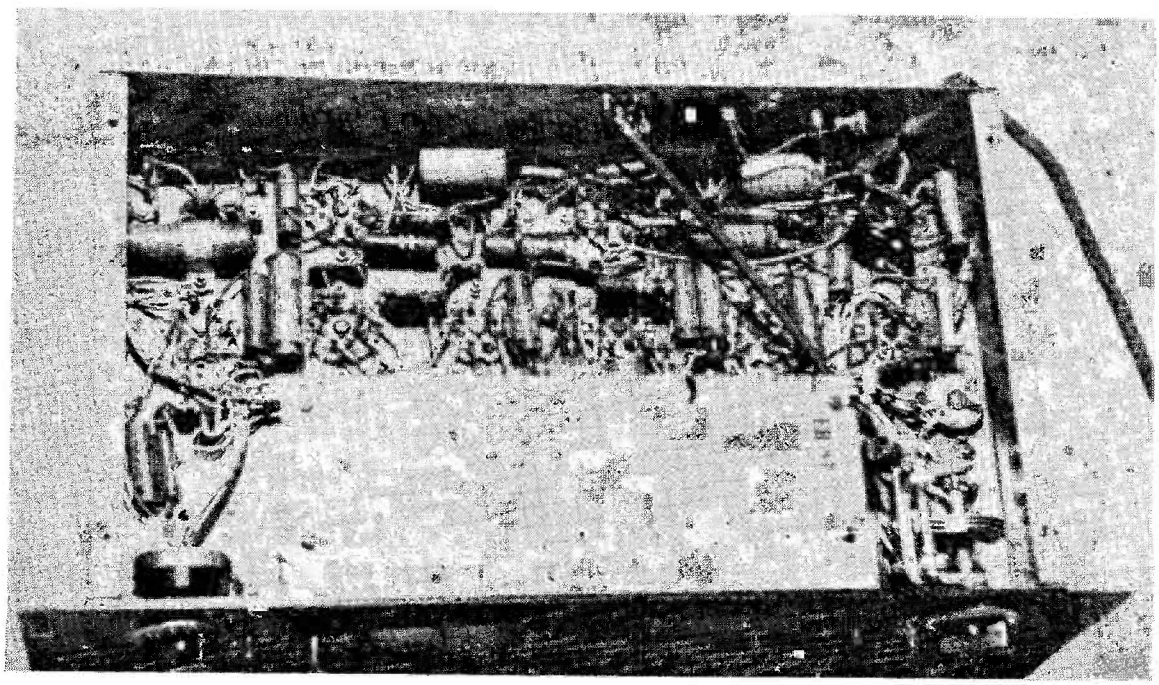
If trouble is met with, a bandspread coil thus made for a special range will be easier to get going if the general-coverage padder is first calculated and installed, so that the coilset may be got going and air-tested, before any attempt is made to add the bandspread padding. But the writer has in fact got such a coilset correctly on to its bandspread range without the intermediate step, using only the test equipment referred to (and without acquiring any grey hairs).

One final practical note on this subject—if a low frequency coil is being altered in this sort of way the existing trimmers will probably be too high in capacity for comfortable use, and some of the moving vanes will have to go ; this needs care if the capacitor is not to be a write-off. A good guide to the number of vanes to leave in can be obtained by looking at the general-coverage coil lower in frequency than the range being worked on.

Selectivity Improvement

This is where we need to start and think a bit. The two RF stages will look after the images if the receiver is aligned properly. However, the adjacent channel selectivity is not all that could be desired. The noise selectivity is adequate for CW at its sharp setting and acceptable for AM/SSB, but the skirts of the response are too wide. It has to be realised that a single crystal has the response of a single tuned circuit of equivalent Q, and that nothing you can do will improve this. In order to get the skirts in to the desired extent you have got to use several tuned circuits in cascade.

After much consideration of the various possibilities, the writer has come to the conclusion that the best answer to the question is to retain the existing crystal filter complete and add the extra skirt selectivity with either a modified second stage IF, or to build an outboard unit. A modified second IF could with advantage use a mechanical filter, provided it is realised that putting it so late in the receiver means that very great care is essential to ensure that it does not overload. A single half-lattice crystal section is hardly good enough, and (as the writer has no mechanical filter) thoughts of an outboard unit seemed to be more practical.



Showing general construction underneath any standard National HRO of the vintage discussed by G3KFE in his article. It is usually advisable to test and replace as necessary all resistors and condensers (see Table on pp.658-659, January). The screened box contains the coil pack, which plugs in from the front of the receiver.

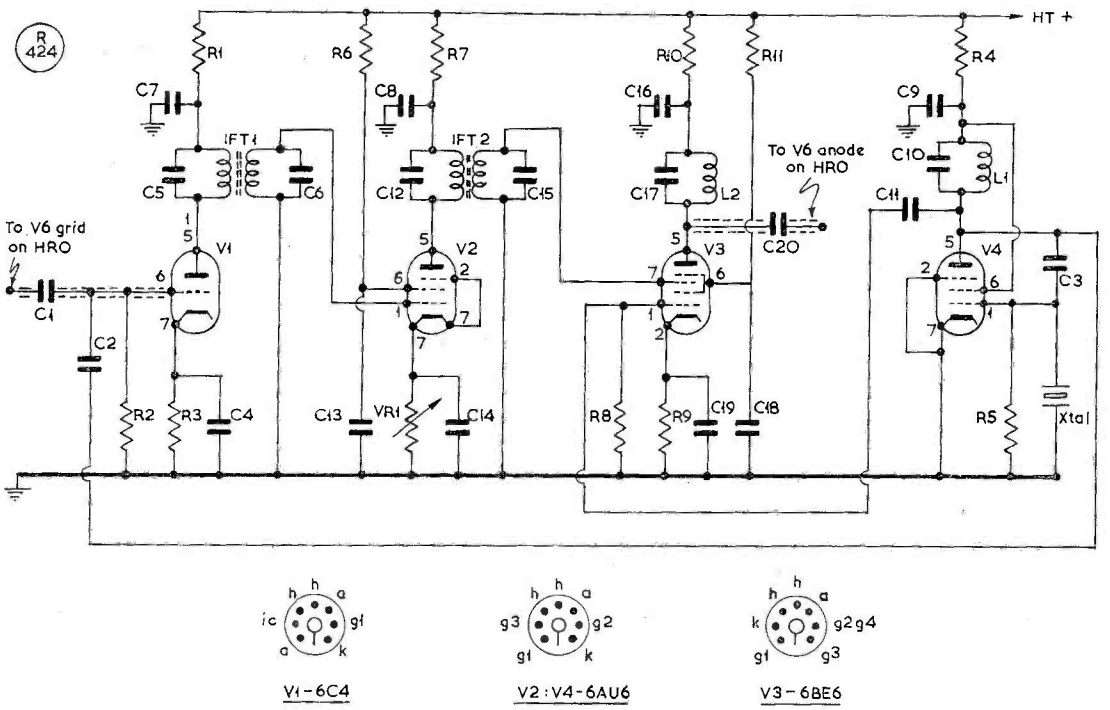


Fig. 3. A suitable Q5'er to work with any HRO in the ordinarily available surplus category. Giving vastly improved selectivity, it can be built separately as an "outboard" unit, and run from the PSU shown in Fig. 1, p.654, January. Details are discussed in the text, and all values are in the table with this diagram.

The obvious answer is to use the BC-453 receiver as the outboard unit. Full details can be gleaned from SHORT WAVE MAGAZINE for November, 1956, as to the slight mods necessary to get it going, apart from the fact that the writer's specimen has the existing BFO trimmer set to minimum, and a new one fitted on the front panel as a variable control. To ensure an adequacy of BFO injection the lead to this trimmer is not screened and is run near to the sensitive spots on the IF stages; this seems adequate. The BC-453 aerial terminal is connected *via* a piece of coax which is usually best earthed to both HRO and the BC-453, the inner conductor of the coax being twisted a couple of times round the second IF stage grid lead of the HRO so as to give a small coupling capacity; this will help to keep the BC-453 from overloading and avoid the capacity of the coax to earth (usually about 30 $\mu\mu$F per foot run) detuning the HRO IF.

The combination outlined above is not ideal, but is not far from it, except for AM phone reception on a clear channel, when the response is, as it were, rather low-fi. To combat this, admittedly rare, case of a clear channel for an AM signal, a common speaker is used, with a change-over switch to connect it to the HRO or the BC-453 as desired.

There is only one snag about the use of a BC-453 as a Q5'er in this way—they are not easily come by, and those who have one, hang on to them, naturally enough. If one cannot be obtained, then it is necessary to make something rather similar. One of the "gold-plated" variety appeared in the *ARRL Handbook* for 1953, Chapter 5. A simpler idea is to pick up the 455 kc signal from the HRO as before, convert it down to 50 or 85 kc, pass it through three IF cans at this frequency, and then convert it back to 455 kc and pass it round again into the HRO in a

Table of Values

Fig. 3. Q5'er for the HRO Receiver

C1, C20	= 10 $\mu\mu$F	R1, R4,	
C2, C3	= 3 $\mu\mu$F, or twisted wire	R7, R10	= 4,700 ohms
		R2	= 100,000 ohms
C4, C7,		R3	= 2,200 ohms
C8, C9,		R5	= 4·7 megohms
C13, C14,		R6, R11	= 10,000 ohms
C16, C18,		R8	= 47,000 ohms
C19	= 0·1 μF	R9	= 390 ohms
C5, C6	= In IFT1	VR1	= 10,000-ohm potentiometer
C10	= 500 $\mu\mu$F, mica		
C11	= 220 $\mu\mu$F, mica	V1	= 6C4
C12, C15	= In IFT2	V2, V4	= 6AU6
C17	= 400 $\mu\mu$F, mica	V3	= 6BE6

Notes: Coils L1, L2 can be *Electroniques* DLM18 or similar, 200-300 μH. IFT1, IFT2 are 50 kc, *Electroniques* DIF Series II. Crystal X is 405·5 kc. Type FT-241, as for Ch.19 or Ch.292. All resistors are rated half-watt.

similar manner for detection.

Q5'er For The HRO

The circuit of such a unit is shown in Fig. 3. The connections to the Q5'er are made through a suitable plug which replaces the last IF valve of the HRO, and inevitably the input and output leads are long and close together, so great care must be taken to ensure that the shielding is adequate, which means screened lead and probably a screen across the plug going into the HRO as well. The setting-up procedure is quite simple, and is as follows: After checking the wiring get the unit going and make sure the HT is at 150 volts. Connect the device into the HRO, the input being from the last IF grid lead (as for the BC-453) and the output *via* a similar small capacitor in the adaptor plug connected to the HRO stage anode pin, removing the last IF stage valve in the HRO to achieve this. Get the oscillator stage going on the right frequency, adding about 3 $\mu\mu$F of feedback capacity from anode to grid if needs be, to ensure easy starting of the crystal when HT is applied. The slug in the coil should be adjusted to give the desired easy starting with as little feedback capacity as may be.

Having obtained output from the oscillator, tune around until a signal is heard, and then trim the 50 kc IF cans in the usual order for a peak, reducing the HRO RF gain to maintain the signal at as low level as possible.

It will almost certainly be found that as the beast comes into line it will break into oscillation. This must be avoided by reducing the gain through the Q5'er by means of the control provided.

The final stage of the alignment process is to put the HRO crystal at the sharpest setting and touch up the alignment, ending up by touching up the two HRO tuned circuits. Finally, adjust the gain on the outboard unit so that the overall receiver gain is about the same as before.

If the scheme is used with 85 kc IF cans then it will be necessary to use six tuned circuits, instead of four, in the unit suggested—and hence, of course, a second IF stage, which would almost certainly need to be tied into the gain control circuit as in the existing circuit, being commoned at the slider of the gain control.

Now, selectivity will be found a little too tight for comfort with AM signals unless they are detuned slightly to one side, or, better, received as an SSB signal (which will soon show up the average AM transmission in its true colours!).

TVI Problem

The HRO does produce TVI. The effect is well known and so is the cure, which is shown in the *Amateur Radio Handbook* on p.453. The writer does not know how long this circuit alteration has been known, but it seems to have got around by word of mouth for years before it appeared in print, so check and see if your HRO came from another amateur who may already have applied this circuit to the receiver.

Aerial Coupling

Not much to say on this, except to remark that the aerial must be fed to the receiver through an ATU of *some* sort. As most people seem to have different ideas on these, no circuit will be given, but a useful one for a long-wire addict will be found in the writer's piece in the September, 1965, issue of SHORT WAVE MAGAZINE. For purely receiving purposes one can do a lot of good with this, a couple of S-points or more being the usual gain, and it has to be remembered that this is *gain without noise* and comes in at the place where it can do most good.

Conclusion

The various modifications described in this article can transform the HRO into a receiver quite adequate for today's conditions, which will stand comparison with any available receiver using valves. The HRO is a very practical proposition for the average amateur on a tight budget. And, after all, there is a truth in the old adage "If you can't hear them you can't work them."

Note: The HRO-MX is fitted originally with UX-based valves. The HRO-5 is fitted with octal types.

MARCH ISSUE—POSSIBLE DELAY

At the moment of writing, the country lies under the threat of a railway strike. Should this materialise —and even if it only lasts a few days from February 14—there will be widespread mail delays and general confusion and chaos which will continue for weeks after normal working is resumed.

Though we anticipate being able to get the March issue of SHORT WAVE MAGAZINE ready for distribution by the due date, March 2nd, it may be quite another matter whether we can get it out.

G2BVN — PRESIDENT R.S.G.B. 1966

This year's president of the Radio Society of Great Britain is R. F. Stevens, G2BVN, who was licensed AA before Hitler's War and is in business as a surveyor for one of the major insurance groups. He succeeds E. W. Yeomanson, G3IIR, and was inducted into his new office at an evening party on January 7. We wish him success and good fortune during his presidential term.

THE TELEVISION SOCIETY

The Television Society, membership of which is open to anyone with an interest in TV—whether technical, commercial or artistic—holds a number of lecture and discussion meetings covering various aspects of the subject. On March 24, the theme is "The Impact of Semiconductors on TV Receiver Design," and on April 21 Professor W. D. Wright of Imperial College will deliver the annual Fleming Memorial Lecture. Non-members can obtain free tickets and other details on application to the Secretary, Television Society, 166 Shaftesbury Avenue, London, W.C.2.

TUNABLE IF AMPLIFIER

FOR MULTI-BAND VHF TUNER

W. M. STURT

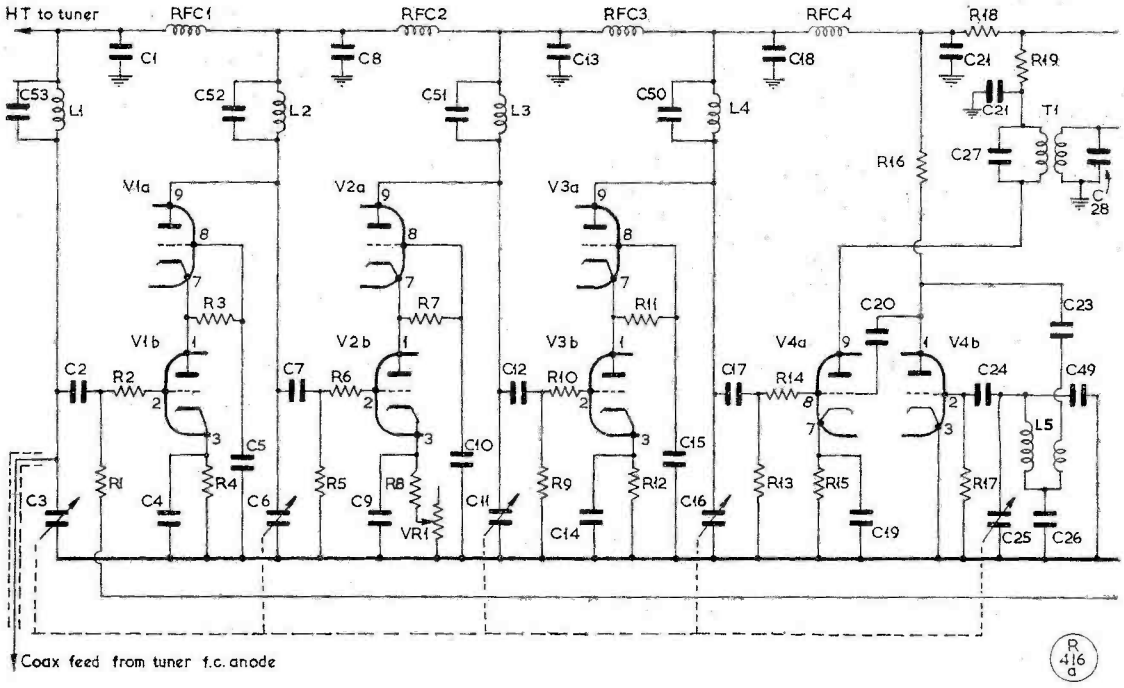
The basis of this suggestion is the use of a modified TV-type multi-channel VHF tuner, to give coverage over about 5 mc per channel, into a cascode IF amplifier stage which is the actual tuning element. Thus, with a 12-channel VHF unit, some 60 mc could be covered, each 5 mc band being selected by the switching in the unit. Since these commercial TV tuners are inherently stable, and of excellent low-loss construction with carefully designed switching, there are no constructional problems on the VHF side. This article deals with the front end and the tunable IF amplifier, which is followed by a normal AF output stage.—Editor.

THE two-metre and four-metre amateur bands usually call for careful design and construction, and a suitable converter feeding into the station receiver is the normal arrangement. However, there is another approach by which a very efficient receiver can be constructed, to cover both bands. This is by using a standard (modified) multi-channel TV tuner ahead of an IF/AF amplifier.

On the VHF side, the tuner to use is the type in which each coil can be set up separately, with all the advantages of low-loss design and efficient switching at VHF. The *Ultra* 17-71 Tuner is a good example, and there are others. Apart from winding the coils, this tuner was used in its original form.

As finally evolved, the heart of the whole receiver is the first IF stage, which here is made tunable over 20-25 mc, this being about the limit to which one can go against one band on the TV tuner; this was originally designed for a 3 mc bandwidth, with a fall-off over about 1,000 kc at each end. Each channel of the *Ultra* 17-71 can be tuned over 5 mc, and with a 12-channel unit this gives a possible total coverage of 60 mc, over any band area that may be required.

The tunable IF stage is fed into a fixed IF amplifier at 1·6 mc. It will be seen from the circuit that all IF stages are in cascode, which had proved very successful in a previous receiver. The output goes to a form of ratio detector, which was developed to suit the writer's own requirements, *i.e.*, either AM or FM reception, with "noise regulation." The ratio detector is normal, S1 removing C47 for AM, and the negative bias arrangement is very effective. Bias is applied to R32 through D1 (an OA70) and is varied by VR2 until background "sharsh" at VHF is minimised. When tuning across a band, even a weak carrier will overcome the bias, and the station can be resolved. When the signal is tuned out, the Rx is again muted. Thus, VR2 varies the level of "noise regulation"; D1 passes the negative bias for



Circuit of the 20-25 mc IF tuner — to be read with remaining section overleaf.

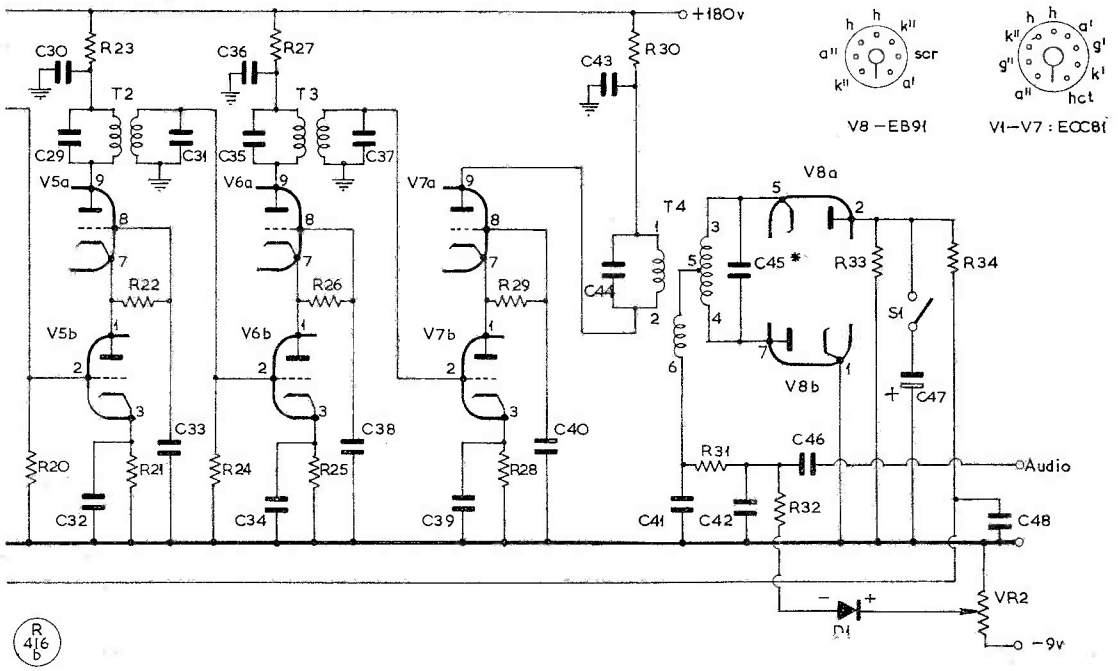


Fig. 1. Circuit complete of the cascode IF amplifier discussed in the text, designed to follow a modified TV-type tuner unit having its coil sections adjusted to cover any required VHF band between about 70 and 145 mc. The tunable section is this IF amplifier, which is built as a separate unit, incorporating such refinements as the constructor may wish, and followed by a conventional audio output stage. All values are given in the table, and the circuit should be read as one from the left-hand edge of p.723.

muting, but when VR2 is at zero, audio is not shorted out.

Constructional Points

The tuner unit should be mounted in such a way that its coil pack is accessible. Its own IF section is disconnected and from the anode of the PCF80 (in the *Ultra* tuner used) a coax lead is taken to the first IF stage. This, being tunable over 20-25 mc, is built round a 80 $\mu\mu$F condenser pack. The coils for this part of the circuit—L1, L2, L3, L4—are each of 12 turns of 22g. on $\frac{3}{8}$-in. diameter formers, with a 25 $\mu\mu$F condenser in parallel. L5 is of 11 turns, with 4 turns of 36g. as a feed-back winding.

Whatever way this part of the circuit is built, all that is required is a fully tunable range of 20-25 mc.

TABLE OF COIL VALUES

L1, L2, L3, L4 — 12 turns 22g. on $\frac{3}{8}$in. diameter former.

L5 — 11 turns 22g. on $\frac{3}{8}$in. diameter former, with 4 turns 36g. as feed-back winding.

RFC's, 1-4 — 200 turns of 40g. wound on 1-megohm resistor body.

T1, T2 — 105 turns each, of 36g. pile-wound on $\frac{1}{4}$in. TV-type IF transformer units (*see text*).

T4 — Connected as shown in diagram above, details in text.

Note: Two-metre coil data for VHF tuner discussed in text.

Table of Values

Circuit of the Cascode IF Amplifier

C3, C6, C11, C16, C25	= 80 $\mu\mu$F, gang var.	C49, C50, C51, C52, C53	= 25 $\mu\mu$F, cer.
C1, C4, C5, C8, C9, C10, C13, C14, C15, C18, C19, C21	= ·002 μF, 350v. cer.	R1, R3, R7, R11, R22, R26, R29, R32, R34	= 220,000 ohms
C2, C7, C12	= 3·9 $\mu\mu$F, 350v., cer.	R2, R6, R10, R14	= 33 ohms
C17	= 820 $\mu\mu$F, 350v., cer.	R4, R8, R12, R15, R21, R25, R28	= 220 ohms
C20	= small capacity, 0·3 $\mu\mu$F	R5, R9, R13, R20 = R24, R31	= 100,000 ohms
C22, C30, C32, C33, C34 C36 C38. C39, C40, C43, C46, C48	= .01 μF	R16	= 47,000 ohms, 2w.
C23, C27, C28, C29, C31, C35, C37, C44	= 100 $\mu\mu$F, cer.	R17	= 47,000 ohms
C24	= 47 $\mu\mu$F, cer.	R18	= 330 ohms, 2w.
C26	= 680 $\mu\mu$F, cer.	R19, R23, R27, R30	= 2,200 ohms
C41, C42	= 200 $\mu\mu$F	VR1	= 5,000-ohm potentiometer
C45	= *see text*	VR2	= 1 megohm potentiometer
C47	= 2 μF, 25v.	D1	= OA70
		V1, V2, V3, V4, V5, V6, V7	= ECC85
		V8	= EB91

Notes: All resistors rated $\frac{1}{2}$-watt, except R16, R18. Value of C45 is dependent on secondary inductance (*see text*).

The coils for the second IF at 1·6 mc are wound on standard TV formers, and consist of 105 turns of 36g., pile wound, with a 100 $\mu\mu$F capacity across each winding. The discriminator coil T4 is wound similarly, also with 100 $\mu\mu$F in parallel on the primary side; its secondary is wound on a former that will slide over the primary (to increase the inductance for the space available) and consists of 45 turns of 36g., double wound. The parallel capacity for this secondary can be found by putting across it a 500 $\mu\mu$F variable condenser and then, with the coil slug half-out, checking for dip with the GDO set at the correct frequency; from the position of the 500 $\mu\mu$F condenser at dip, the capacity can be estimated with reasonable accuracy, and a fixed condenser of that value substituted for permanent wiring across the coil—C45 in circuit opposite.

Two-Metre Signal Circuit

In the *Ultra* 17-71 tuner, there are four 5/16th. inch diameter formers on each biscuit—RF grid, RF anode, Mixer grid and Oscillator. For two-metre band coverage, the windings are as follows: RF grid, 9 turns; RF anode, 7 turns; Mixer grid, 5 turns; and Oscillator, 5 turns—all with 22g. enamelled wire.

For each 5 mc of band area lower in frequency, one turn is added to each of these windings. When the band area to be covered gets to below 100 mc, it will be found that thinner wire, 28g. or 30g., will be necessary to get the required inductance on to these small formers. But the 4-metre amateur band (at 70 mc) can be brought in.

Provided that some sort of output meter and the usual calibrated GDO for the frequencies involved are available, the setting up procedure can follow the usual lines. With the oscillator in the TV tuner set to 122 mc, the signal frequency circuits are adjusted for 142-147 mc coverage, and the IF amplifier stages similarly set up and checked for the frequencies and coverage required.

Other 5 mc bandwidths are similarly set up and aligned, and can then be selected simply by the switching in the Tuner unit.

ABSORPTION WAVEMETER FOR VHF

NEAT CONSTRUCTIONAL METHOD

W. T. SUTHERLAND (GM3JWS)

THE recent construction of a two-metre converter necessitated the use of an absorption meter covering the frequencies of 35·5 and 71 megacycles. The fact that it was found necessary to visit a fraternal amateur to obtain this facility was such an admission of inadequacy that it was decided to construct one for permanent use. A little experimentation showed that in the interests of reasonably accurate calibration the absorption unit should not require the use of plug-in coils or any indicating device as an integral part. This, together with further thought on calibration ranges, led to the construction of two mechanically identical units, covering the frequency ranges 30-55 and 50-80 mc. The coverage is actually greater, as can be seen from the graphs, but accuracy falls off at the ends. (Further units are now contemplated to accommodate higher frequencies up to 146 mc.)

[over

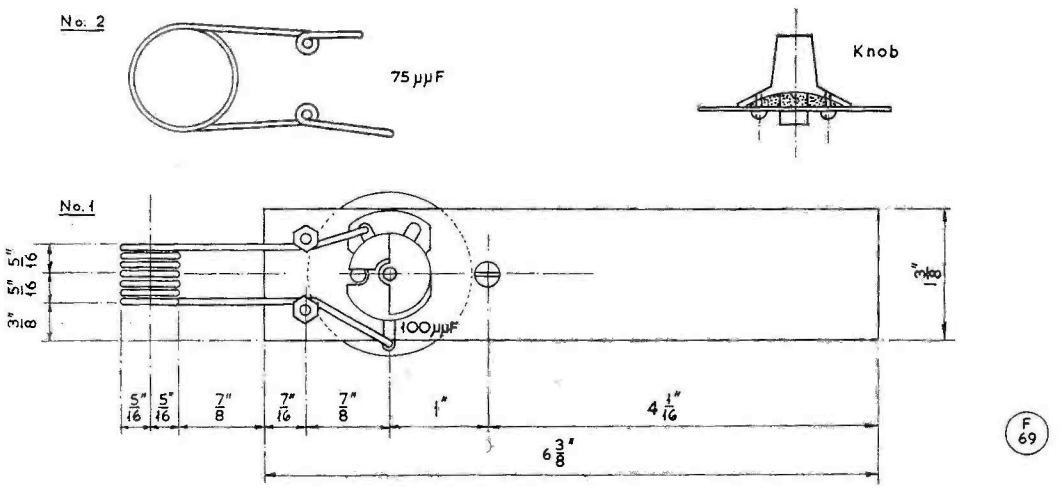


Fig. 1. Mechanical arrangement for the instrument discussed in the text. The No. 1 coil consists of 6½ turns of 16g, wound on a ¼in. mandrel (for shape only) spaced out to a little over ¼in. The No. 2 coil is of 1½ turns, shaped on a 1in. former, and spaced to about ¼in. The mounting handles are of perspex, with the edges taken off for easy holding. These wavemeters can be quite accurately calibrated and readings are taken by indirect indication—see text.

General Construction

The units are constructed on $\frac{1}{4}$-in. thick perspex measuring $6\frac{3}{8}$ ins. x $1\frac{3}{8}$ ins., which is a convenient size and comfortable to handle, especially when the edges are rubbed down with fine sandpaper. Two 6 BA bolts with nuts, washers and spring washers are mounted about $\frac{1}{2}$ in. from one end and these serve as permanent anchors for the coils, the ends of which are secured to the bolts. A suitable variable condenser is then mounted $1\frac{1}{4}$ ins. from the same end, and so orientated that the tags are located conveniently for soldering of the coil ends. To avoid any possibility of calibration being upset a bolt is fixed through one of the holes in the ceramic base and through the perspex, so that no rotation can take place. The nut is soldered to the bolt after fixing. On the drawing, this bolt, for clarity, is shown on the side remote from the rotor blades, but it was found to be more convenient in construction to use the hole on the other side.

Indication of calibration is given by a circular Eddystone plate which is fixed to the underside of a salvaged TV Rx control knob, by means of two small self-tapping screws, the points of which were carefully ground down on a grinding wheel. This form of knob necessitates the condenser spindle being filed to a flat face on one side, the knob itself being a force-fit on the spindle. The whole arrangement is designed so that with reasonably careful handling calibration will not go wrong. Readers may be interested to note that an attempt was made to allow for zero'ing of the scale by drilling oversize holes in the circular plate but it was found that tightening up of the self-tapping screws resulted in bending of the plate into the hollow under the skirt of the knob. The solution of filling the hollow with plastic wood was adopted. On the second knob, however, care was taken to drill holes of just the diameter to accommodate the screws in the exact position required.

An indicating point is provided by the use of a small metal stand-off pillar. This is located 1 in. from the condenser spindle. The coils were then constructed from 16g. enamelled wire in accordance with the details given with the drawing. Coil No. 1 is tuned by a 100 $\mu\mu$F condenser and Coil No. 2 by a 75 $\mu\mu$F variable—*see* Fig. 1 p.725.

Calibration and Use

Calibration was achieved by the use of a known variable calibrated source and checked on one point of the graph by a crystal-controlled oscillator.

In using these devices a separate 500 microamp meter having a diode rectifier and pick-up loop in series is close-coupled to the (energised) circuit under test. The wavemeter coil is then brought near and the condenser rotated until a dip is observed on the microammeter. At this stage the pick-up loop and the wavemeter coil should be as loosely coupled as possible and the wavemeter resonated as before, when a frequency reading within the limits of the calibration of an absorption wavemeter will be obtained.

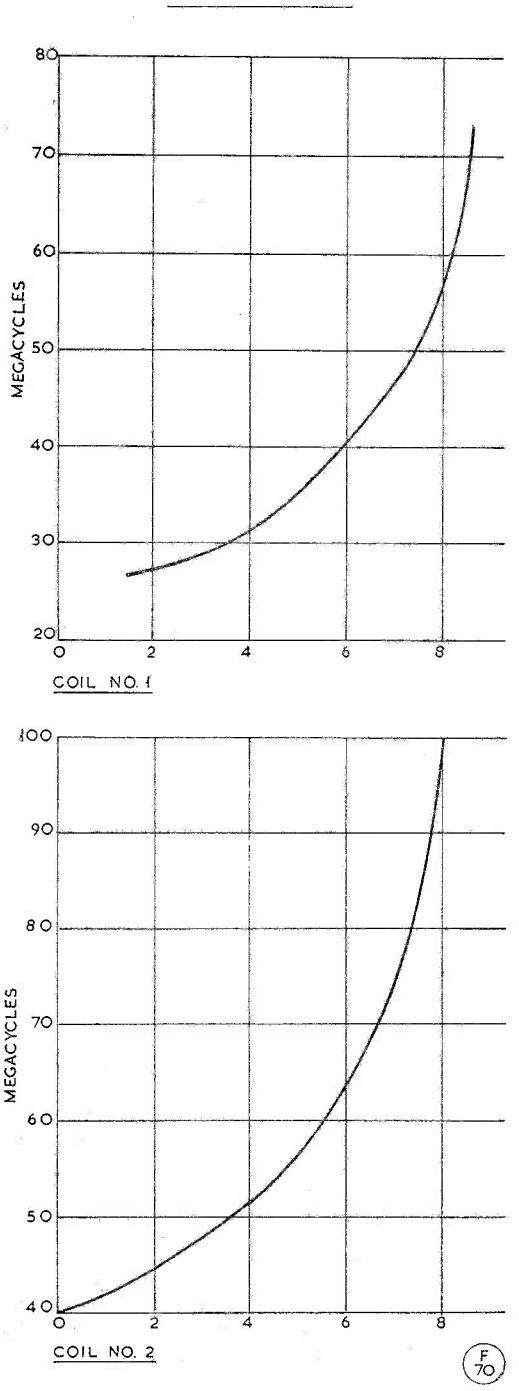


Fig. 2. The calibration curves obtained with the two instruments in the photograph and described in the article. They give a total frequency coverage of 20-100 mc, suitable for much checking work on the HF and VHF ranges. Coverage could easily be extended to 160 mc or so, to take in the two-metre band.

COMMUNICATION and DX NEWS

L. H. Thomas (G6QB)

ONCE again the winter months have brought some disappointing conditions on the HF bands, made more obvious by the excellent spell that preceded them, and also by the general feeling that an increasing sunspot number ought to mean spectacular DX.

Ten has been virtually out of use; *Fifteen* has been dull compared with its excellent state during the autumn; *Twenty* has been the main DX band, as always, but has fallen off sadly during the early-morning periods which showed so much promise. But all bands should be improving by the time this reaches you, and when the month of March arrives there should be a very noticeable change for the better.

Meanwhile *Forty* has been really excellent as far as ionospheric conditions are concerned; it's only the man-made conditions that wreck that band. And *Eighty* and *Top Band* (especially the latter) have been in excellent shape.

This sort of period is pretty dull for the single-band man; happy are those who can use all six, because they can usually find *something* of interest going on.

If this sunspot cycle develops at the same rate as the last one, it seems that the early part of 1966 will see sunspot numbers in the region of 25-30, increasing by the end of the year to a figure of 65-70. Then we shall *all* notice the difference—especially on Fifteen and Ten metres.

Meanwhile, make the best of the winter doldrums and reflect that spring is not far away. This applies also to the weather, as it affects us! The choice between W1BB on Top Band and an electric blanket has not been an easy one for many people, and some wonderful early-morning openings must have gone unnoticed by those who give a thought to their personal comfort. Maybe there's some direct correlation between the temperature and the age-group of the operators heard around at 0500? That would account for the absence of old timers on Top Band at these times.

We Are Not Alone!

From time to time we have been taken to task for the somewhat cynical attitude towards "super-DX" betrayed in these columns. We have an ally at last, and a far more outspoken one than we ever expected to find on the other side of the Atlantic. The Editorial in the January *CQ* really hits out, opening with the question "Bought any good DX lately?" and firing a devastating broadside at those who are forced to buy a QSO, or a QSL—a concept described as "completely revolting."

After analysing the motives of a man who can't afford to finance a DX-pedition of his own, and relies on contributions (whether exacted by a form of blackmail or merely asked for), K2MGA lambasts those who seek out a remote dot of land that can be considered a "country" under completely artificial terms, and "create havoc on the DX bands for a few days or a few hours, just 'to give a few of the boys a new one.' What useful purpose has been served? What contribution has been made to ham radio? What will be the lasting effect of the operation? The answer is 'None.' Hasn't DX-ing reached the point of utter idiocy when, in order to stay at the top of the DXCC list a fellow must *pay* for his contacts, or even pay for the QSL he receives?"

He continues: "What drives them? The searing desire to remain at the top of the list! Fine! Competition is a necessary stimulant in any endeavour, but falsely-created competition—for something not worth having—is worse than none at all."

He suggests a sweeping revision in valid-country-status requirements in an attempt to regain a measure of sanity, and adds that any expedition for the sole purpose of "creating" a new country should be deprived of all credit. Such plain speaking will only arouse mild feelings over here, but we shall be interested to see the American reaction to it, especially as K2MGA has invited readers to send their comments and pull no punches.

Mail from Overseas

9M4MT is probably known to some of you as G3ATH, GI2ATH, DL2XS, VS7PH, XZ2HP or ZB2A. Currently, as 9M4MT, he is well back in the DX game. He forwards a certificate called the "South East Asia Net Award"—available to anyone exchanging reports with any twelve members of the S.E.A. net, which meets daily on 14320 kc SSB. Members are spread over such countries as HL, HS, KR6, KX6, VK, VK9, VS9, XW8, 4S7, 9M2-4-6 and 8, and 9N1. This sounds like one of the more worthwhile awards.

9M4LP passes on the news that the JA spot frequency of 1880 kc is no longer in force—licences expired December 31. They are hoping to get new ones by March, but for 1995-2000 kc. (However, W1BB mentions their new frequency as 1910 kc—which is right?)

ZL3RB notifies us that ZL3RW and 3VP will be touring the U.K. this year—for full details please turn to the preamble to "Month with the Clubs."

VE3BWY (Scarborough, Ont.) writes to say that he has a new QTH, much quieter than the old one, and that Top Band listening is now a *delight*. The band is quite clear from 1820 to 1840 kc, and he recently worked five G's in one morning, "very easily indeed." He has a dipole for this band, also an 80-metre vertical, with an adjacent long metal fence

as one of the radials. Further notes from him under the "Top Band" heading.

Pirates Again

The subject of piracy is always cropping up, whether someone finds his callsign being used by an unauthorised person, or in connection with all the "floating gramophones" that now surround our coast line. G3RND (Pontefract) refers to both types, by enclosing a cutting about an official protest from Yugoslavia about British pop-tunes interfering with Radio Zagreb, and by adding that someone has been using G3RND on 20-metre CW. The genuine operator uses the VHF bands, and the fact that the cards he is receiving come from all over the world fails to give him a thrill, since all reports are on 20-metre transmissions. Not only that, but he is probably getting a bad reputation for not QSL'ing !

And, concerning the Radio Zagreb protest, he says the Yugoslavians are pretty quick off the mark . . . but what about the countless pirate stations causing interference to us on our own exclusive bands ? It's the old, old story—the amateur is only a little fellow as far as power and influence are concerned, and it's power that wins.

Correction

In the December issue we passed on a note (from someone else) that VS1EU (operator G3JKU) was operating on Top Band in 1952. We are now told by G3JKV that *he* was the one, and that his call was VS1EV. And he adds that it's not quite right to say that no one in the U.K. attempted a contact, because he did fix several skeds. They never worked, though. Thanks, G3JKV, and apologies for the misinformation on which this duff gen. was based.

And attention is also drawn to the "NS1A" note on p.694 of the January issue.

Keep off the Grass

G3IDG, browsing through the *ARRL Handbook* for 1931, found the signal "99" listed, along with "73" and "88." This "99" was meant to assert "Keep Out." (And we well remember that it became quite common usage in those days, although not regarded as very polite.) He suggests that it should be revived, as slightly more respectable than "nut" or "lid"—especially in view of the current fashion for sending "599" as "5NN." So what's wrong with "NN" (for the CW boys) as meaning "Sorry, chum, we don't want you" ? Who will be the first to register a direct hit ?

Sundries

One of the nicer things about being a scribe (or is it a "columnist" these days ?) is that stray remarks are passed along during QSO's, odd bits of news are bandied about, and even the occasional QSL received bears some items of unusual interest.

Apart from the stray compliment or kind remark (which is always gratifying but not worth further comment), it is pleasant to find that many an operator normally looked upon as hell-bent for DX, with fangs bared and no holds barred, turns out to be a perfectly normal human being—kind to children, crazy about dogs and willing to lend a helping hand in almost any way possible. The image has often been misleading !

Many a stray news item has been passed along in the course of a QSO, and many a remark on the back of a QSL has made us stop and think. (This very day a card arrived from W1RAN, with information about the latest HZ3TYQ/8Z4 sortie ; on the back were the words "Enjoy your SWM column, but think you are a little bit hard on DXCC—some people chase butterflies ! ")

Then there was the G3 - - who wanted to say thank-you for some articles on receivers, by a certain "W.L.S." of *Popular Wireless*, written in about 1935 ; and on the very same day G2DX was telling us, on the air, that he had unearthed his log for 1913 !

Those who disagree with views expressed in the past are just as nice about it as those who agree, which sometimes makes your scribe feel a little bit conscience-stricken. Never mind, press on—and long may the opinions con-

FIVE-BAND DX TABLE

Station	28 mc	21 mc	14 mc	7 mc	3.5 mc	Countries Worked
GI3IVJ	180	263	317	102	83	324
G2DC	170	291	316	169	112	328
GW3AHN	151	302	330	71	21	336
G6QB	145	211	302	119	67	323
G3NOF	132	191	266	33	39	383
G3IDG	60	70	54	27	18	101
G3UML	31	84	168	31	20	182
G3UDR	17	41	90	4	18	122
G3RJB	11	26	113	50	2	120
G3KMQ	10	99	212	101	55	237
G3UBI	10	20	69	9	29	95
GM3RFR	7	53	86	37	15	105
G3PQF	7	24	39	56	40	82
VP8HJ	6	56	169	25	11	174

(Entries for this Table are still being accepted, but refer to text for details of new Five-Band DX Table, starting w.e.f. January 1, 1966, p.732.)

Not, as you may think, rather a fine amateur station with the operator tuning in DX — but the control console at GLD, Land's End Radio, the famous Post Office coast station, equipped to work ships on MF, HF and VHF, using the most modern apparatus and handling a great deal of traffic. Like several other coast-wise G.P.O. stations, GLD functions on what is known as the short-range service, working to craft of all nationalities in the approaches to the English Channel and the Irish Sea.

Picture courtesy Postmaster General

tinue to flow in by every means possible.

DX Mobile

G3LCZ (Stockton-on-Tees)—incidentally, a reader since the pre-war No. 1 issue of SHORT WAVE MAGAZINE—raises some nice points about DX'ing as a mobile. First, he says he never was an avid DX-chaser, partly because of restricted aerial space and partly because he dislikes ungainly structures anyway. Eventually, being forced by business to spend more time in the car than he could ever hope to do in the shack, he went mobile, and for the last ten months has remained that way exclusively, although he could get the rig indoors and have it on the air in five minutes.

Results: VK and ZL worked on the way to the office, and W's while returning for lunch (on Twenty, of course). A sked with ZL3UN, four mornings running and perfect every time; a multi-way with VK2NN, 2AZX, 3TL and ZL4BX; and many solid DX QSO's, all while on the move.

G3LCZ says he finds that driving through a town makes little difference to DX working, and some places, on the tops of hills, are actually poorer than down in the valleys. Another advantage is that one can cash in on rapidly-changing skip conditions at times when one could not normally be at home in the shack. A rig running 100 watts p.e.p. and a whip on the rear bumper of a Cortina are the ingredients used, and their owner really recommends mobile working on the HF bands to anyone who is tired of trying to get through weekend QRM from an indifferent QTH with an indifferent aerial, or to one who finds conditions flat at the only times it is possible to work from the shack. (As a further bonus, you get away from TVI and next-door's vacuum cleaner !)

Final quote: "All I can say is that I have never enjoyed Amateur Radio so much in my life, except perhaps when I first got my licence. I don't even have a grouse ! "

Isle of Man Expedition

G3SGK informs us that Cambridge University plan another trip to the Isle of Man during

March. GD6UW will be on all bands from One-Sixty to Two, probably using SSB for the first time; the dates will be March 15-22, and all contacts will be welcome.

The HF Bands

G2DC, to whom we are indebted each month for a very full survey of the bands, was referred to by another reader as "the one-man monitoring station," and one just could not disagree. Last month he sent a very full review of six bands and a load of news, but Christmas chaos intervened and his letter did not get in until far too late for the January deadline. In it he reported a WAC in six consecutive QSO's on Fifteen (between 1100 and 1200 with 9M2LO, VK5DS, TY3ATB, PJ2CZ, FG7XJ and UB5EH). Since then, though, conditions on the band have fallen off a lot.

This month he finds that the nice period (0730-0830), which was so good on Twenty last month, has gone sour on us. Only on the odd day does the exception occur, with a few ZL, VK and JA stations coming in over the long path. But almost anything is likely to pop up from time to time, and Jack points out that when the odd Pacific station *does* show up, it is liable to be a good one—provided one is listening in the right direction at the right time . . . and he quotes the case of KX6SZ/Ebon, calling CQ several times without a reply.

On Forty and Eighty, G2DC is sure that some extra incentive is necessary to induce the DX stations to show up and face the eternal QRM. When there's a big contest on, there's no lack of them; at other times they vanish. He found, on Forty, that during the period 1800-2000 GMT, VK, JA, 9M4 and the like are usually workable, together with the occasional African. A "CQ DX" call between 0700 and 0800 would usually bring back the odd PY. On Eighty, during the *CQ* Contest, he went on the band at 0700 and, in just over an hour, worked 22 U.S. stations, in all districts except W7, together with VE1-2-3, VP9 and ZL4.

Final note (still from G2DC) on how much *patience* is necessary to work a new and rare one. XE5L (the Socorro expedition) was contacted on Fifteen only with the help of half a dozen W's ranging right across the States. W6's were heard working him at 1615, and East Coast stations by 1639, but during all that time he was not even audible here. Finally at 1643 XE5L emerged from the noise with a 569 signal, was duly worked by G2DC, and by 1649 had disappeared again completely! There's a valuable lesson for would-be DX'ers who say "I listened several times but never heard him" . . . that listening has to be *planned*.

G3NOF reports nothing on Ten, but a few VK's (short path) at 0900 on Fifteen, and again (long path) at 1100; shortly after, XW8AZ was there (all SSB). ZD8PI and East Coast W's were worked. On Twenty, some late evening openings were noted, to the South and South-West. PY's were raised on SSB at 0030, and ZS's at 2100. Best of the month were FG7XX, KV4CF, PJ3CD, 5BC and 5BD (both the latter on Bonaire Island), PY7AKW (Fernando), TT8AW, TY3ATB and TZ5H, VP1PV, 5RB and 7DL, VE1AED/SU (at 2245 !), YN1LH, ZD8L, 5T7H, 6W8AG and 9Y4TX. EA9IC in Ifni was heard many times but seemed to be working only W's.

G3SXR (Fowey) sends an entry for the Ten-Metre Activity Table and says that far more DX could be worked there if the CW contingent was stronger. He raised Gus, when he was signing 5VZ8CM, on that mode, although his QTH is badly screened, and only 35ft. a.s.l. (at low tide !). On Eighty he found East Coast W's easy to work, and on that band he heard from 9H1AB that he hopes to be trying 160 metres this season.

G3AHB (normally a VHF man) had two weeks' sick leave, which was his chance to give Twenty and Eighty SSB a workout. On Twenty he heard and worked some nice ones; on Eighty he raised W1HKK, 1AQH, VE1IE, 1BL, 2WM, 1ACE and 1ADW, plus W1FZJ/KP4 (all SSB). He dislikes the "group working" at the high end of Eighty, and prefers to winkle out his own DX without being "carried by the big boys," most of whom have worked the station before. (And we have had many other comments about the way a group can monopolise a frequency for long periods.)

G3NMH (Swindon) comments on the consistency of the VP8's, with quotes from his log for December 26 to January 17. VP8HZ and/or VP8IH/MM were worked almost every day, with VP8IN also worked twice. VP8IH /MM was using both AM and SSB (the latter on a KW-2000A *en route* to VP8IN). Other interesting contacts—G3AYL/W4 (first G to G/W QSO ?), VQ8AX on his Joystick, and G3NUF/CX. (All this on Twenty.)

G3TTG (Ripon) worked VP5RB, signing "Bob" from Turks Island, but understands from 6Y5RD that the VP5 is not genuine. Can anyone confirm? Other stations worked on Twenty — PJ2CE,

TOP BAND COUNTIES LADDER

Station	Confirmed	Worked
Phone and CW		
GM3KLA	98	98
GM3IKD	98	98
G2NJ	98	98
G2CUZ	98	98
G3PLQ	92	95
G3SED	82	82
G3SWH	70	80
G3PPE	67	80
GW3PMR	63	73
G3SVW	55	75
G3IDG	55	59
G3SHY	53	71
GW3TLW	53	65
G3UBW	47	74
G3TSS	43	53
G3SQX	34	64
G3KPT	30	69
Phone only		
G2NJ	61	61
G3PLQ	55	58
G3MDW	44	64
G3RTU	35	37

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

HC1PW and 7X2AH, all with the beam "below gutter level."

Briefs

HZ3TYQ/8Z4, operated by W1TYQ, was supposed to be on from January 25 until February 1 . . . pity the news didn't get here earlier, but there's always the chance that he may have been delayed and therefore current. For those who succeeded, QSL's to W1RAN.

The QSL address for all Hammarlund "DX of the Month" activity is now: Stuart Meyer, W2GHK, P.O. Box 7388, Newark, N.J. 07107, U.S.A. All outgoing cards thence will be sent to the appropriate bureaux, except those requested with s.a.e. and IRC's.

Plymouth Radio Club report that all their cards for the GB2USA operation are now in the bureaux. Please report any non-arrivals direct to G3UK1 *(QTHR)*.

Last month's query about UM8 stations giving their QTH as Jalalabad brings a note from SWL Stephen Shaw (Stockport), who suggests that if the QSO's were on Phone (though we believe they were CW) the town name might have been misread. In UM8-land are Jalinabad, Leninabad, Stalinabad and others . . . there may be one that's even more like Jalalabad (which, as we pointed out, is in Afghanistan).

Grafton Radio Society ask for another brief mention of their "WALT" (Worked All London Town) award. Contacts with 65 of the 118 London Postal Districts are the qualification—QSL's to G3AFT, Montem School, Hornsey Road, London, N.7.

Top Band DX

Once more we cannot help treating One-Sixty as the "Top Band for DX." The season is at its height, more and more chasers are really working this band to the limit, and activity is still on the increase. First, a promise of things to come.

During the coming equinox that old-stager ZL3RB promises activity, and there's no doubt that a G/ZL contact is just about the ultimate achievement on the 160-metre band. ZL3RB will be on every day from February 26 until April 3, 0600-0700 GMT, 1879 or 1881 kc. He will transmit on the hour for five minutes, then listen for five minutes, and so on, also listening for one minute in the middle of each five-minute sending period. He will **not** be listening on his own frequency, so it's a complete waste of time cluttering it up with your calls.

Reporting the HF Bands

ZL3RB thinks the peak will be at 0630-0700 during the first half of March, and nearer to 0615 after that. The rig runs 150 watts to a Vee-beam (560ft. per leg), 60ft. high. Receiving conditions are "practically ideal" and commercial QRM almost non-existent at the times mentioned. How many G/ZL contacts shall we log this year?

The Trans-Atlantic tests have been going well, with many new contacts made. G3SED reports that on the first test he worked HK4EB and twelve W/VE stations, including WØVXO; that YVØAA was heard at 569 during the *CQ* Contest; and that EP2IW, with a balloon-borne vertical, has heard G3LIQ, 3RPB, 3SED and 3TLY, but hasn't yet been able to raise them. Incidentally, congrats. to G3SED on being the final leader in the G3S--/G3T-- Ladder, which is now changing over to the 1966 Ladder for G3T--'s and G3U--'s.

Bob Snyder, 9M4LP, has kindly forwarded a tape (90 minutes of it!), which gives a first-hand impression of what he hears out there—and the listening was actually done in Indonesia, where he works, and not in Singapore. Stations on the tape are DMJ-59 (of course!), DL1FF and 9KRA, G3LIQ, 3MYI, 3RBP, 3RRJ, 3SED, 8RQ, OK1NQ, 9L1HX and 9M6BM. We shall be circulating this tape amongst those concerned, in due course. The period covered is December 12-19, the hours 2200-2330.

Other stations logged by 9M4LP on December 8 were G3PPE and G3TLY. Incidentally, the tape discloses horrible QRM from a local Hifix beacon on about 1825 kc, on top of which nearly all the G's persisted in sitting!

Quite a number of readers claim to have heard or worked JA6AK on Top Band during early January. Too bad . . . yet another misguided gentleman is at work, as the JA's are not now licensed for 160 metres. When they do come back (at the end of March) they will be on 1995-2000 kc (or 1910 kc.).

Another one treated (at present) with reserve is IS1FR, worked by many around January 13. GM3IAA hopes to have been the first GM/IS1, so he'd better be genuine—but further hard news must be awaited. (Remember PX1FR?)

Incidentally, GM3IAA marvels at the colossal strength of certain G's up there in Inverness. Some of them block his receiver if he turns the gain up—so he doesn't!

G3UBW has worked 16 countries to date, including DJ6SI/LX (who *was* genuine), and he recently raised EL7B/MM, who has been described as phoney. (What a cloak-and-dagger business this is becoming?)

G3TKN says that he and his close neighbour G3PPE have both settled for Marconi-type inverted-L aerials after having tried loaded verticals; he would like to hear from others who have tried both types. G2NJ reports a fine CW contact with HB9T as early as 1450 GMT, and he also worked HB9TT (as did G3TKN).

G3PPE's best QSO's of the winter, all between 2300 and 2359, have been with W1-2, VO1, ZB2 and 4U1, with a heard-report from 9M4LP.

GM3IAA says he has heard G stations giving W1BB a 599 report. when up there he is only 349; he raised VO1FB, who was heard working G stations on AM Phone. Other new ones for Jim were DJ2UR/LX and OE5CD. And he was very amused to hear all sorts of people shouting rude remarks at a G who called CQ DX on

1804 kc . . . but a little later, when ZB2AJ and VO1FB were working *each other* on that frequency, all scruples vanished and even the critics caused bedlam on the spot from which they had been trying to chase someone off. GM3IAA eventually raised the ZB2—happy ending!

G3SJJ heard G3PLQ operating from W1BB in January. And from G3PLQ himself (our well known /MM enthusiast, who is a sea-going radio officer) come several voluminous logs which we should like to print in full (but they would fill the whole issue!). During his Atlantic crossing (roughly Dakar-Bermuda) G3PLQ when off-watch heard little but W's, but prior to that, off the West African coast, he was logging the normal bunch of G's, whose calls now make familiar reading.

We look forward to hearing of his adventures at W1BB, especially as John has already visited DL1FF and seen the origin of that other "big sig" at first hand. Meanwhile, he has been pretty thrilled at logging W4's, 5's and Ø's from relatively close quarters.

DX Shorts

VS9KRV promises Kamaran Island activity, March 4-14, VS9ARV and 9AFR operating . . . ZF1RV is VE7RV using the new Cayman Is. prefix . . . Lloyd (W6KG) after his long sojourn on Ebon, planned to be on the air from Nauru, VK9, around January 24, and is probably still there.

The British Indian Ocean Territory (BIOT) is an amalgamation of four groups formerly administered by Mauritius (VQ8) and Seychelles (VQ9) and will result in country-status changes in those parts. Chagos, Aldabra and Des Roches are involved—full details as soon as we get them.

FW8XX and FW8ZZ started up on January 17, but conditions were not favourable for Europe then . . . likewise much activity from FU8 and FK8 is reported, which should be interesting when the path improves.

VR6TC should be on SSB, all bands, by mid-February. Meanwhile, he continues active on 21065 kc, Mondays from 2000 . . . W9WNV is talking of operation from Clipperton Island, but his DX-pedition is reported to be $3750 "in the red," including the KWM-2 which was loaned to the BY operators in China, and *has not come back!*

ZD9BE (Gough Is.) is G3SWQ, there for two years and very keen; he has been worked from here, 1830 and 1900 GMT . . . ZD7IP is awaiting crystals for radiating on Top Band and Eighty . . . ZL4CH is the new and very active station on Campbell Is.

XV5AA is *legally* active from Saigon . . . VP8IP is on Adelaide Island . . . VQ9TC is on Mahe (Seychelles) . . . ZD8HL and others promise a visit to Montserrat in the near future . . . VP2SV is on St. Vincent, and can be found on 14050 kc CW.

TOP BAND LADDER

(G3S-- and G3T-- stations only)

Final Results

Station	U.K. Counties	Countries
G3SED	88	26
G3TBJ	82	16
G3SYS	80	16
G3TTK	79	19
G3SJJ	69	13
G3TXS	66	11
G3SVW	60	10
G3SHY	60	6
G3TJD	53	11
G3TQZ	52	8
G3TZM	40	11

The Tables

Next month the **Five-Band DX Table (New Cycle)** is being started, reckoned from January 1, 1966, which will give the newcomers a chance to open on equal terms with everybody else. The present Five-Band DX Table (All-Time) will continue, but may not appear *every* month. It is becoming stagnant from lack of new support, and we hope the new one will get off to a flying start next month.

The G3S--/G3T-- Top Band Table appears for the last time herewith. This, together with the other tables, has been shorn of its dead weight (meaning people who have not reported at all for *five months!*). The new G3T--/G3U-- table will replace it next month, starting from January 1 for scoring in terms of Counties Worked and Confirmed.

Get your entries ready for the Five-Band DX Table *(New Cycle)* now! And let's hope that some new blood will turn this into the healthy, cut-and-thrust affair that the old Five-Band Table used to be, but no longer is.

Last-Minute Flashes

A 160-metre bulletin from W1BB (known as "Stew's Symposium") arrived at the eleventh hour, and we quote these short extracts: The First-Timers' mornings were a great success with not too much violation by the old hands . . . DL1FF worked JA6AK (first European QSO) on December 6 . . . G3SED and G3RPB raised HK4EB, December 5.

January 3-9 was an exceptional week for DX, especially late evenings. During January 5-6, W8ANO worked EI9J, G3LIQ, 3RFS, 3RPB and 3RAU . . . WA1CAG reported a QSO with G3RAU as "just like a local ragchew."

Stew says that U.K. stations should check for DX more often; he has heard groups of G's working each other as late as 0830, and they haven't even listened on his frequency, despite wide-open conditions.

HR3HH has moved QTH and will be on as HR2HH . . . G3SCP got through to W1BB with a transistor rig, thanks to a new QTH and aerial (inverted Vee with apex at 90ft.).

Forthcoming Tests: February 6, First-Timers (Europe); February 20, Open Test; March 6, First-Timers (W/VE).

Sign-Off

No room for more, unfortunately. We hope next month will be as lively. The next deadline is first post on **Monday, February 14**—earlier if possible—and don't forget those new Table entries. Address everything to "Communication and DX News," SHORT WAVE MAGAZINE, Buckingham, England. Until then, Good Hunting, 73 and—BCNU.

Miscellany

COMMENT ON THE TIMES

"In these days of semi-automatic, electronic and typewriter keys, we imagine that any monitoring station would be hard put to it to distinguish between a transmission made by the licensed operator and one sent by 'his friend in the shack' . . . Amateur Radio, we feel, is a leisure hobby, not a top secret defence project." *(GM3AXX, in "GM Magazine")*

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"Strange that so many amateur stations appear to be owned by more than one person: *We* are running 10 watts to an 807 . . . *We* have just put up a long-wire antenna." So writes G2HP in *QUA* (Cray Valley R.S.). But it can be even more ridiculous. Consider the really pretty picture conjured up by one of our favourites: "*We* are speaking closer to the microphone now." Perhaps the average operator is afraid to take full responsibility for what he is putting out, and doesn't want to incriminate himself by saying "*I* built this transmitter," or even "*I* am using a Super-Splasher 1066."

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The R.A.I.B.C. (Radio Amateur Invalid and Bedfast Club) are to be congratulated on having produced a complete R.A.E. course on tape. It occupies seven 5½in. reels, two-track, 3¾ i.p.s. G3KQK and Peter Bates of Lancing are credited with this tremendous effort, and members have several alternatives. They can send in the necessary blank tapes and receive them back "filled up" (either at the same speed or at 1⅞in., two-track or four-track); or the Club will furnish one reel per member, which will have to go back after each lesson for a refill. Whichever way you look at it, this is a very worthwhile project and reflects great credit on all concerned.

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"One of the reasons why the Ten Commandments are so well worded and to the point is that they were given direct and not passed as traffic." *("Auto-Call")*

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"The fortunes of all clubs and societies are naturally cyclic, and one does not have to look very far afield to find a case in point. Nevertheless, once any downward trend is suspected, it is always a wise precaution to examine the situation carefully, to make sure that it is due only to the normal ebb and flow of enthusiasm . . . usually the first signs are no more than a vague feeling among the regular supporters of the club that there is no real urgency to get things done." *G2HIF in "QAV"—A.E.R.E.*

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Heart-cry heard on 80-metre phone: "If all these commercial teleprinters knew how many of us were creeping along the cracks in between them, I suppose they'd spread out a little more and eliminate us."

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Comment on the proliferation of Certificates and Awards: A certain American publication printed, in its October issue, a "Free Certificate" worded "This is to Certify that this is a Free Certificate," and adding, after some pithy remarks, "It isn't good for anything—it's just Free!" How many of those things on the walls could be described in these terms?

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"Amateur Radio today is fast becoming a large group of radio operators, operating equipment which only reflects the size of their incomes. The art of constructing gear is fast becoming a thing of the past." *G3OGD in "Tamar Pegasus" (Saltash)*

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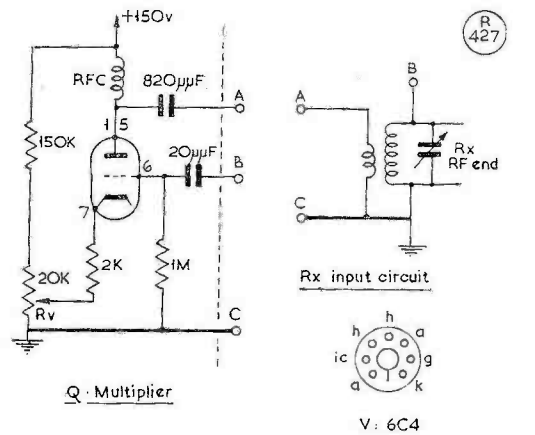
Rather intrigued by a report in a daily paper that the station at the Schoolboys' and Schoolgirls' Exhibition (GB3SBG) was "talking all over the



The circuit shown here, applicable to any receiver in which the "B" point is accessible, can have the effect of narrowing the Rx bandwidth at the input end. Thus, it will improve image rejection—particularly in the case of receivers having no RF stage before the mixer—and also signal-to-noise ratio.

It can be regarded as a sort of "front-end Q-multiplier" with input control by the variable resistor Rv. We have not tried this circuit, but it ought to work—and the idea is due to G3DWW, offered in *QRK-5*, the newsletter of the Wimbledon & District Radio Society.

world, with only £20-worth of Government surplus gear," one of our sleuths investigated. And what did he find? Why, a neat station, the basis of which was an SB-400 exciter and SB-200 linear—roughly £300-worth of transmitter alone!

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Do all your meters read what they should? So many surplus meters, of extremely high quality, happen to be calibrated to read the wrong things. We recently heard an amateur saying that his anode-current meter in the final read "Gallons per Hour"; we know of another whose grid drive is measured in "Oil—degrees C." And only yesterday we were told of a field-strength meter with the legend "Röntgens per hour." Some fascinating combinations could be built up—but it's advisable to know what the meters are *really* displaying, in volts or milliamps.

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The National Bureau of Standards in Washington, D.C. (home of the famed WWV) has recommended the adoption of "Hertz" instead of "cycles per second." So Kc/s will become Khz, Mc/s will be Mhz, and so on. Certain European countries already do this, of course. But some of the larger firms in the U.S.A. are already adopting it, and we understand that the technical press is to follow suit. (Quite right that the great Hertz should be honoured in this way, too . . . what did those anonymous cycles ever do for radio?)

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In connection with the Japanese walkie-talkie sets which are freely available in this country (operating on 26·965-27·225 mc), the press has once more done us a grave disservice by reporting that this waveband is "reserved for amateurs." This causes the general public and all those uninformed types who think *they* should be allowed to use these sets to feel a certain resentment against amateurs, who are presumed to be standing in their way. Our press relations organisation could be improved!

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Those writers who love to describe items of radio equipment as "sophisticated" *may* know what they mean . . . but they might be interested to know the dictionary meanings of that much-misused word. They are all uncomplimentary, not to say libellous—"rendered worthless by adulteration"; "perverted"; "vitiated"; "rendered artificial or false"; "corrupt"; "critical, cynical or blasé." Which one of these is implied when someone writes about a "sophisticated control system" or a "sophisticated dial mechanism"?

A YL's FIRST ENCOUNTER

WITH AMATEUR RADIO

Norma Gowen (XYL/G3IOR)

This amusing piece appeared in the Christmas issue of the "N.A.R.C. Challenge," published for members of the Norfolk Amateur Radio Club—it will find an echo in many a heart on the distaff side!—Editor.

IT was 1959 when I first met G3IOR, some two weeks before he left on the fateful GB3GD DX-pedition to the Isle of Man. I was young, innocent, and quite oblivious of the remarkable world of Amateur Radio . . . for a few hours, at least!

One evening when he saw me home, he told me of the untold pleasures that I had missed up till then; he told how man could speak unto man over vast distances, of how language barriers and international boundaries could be overcome, and how words of wisdom and scientific impact were exchanged between men of standing on opposite sides of the earth. He did, however, point out that he could only give me a mere outline of the fantastic world of his domain within the three hours of lecturing that he had devoted to the subject, and promised a practical demonstration, termed "a visit to the shack"!

I pictured in my mind the vast transmitter, the studio, the world-wide network of scientific communicators, the value of free and uninhibited converse between nations, and the brotherly pearls of speech that spanned the globe. I went to sleep that night dreaming of the revelation yet to come.

"This is the shack" said G3IOR, as he swung the shattered door open on its creaking hinges, and exposed an array of rusty and broken metalwork that made any car dumpyard look like a new Rolls by comparison. I gazed in wonder at the vast array of numbers on the many postcard-sized pieces of paste-board around the walls, some of which, by virtue of a different permutation of letters and numbers, so it was explained, were placed in positions of merit and pride.

". . . And this is the transmitter" he said, blowing the cobwebs off a biscuit tin with numerous inverted jam-jars within its interior. "I will press the big switch" he said, and promptly flicked some dozen or so assorted knobs protruding from yet another vast bank of rusty iron. The jam-jars took on a dull red glow. Suddenly a deafening noise filled the room. Ear-shattering squeaks, clicks, growls and buzzes assaulted my ear-drums. "Sounds like twenty-one is open" he shouted above the roar from the loudspeaker. I nodded agreement, assuming that these words were obviously part of the ceremony, thinking that it would be best to humour him rather than have him prove the point by a possible increase in the volume.

By carefully rotating one of the many dials, he found a position where the onslaught of sound was

almost bearable, and pointed out that this was a clear frequency, upon which he would call CQ. "Who's Sea Queue?" I bawled. "Anybody who answers" he grunted, still spinning knobs and pressing buttons for all he was worth. When a few more knobs were pressed, the noise abated, to be replaced by a low hum, and the ticking of lots of little pointers moving from left to right across a range of further numbers. The jam-jars went a bright blue. G3IOR picked up a tobacco tin he called mike, and, to the accompaniment of the ticking meters yelled ". . . CQ CQ CQ CQ CQ DX 15 metres . . . "

"What's a metre?" I asked, "That is" he replied, pointing to one of the little cases with pointers registering numbers. Actually this particular one had given up, and had wound its little hand twice round the end-stop. ". . . CQ CQ CQ 15 metres DX" he repeated *ad nauseum*, until he was hoarse enough to stop, and the jam-jars had all but melted, when he asked somebody to "K please". Sure enough, somebody did K. From the midst of the roar which had returned again, a voice was heard repeating some letters. It was George III, a Mexican doing the Foxtrot in Quebec, it said. Then, lots of numbers and letters followed. The clever code used would have fooled the Man from U.N.C.L.E. "You are 5 and 9 plus 10 dB on my S-meter, with FB mod at 95 per cent, but QRM at S7 and perhaps a little QSB and QRN as well".

"Roger Sid" said the unperturbed G3IOR, "I will QSY 10 HF. C U 21265 kc". Eventually, after much switching and pointer rotation, and more number-on-meter scrutinizing, communication was established.

"Hrd VR6TC on 21055 kc at 0730 GMT, and QSO'd VK9AD on 21320 kc at 1130 GMT on A3, 5 and 9 out, 5 and 7 in" said Roger-Sid.

"Wkd CEØZA on 21030 CW at 2345 GMT on my 137 ft. long wire with 300 ohm feeder" said G3IOR. For the next two hours, Roger-Sid and G3IOR exchanged just about every combination of letters possible, and after adding 73 to the total, said that they hoped to be able to repeat it again the next evening. Roger-Sid wished 88's to the YL in the shack. I wished Roger-Sid 172's, hoping to be thought generous but not over-benevolent. The switches were clicked around again, the jam-jars cooled to black, and the silence was once more golden.

"Where was Roger-Sid" I asked, amazed at the fluent English of a Mexican Foxtrot dancer in Quebec. "Belvoir Street" said G3IOR, "just round the corner".

After six years, as far as I can see (or rather hear) the conversation is still the same perplexity of numerals and letters, at all hours of the day and night. There is only one difference . . . after six years of indoctrination I am a little more familiar with some of the terms, and can now respond to a QSP of 88's. I have learned to accept and live with the strange ritual. At least I always know where G3OIR *is* . . . I can always hear it ringing in my ears, however loudly I turn the domestic receiver on.

WINTER ISSUE "CALL BOOK"

This is now available from us, in both versions: "U.S.-only Listings," 45s., and "DX Listings (rest of the world)," 27s., or the two together, covering the Amateur Stations of the World, at 67s. 6d. post free. The U.K. section of the *Call Book* appears in the "DX Listings" edition, and includes all entries in our regular "New QTH" page up to October, 1965. Thus, if you have had your callsign/address published by us in any month up to and including October last, you are in the world directory of radio amateurs, and can use the abbreviation *QTHR*, meaning "my address is correct in all current Call Books."

SOME MOBILE RALLY DATES

Dates so far notified for the 1966 Mobile Rally Season are as follows: *March 20* and *April 24* (RSGB bookings); *April 24*, Trentham; *May 8*, Thanet; *June 12* and *September 11* (RSGB); *September 16-18*, Knokke, Belgium; and *September 25*, Harlow. We shall be glad to list booked dates as they are received, and Rally organisers are advised to get in early, so that as far as possible clashes can be avoided.

INDEX—VOLUME XXII

As in previous years, the next (March) issue of SHORT WAVE MAGAZINE will include, as a free loose supplement, a complete Index to Vol. XXIII, which concludes with this issue.

"RTTY TOPICS"

The next "RTTY Topics," due for this issue, has had to be held over for reasons outside our control, and will appear next month.

OBITUARY

We very much regret to have to record the death of Jack Dobson, G3HTU, of Canterbury, Kent, at the age of 47 years. He had been regularly active ever since being licensed.

INTERNATIONAL I.E.A. EXHIBITION

Always one of the big events in the exhibition calendar, this year's International Instruments, Electronics and Automation show will be held at Olympia, London, during the period May 23-28. More than 800 exhibitors are expected, from many countries, with some 70 firms representing America alone.

SCOUT DX/QSO PARTY FOR 1966

The ninth Jamboree-on-the-Air, when Scout stations all over the world are active on all bands in every mode, is arranged for the weekend October 22-23. It is hoped that the U.K. participation will again be an increase on the previous year's showing.

For £100's worth of bargains, see Readers' Small Advertisements on pp.760-768 of this issue

DISCUSSING SINGLE SIDEBAND

FILTERS FOR SSB—HOME CONSTRUCTION AND ALIGNMENT —ASSESSING SB SIGNALS— SELECTING CRYSTALS— MEASUREMENT OF FILTER CHARACTERISTICS

Part III

B. A. WATLING (G3RNL)

This article will be found to contain a lot of very useful practical information on the subject of filter construction. Our contributor also discusses the selection of crystals, and a simple method of checking the performance of home-built filters. Much of this is entirely new material in the amateur context. Previous articles in this series appeared in our issues for December and January.—Editor.

WHAT factors govern the choice of frequency at which the original sideband signal is generated ? A lot of it is personal preference and of course the availability of parts. 455 kc is a very popular choice, mainly because the standard IF transformers can be used, with either the Japanese (Kokusai) or the American (Collins) mechanical filters. The Japanese filter has now come down in price and is a worthwhile buy. It does save all the frustrations of building your own. However, a home-brew filter is the cheapest and if you have the facilities for plotting bandpass characteristics then this is the answer. You could get your feet wet on SSB by using just a simple half-lattice filter with only two crystals. At some later date this could be improved with a more elaborate filter, such as two half-lattice sections in cascade. This arrangement will give you perfectly adequate sideband rejection.

For generating the original sideband signal 9 mc is also a useful frequency. A commercial filter, made by McCoy, is available at roughly the same price as the Japanese mechanical filter. A home-made 9 mc filter using only four crystals is also a very worthwhile task. Various other frequencies can be used to suit your own circuit; one previously mentioned is 8 mc. A sideband signal at this frequency when mixed with a VFO running 6 mc to 6·5 mc produces 160 metres and 20 metres.

Things that I consider with my own rig is, first, to keep the VFO frequency as low as possible. This is why I like using 455 kc. For 160 metres the VFO runs at 1345 kc to 1545 kc and for 80 metres from 3045 kc to 3345 kc. For all-band operation the 80 metre signal can be converted. Some designs do three conversions to all bands. The first conversion is to a fixed IF of about 2 mc, then to a tunable IF of 5 mc to 5·5 mc and from there to all bands. This tunable IF is a very useful frequency to play with. Two-band operation can be achieved with one crystal, *i.e.* an USB signal at 5 mc to 5·5 mc added to 9 mc provides USB on 20 metres and substracted from 9 mc gives LSB on 80 metres.

Fig. 1 opposite shows four different configurations for SSB transmitters.

Right; let's look now at the requirements for a filter. It must have a bandwidth, at the points 6 dB down from the peak, of about 3 kc. The steepness of the sides of the filter curve are also very important. This steepness is defined by the "shape factor," *i.e.* the ratio between the bandwidth at 60 dB down and the bandwidth at 6 dB down. A shape factor of 2:1 is what to aim for; even better, if possible. This figure (2:1) is met by a filter having a 3 kc bandwidth at 6 dB and a 6 kc bandwidth at 60 dB.

How about this figure of "3 kc for the 6 dB" bandwidth ? The narrower the bandwidth is at these points the more of the higher audio frequencies you will lose. A lot of rigs have bandwidths of 2 kc and this is all that is needed for adequate communications quality. It also means that three stations with 2 kc bandwidth take up only as much room as two stations having 3 kc bandwidth. This does not make much difference to you when you are transmitting but when you come to work a weak DX station with a strong 3 kc wide signal 2·5 kc away it does matter !

Before we go on to some details of filters it will be as well to consider what sort of figures one should aim for as regards unwanted sideband and carrier suppression. Sideband suppression should be at least 25 dB down and one should aim for 40 dB or more. Even if you do have 40 dB of suppression your locals on 160 metres will say "Your signal isn't any narrower than my AM transmission." If your signal is reported as being S9 + 40 then it isn't

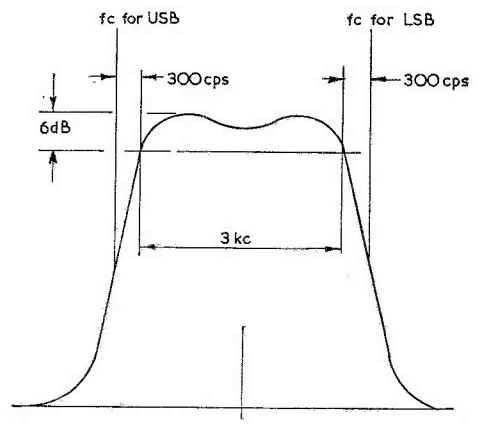


Fig. 14

On p.663 of the January issue, Fig. 14 was shown slightly incorrectly. The sketch above puts matters right, and should be noted by those following this feature.

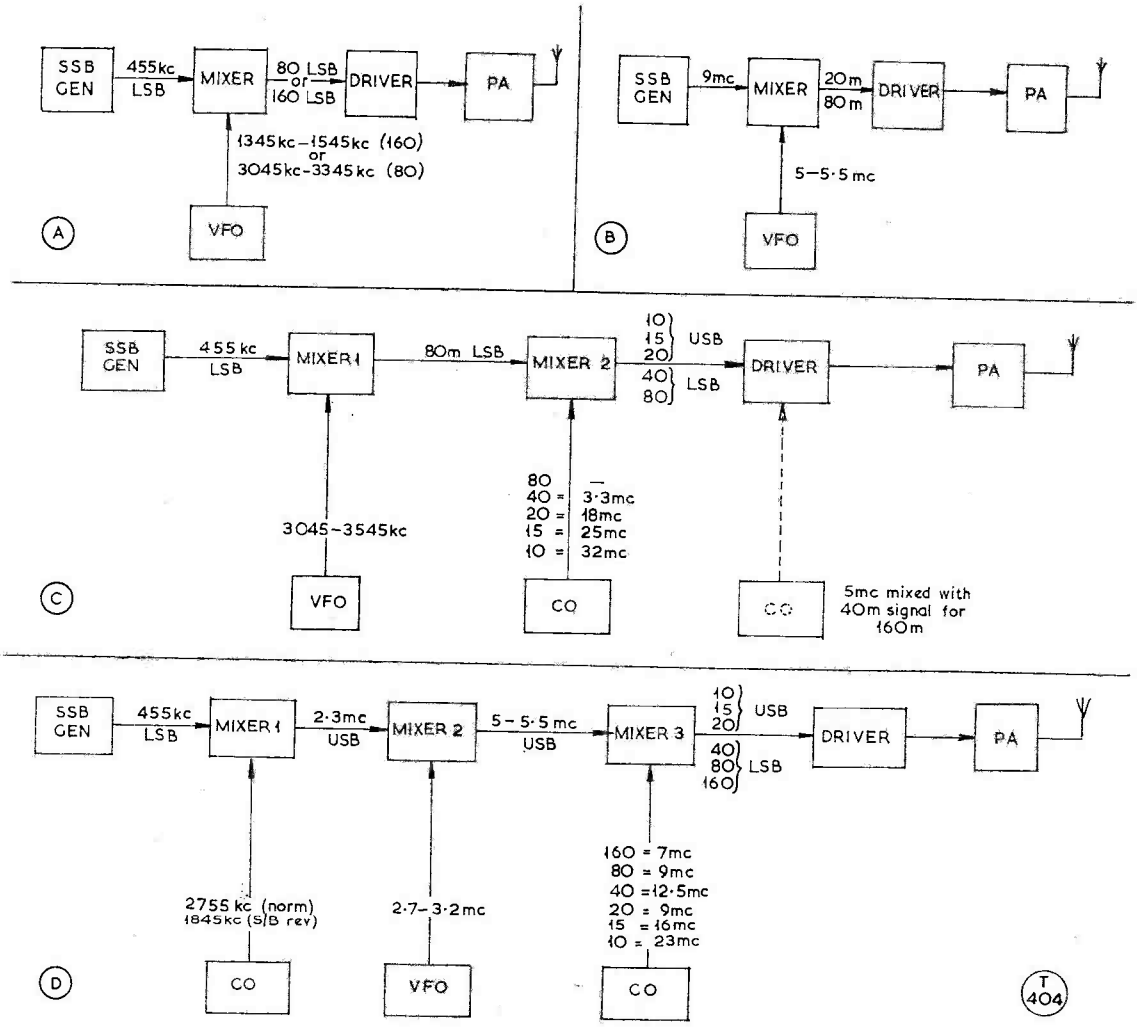


Fig. 1. Some typical configurations for SSB transmitter layouts. (A) Single-band transmitter for 80 or 160 metres. (B) A two-band Tx for 20/80m. (C) Five or six band transmitter with automatic Sideband selection. (D) A six-band Tx with automatic Sideband selection plus the facility for switching sidebands without changing frequency.

surprising. Your unwanted sideband will be S9. How about on-the-air sideband suppression reports? These will no doubt be very misleading and conflicting. Why is this? Several reasons: First, how many stations have accurately calibrated S-meters? They say "Well, your wanted sideband reads S9 and your unwanted reads S2 so that means that your suppression is $7 \times 3 = 21$ dB." It could mean almost anything! Even if his S-meter is calibrated correctly, if the filter in his Rx is not better than yours then this will cause errors in his measurements. Let's see how this happens. Diag. 1 p.738 shows what things look like when the filter in the Rx has an asymmetric shape when receiving your wanted sideband.

Then he switches over to your unwanted sideband.—Diagram 2.

It was OK when he was receiving your wanted SB because the steep side to his filter rejected whatever there was of your unwanted. What about when he tries to receive your unwanted? His filter also accepts some of your wanted so that his AGC will operate on, and hence his S-meter will read a combination of the two. (How can I find out, then?) Well, you could do this on your own station receiver providing:

(a) that you have a filter whose bandwidth is say 1 kc wide or less at about 40 dB or more down, and

(b) that your S-meter calibration is known.

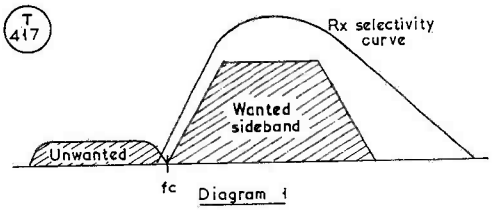


Diagram 1

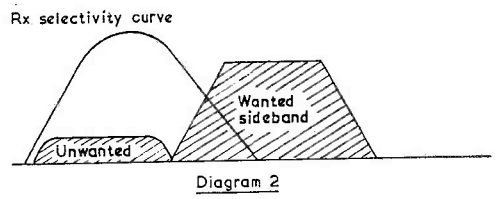


Diagram 2

It doesn't have to be calibrated accurately as long as you know what each S-point means.

Now if you take the output from your exciter, preferably immediately after the first mixer, to the Rx and inject a 1 kc tone (pure sine wave, please) into the microphone socket you will be able to find the two frequencies on your receiver. From the readings on your S-meter you can calculate sideband suppression. You should also be able to measure carrier suppression this way but you must know what level of signal, at the point you are taking off to the Rx, will drive the PA to maximum. Turn up your audio gain to that level and then measure the difference between wanted sideband signal and carrier signal.

The reason for taking the signal to the Rx *after* the first conversion is to prevent any stray signal field leaking into the receiver, causing misleading results.

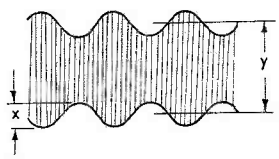
You can get a rough guide from an oscilloscope. Take the RF output from your exciter to the 'scope. Now with absolutely perfect suppression an audio tone fed into the microphone socket will appear as a single frequency RF output. If another frequency is present the 'scope trace will have a ripple on it. The ratio between the peak-to-peak level of the ripple, and the level between means of the top and bottom ripple, will give you an approximation of sideband suppression. (*See* Fig. 2.) Two words of warning : first your carrier suppression must be good (60 dB or more) otherwise this too will show up as a ripple on the trace. Secondly, make quite sure that you're not overdriving any stage. If a stage is driven well beyond the point of saturation (where any further input does not increase the output) then even a DSB signal will look like pure CW.

One other misleading report you may get on the air is that of bandwidth. Fig. 3 will illustrate the reason for this. When giving sideband reports you should subtract from the indicated figure the bandwidth of the receiver filter.

You may wonder why so much has been said about what you should do once you've got your filter, without getting down to the meat of things. Well, many of us (including the writer) are so eager to get on with things that once we've read how to make it we don't bother about how to *use* it. In an attempt, which it is hoped isn't futile, to overcome this things have been done the other way round. So ; here it comes !

Low Frequency Crystal Filters (400 kc to 500 kc)

What properties do quartz crystals have that make them suitable for use in filters ? A very high Q and two resonant frequencies. Fig. 4A shows the equivalent circuit for a quartz crystal. You will see how the two resonant frequencies are obtained. Firstly, the series resonant frequency (called the *zero* or just the resonant frequency) due to L and C. This is the point where the impedance between the terminals of the crystal is at its minimum. Secondly, the parallel resonant frequency (called the *pole* or antiresonant frequency) due to L, C and Co, and this is the frequency at which the impedance between the terminals is at maximum. Fig. 4B is a typical plot of reactance against frequency showing these two points *fr* and *fa* (sometimes denoted by Fz and Fp).



y/x	Approx. sideband suppression
10	20 dB
15	24 dB
20	26 dB
30	30 dB
50	34 dB
100	40 dB

T 405

Fig. 2. Method of approximating Sideband suppression of a tone-modulated transmitter by displaying its output on an oscilloscope.

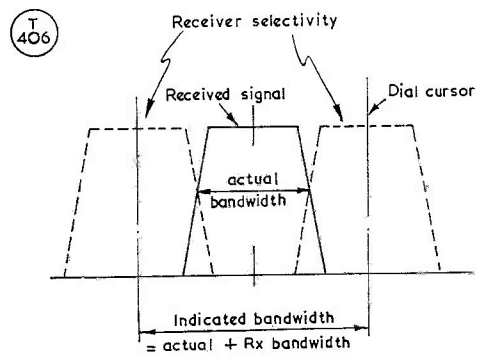


Fig. 3. When attempting to give, over the air, reports on the bandwidth of a Sideband signal, subtract from the indicated figure the bandwidth of the receiver filter.

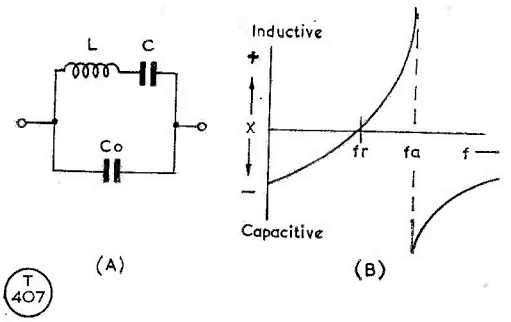


Fig. 4. At (A) is shown the equivalent circuit of a crystal. (B) is a reactance-against-frequency plot of a quartz crystal.

The object when designing a filter is to manipulate the poles and zeros so as to produce the required flat top and steep sides. An example of this using two crystals is where the pole of the lower frequency crystal is at the same frequency as the zero of the other. These then will cancel and produce a flat top. Fig. 5 shows the theoretical shape of the passband, and it will be seen that the bandwidth at the top is the difference between the series resonance of crystal A and the parallel resonance of crystal B. The snag with LF crystals around 400 kc to 500 kc is that the poles and zeros are only 200 c.p.s. or so apart, which would mean a bandwidth of about 400 c.p.s., and that isn't much good ! However, there is a solution. If we shunt the crystal with inductance the original pole and zero can be spread a little and another parallel resonant frequency introduced, as shown in Fig. 6. By using these facts a lattice filter was derived as shown in Fig. 7A and simplified to the half-lattice configuration shown in Fig. 7B.

A practical arrangement of the half-lattice suitable for use in the sideband generator described on p.664 of the January issue is shown in Fig. 8. X_2 should be chosen such that its frequency is about 2 kc higher than X_1. When buying surplus FT-241 crystals for this job consult Table I for suitable pairs, designated by their channel numbers (which is how the crystal case is often marked). To work out the

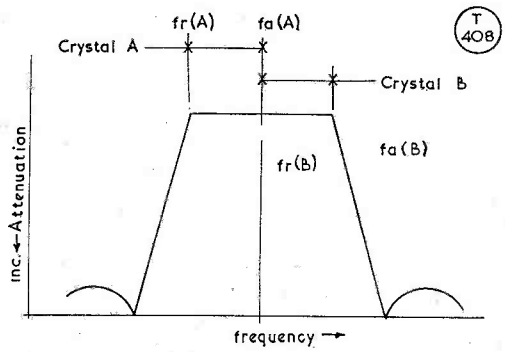


Fig. 5. The theoretical attenuation curve of a filter using two crystals, where the "fa" of the lower frequency is the same as "fr" in the higher frequency crystal.

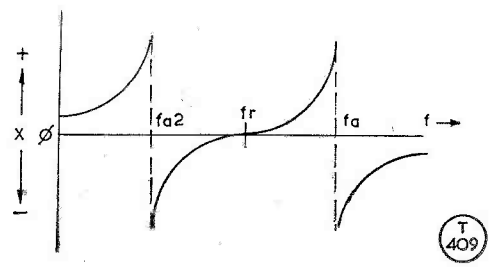


Fig. 6. The reactance/frequency plot of a quartz crystal shunted by an inductance — see text.

actual frequencies from the channel numbers proceed as follows : The *three* digit channel numbers are 72nd harmonic types and the number, *e.g.* 356, means 35·6 mc. Dividing that by 72 gives the fundamental, in this instance 494·44 kc. The *two* digit channel numbers are 54th harmonic types. If you take these two digits, *e.g.* 62, add a 2 to the front, (2)62, then the frequency of the 54th harmonic is 26·2 mc. The fundamental can be worked out by dividing this by 54, giving 485·19 kc (*see* p.742 for Table I).

Filter Alignment

Referring again to Fig. 8, VC1 will be about 2 $\mu\mu$F and can be made up by using two pieces of insulated wire, about an inch or so long, twisted together. It must be placed across the higher frequency crystal. T_1 is a standard 465 kc IF transformer with the primary modified by replacing its tuning capacitor with two others of twice the value, or values, such that they will tune it to the frequencies of the crystals used. Alignment of the filter can be simplicity itself. If you have a BC-221 and a valve voltmeter a very accurate plot of the curve can be made. Don't be put off ! It can be done with less. A set-up used at G3RNL is a home-built oscillator which, by adjustment of the coil slug, will cover about 400 kc to 500 kc. Fine tuning of about ± 6 kc either side of the set frequency is achieved by use of a tuning condenser with a slow-motion calibrated dial on the front panel of the unit. The only essential thing here is that the oscillator must be very stable. Obviously, calibration of this unit isn't easily possible for all settings of the coarse frequency control. The method of overcoming this at G3RNL is a little fiddly but quite simple. The

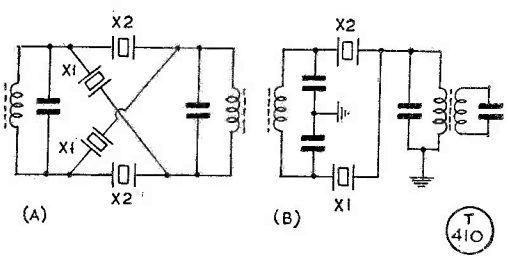


Fig. 7. Showing at (A), a full-lattice crystal filter, and at (B) a half-lattice filter.

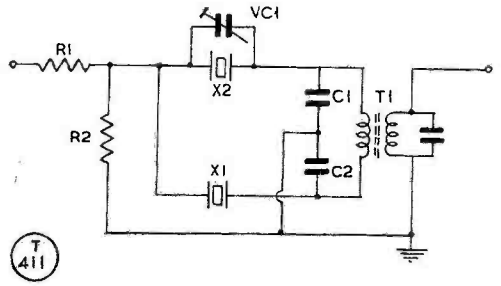


Fig. 8. Practical circuit for a half-lattice filter suitable for use in the fixed-frequency Sideband generator shown on p.664 of the January issue of "Short Wave Magazine." For proper operation, crystal frequency X2 should be about 2 kc higher than X1. Suitable pairs can be extracted from the data given in Table I on p.742.

output from this low frequency oscillator goes first to the filter under alignment and then to a mixer-oscillator which, with the use of almost any frequency crystal, will convert the LF signal to a frequency suitable for finding on the station receiver. Fig. 9 illustrates this. The station frequency standard is a Class-D Wavemeter and although this is not the most accurate device one can use, it is just about adequate as only relative frequency is required. The fine tuning on the filter alignment unit is set to mid-scale, then tune the receiver to the spot on the dial where the crystal oscillator *plus* or *minus* the centre frequency of the filter will appear, and adjust the coarse tuning of the LF oscillator until a beat appears on the receiver. (Make sure this is the correct one and not a harmonic of the LF oscillator.) The exact frequency of the LF oscillator can now be calculated by measuring, with the Class-D Wavemeter, the resultant frequency and subtracting this from (or subtracting from it) the frequency of the crystal oscillator. By swinging the fine tuning either side of mid-scale and measuring the resultant frequency the dial can be calibrated in kc either side of centre. This calibration will, however, only be reasonably accurate for that particular setting of the coarse tuning.

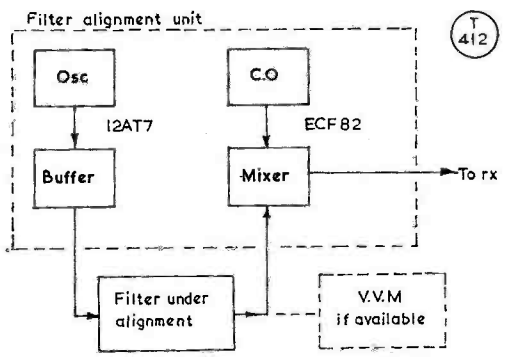


Fig. 9. Block diagram of a suitable set-up for LF filter alignment. The derivation of this arrangement is shown in detail in Fig. 11.

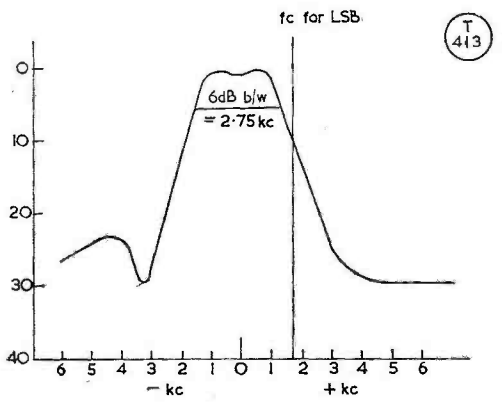


Fig. 10. Plotted passband of the half-lattice filter shown in Fig. 8, when aligned for LSB. The attenuation at 300 c/s is 19.5 dB; at 500 c/s, 22.5 dB; at 1 kc, 27.5 dB; and at 1.5 kc, 28.5 dB. See text.

Alignment Procedure

Now in order to align the filter you require a valve voltmeter or failing that the station receiver's S-meter can be used. The procedure adopted is as follows. First, detune as far as possible the cores of T_1. Swing the oscillator over the passband of the filter and you will find two peaks. Tune to the absolute bottom of the dip between the two peaks and then adjust the primary and secondary of T_1 for maximum S-meter (or valve voltmeter) reading. This is all that should be needed on the T_1 adjustment. Swing the oscillator over the passband and check that the top of the curve is fairly flat. If not, slight further adjustment of T_1 primary may be needed. A dip of 3 dB can be tolerated but anything more than that needs ironing out. Adjustment of VC1 is carried out by tuning the oscillator down the side of the passband that the carrier oscillator will be placed, *i.e.* the HF side for LSB, to a point about 1·5 kc beyond the 6 dB point, then adjust VC1 for minimum reading. Check the top of the passband again and if all is well—seal the core in the primary of T_1. The secondary core will probably need peaking for maximum when the filter is put into the rig. That's it!

Measuring Bandwidth

The bandwidth can now be worked out by tuning each side of the passband to the points 6 dB down from the peak and measuring the frequency difference as indicated on the alignment unit dial. A typical plot of the passband that can be achieved is shown in Fig. 10, while Fig. 11 is the circuit diagram of the filter alignment unit used at G3RNL. For a really comprehensive and versatile unit it could be extended by building in a valve voltmeter. But even just as it is the device can be quite useful. Several crystal sockets of differing types are fitted to the front panel and it can, when not being used for filter alignment, function as a marker oscillator by plugging in the appropriate crystal. The unit can also be adapted

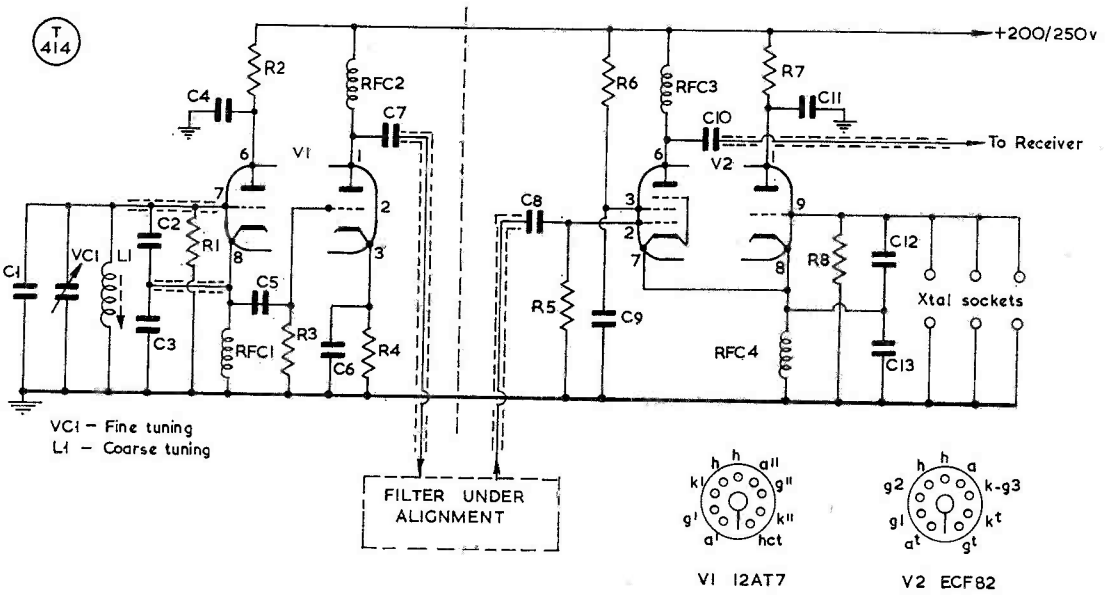


Fig. 11. Circuit of the set-up used for aligning the LF filters. Values are: C1, 150 $\mu\mu$F, silver mica; C2, .001 μF, s/m; C3, .002 μF s/m; C4, C6, C9, C11, .01 μF; C5, C7, C8, C10, 150 $\mu\mu$F; C12, 25 $\mu\mu$F; C13, 250 $\mu\mu$F. R1, R3, R5, R8 47,000 ohms; R2, R7 10,000 ohms R4 2,200 ohms; R6 100,000 ohms. RFC's 1-4, 2.5 mH RF chokes. Tuning VC1, 100 $\mu\mu$F. Valves V1, 12AT7; V2, ECF82.

for aligning HF filters by plugging in a crystal, or by feeding the output from a stable signal generator into the crystal socket, such that its frequency when combined with the LF oscillator comes out to the HF filter frequency.

Getting back to the half-lattice filter of Fig. 8, the carrier oscillator frequency must be decided upon. For LSB it should bt 300 c/s higher than the 6 dB point on the HF slope of the curve, as indicated in Fig. 10. A rough estimate of this frequency is 600 c/s higher than the highest-frequency crystal used in the filter. For USB the frequency chosen should be the equivalent position on the other side of the curve; also VC1 should be adjusted for that side. Theoretical sideband attenuation for telephony will be about 25 dB, which is just adequate. Slight improvement of sideband attenuation can be achieved by placing the carrier frequency further down the slope but it's not really worth it due to the reduction of the lower frequency region of your speech. (As one advertiser puts it "like voices from outer space.")

A few words of warning here when constructing these filters. Those described are a result of attempting to cut as many corners as possible. Don't try to cut any more, such as leaving the primary of T_1 standard and just adding two 10 $\mu\mu$F capacitors for C_1 and C_2. One other corner people try cutting is using octal valve holders instead of *pukka* crystal sockets. This was tried at G3RNL and did not give as good a shape as that shown in Fig. 10.

The filter as described is probably the easiest possible for home construction. The only other way which is easier is by using a commercial filter. The disadvantage here is that the cheapest is about 12 times as much as this simple design.

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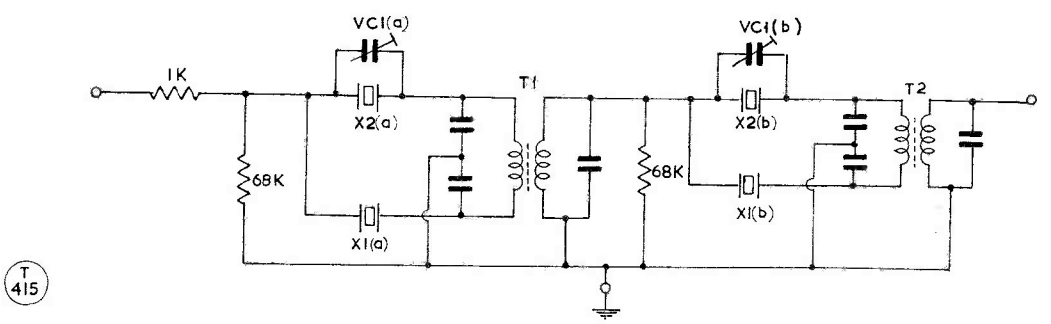


Fig. 12. The question of the filter arrangement to use can be complicated. There are various possible arrangements, as discussed by G3RNL in his text. The layout here is for two half-lattice filter sections in cascade.

TABLE I

The pairs of crystals suitable for use in the 1/2-lattice filter of Fig. 8.

Approximate Centre Frequency (kc)	X_1	X_2	Approximate Centre Frequency (kc)	X_1	X_2
402·5	289	18	452·5	325	45
403	17	291	453	44	327
408	293	21	458	329	48
408·5	20	295	458·5	47	331
413·5	297	24	463·5	333	51
414	23	299	464	50	335
419	301	27	469	337	54
419·5	26	303	469·5	53	339
424·5	305	30	474·5	341	57
425	29	307	475	56	343
430	309	33	480	345	60
430·5	32	311	480·5	59	347
436	313	36	486	349	63
436·5	35	315	486·5	62	351
441·5	317	39	491·5	353	66
442	38	319	492	65	355
447	321	42	497	357	69
447·5	41	325	497·5	68	359

Figures under X_1, X_2 headings are FT-241 channel numbers. For method of calculating exact frequencies, see p.739.

An example of how quick and easy this filter is to align is that the curve of Fig. 10 was from a filter aligned and plotted in about 15 minutes.

How about the carrier crystal? You probably will not find a channel number at exactly the required frequency. By selecting one which is a little LF of the required frequency you can edge-grind this using a paste made up of household *Vim* and *Three-in-One* oil on a piece of glass. Take hold of the crystal in the thumb and forefinger and stroke each edge of the crystal to the same degree. You should be able to shift the crystal about two or three hundred cycles. After each session, before checking its frequency, wash the crystal in carbon tetrachloride. *(Thawpit*—again !) For crystals which are too high in frequency you can either try copper plating with a jam jar of water, a piece of copper wire and a battery; or for shifting by very small amounts try a touch of lead pencil on the crystal.

The filter just described provides the minimum

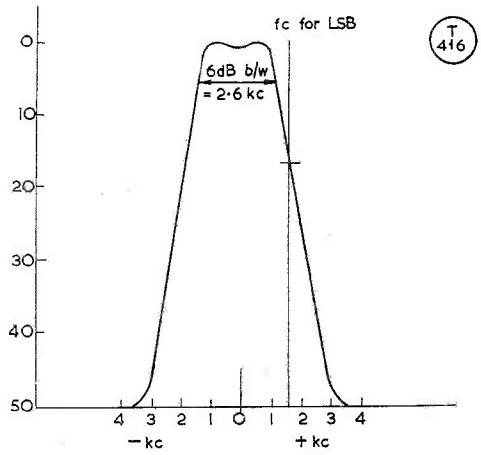


Fig. 13. The passband to be expected from two half-lattice sections cascaded as in the circuit of Fig. 12. The Sideband attenuation could be: at 300 c/s, 24 dB; at 500 c/s, 31 dB; and at 1 kc, 50 dB.

acceptable sideband suppression. For an improved signal two identical half-lattice sections can be cascaded as shown in Fig. 12. The alignment of this filter is best carried out one section at a time. The passband to expect is shown in Fig. 13. Theoretical sideband suppression is approaching 60 dB at some frequencies but this is very difficult to achieve due to the unwanted sideband leaking around the filter. Careful construction with a screen between sections and the filter components in a straight line will produce perfectly satisfactory results. The carrier crystal frequency should be selected by the same method as used in the single half-lattice section, *i.e.* 300 c/s higher for LSB or 300 c/s lower for USB, from the appropriate 6 dB point.

The other important point to make is that if, having followed this discussion, you will learn a great deal if you now set about making a filter and get a good curve out of it.

(To be continued)

AMATEUR LICENCES IN ISSUE

We are informed by the Post Office that, as at December 31, 1965, the totals of current U.K. amateur licences were as follows: Sound A—11,537; Sound B (VHF only)—312; Sound A (mobile)—1,962; Sound B (mobile)—3; Amateur TV—173. For the eleven months since the end of January last year, these figures show a nett gain of 522 in the Sound A (full licence) category; of 148 in Sound B (the G8/3's, VHF only above 2m.); of 213 in the Mobiles; and of five in amateur TV.

The most significant increase is in the G8/3's, in that they have nearly doubled in the year. The percentage of U.K. amateurs licensed /M of the total licences in issue has also increased, to about 17%.

CONTROL CIRCUIT FOR QUICK CHANGE-OVER

SEMI-AUTOMATIC BREAK-IN

G. V. FARRANCE (G3KPT)

THE writer attempted to operate during MCC using a normal rotary-switch changeover system —much to his disgust he found himself missing out on stations using full break-in.

After a few sketchy circuits, and experiments with relays, the system shown here was evolved and is found to operate very satisfactorily. This circuit is not the ideal method for BK systems but is certainly better than any sort of manual control. The transmitter in use is the *Codar A.T.5*, but the circuit could be applied to most transmitters with little modification. For instance, the *Heathkit DX-40U* would only require one contact in the centre tap of the mains transformer.

A 50v. sec. transformer supplies a bridge rectifier to give a nominal 50v. DC smoothed by C1, which of course lifts the DC level, but the relays will cope with this for several hours continuous running without detrimental effects.

When the key is pressed RLA and RLB energise together, though RLB may be a few milliseconds later than RLA. A single dot is not sufficient to energise RLB, but if you start with a dash, everything follows correctly. When energised, RLB will be held in continually, whilst RLA will follow the keying accurately, controlling the transmitter *via* the filter C4, R3, Ch., C5) which is specifically designed to give a good T9x note on the A.T.5.

It is assumed that the keying would be at no less than 8-10 w.p.m., or else the transmitter will switch off. The relay RLB de-energises approximately half to one second after RLA is de-energised.

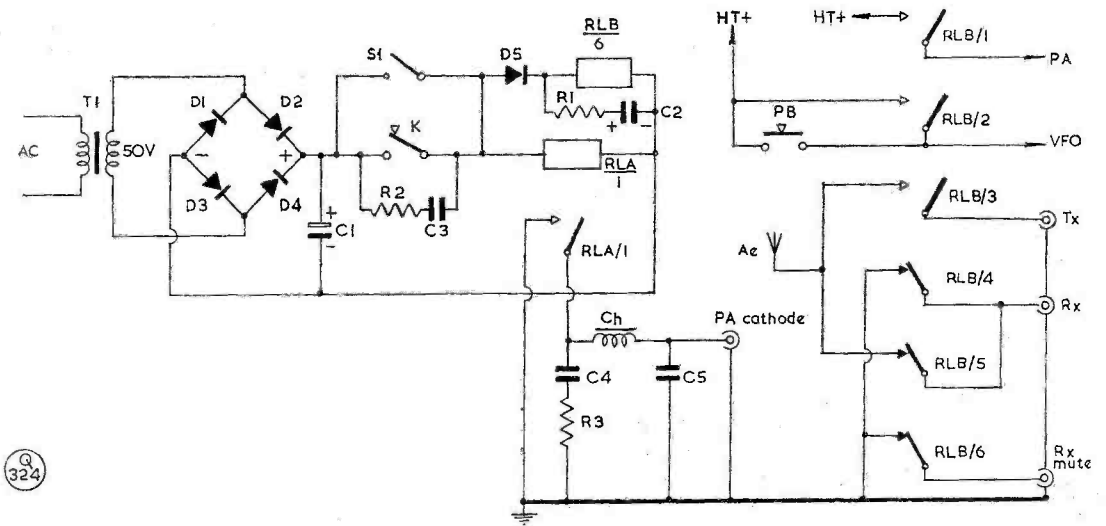
Switch S1 energises the relays permanently to allow for Phone operation, but the filter jack plug must be removed from the transmitter as it effects the modulation. The diode D5 in series with RLB prevents the time constant R1, C2 from affecting the operation of RLA. The R2, C3 network is to prevent any arcing across the key contacts. Relay RLB is an H10 (G.E.C.) with two normally-open contacts and four normally closed. The original coil was removed and replaced with one having a one-inch slug at the nose end. The residual stud of the armature was also filed off. These two alterations, together with the R1, C2 time constant, govern the long fall out time of RLB, which can be increased or decreased by altering the values of R or C. But it will be found that if R is decreased too far, arcing will occur across the RLA contacts.

Table of Values

Quick Change-Over Keying Circuit

C1, C2	= 100 μF, 350v.	RL2	= Heavy-duty relay, 2000 ohms
C3, C4	= ·01 μF, 300v.	D1-D5	= Lucas DD006, or similar
C5	= 2 μF, 300v.	Ch	= 100 mA LF choke, 2 Hy
R1	= 1,800 ohms, ½-w.		
R2, R3	= 56 ohms, ½-w.		
RL1	= High-speed relay, 2000 ohms		

Notes: T1 is a transformer giving 50v. at 60 mA. K is the keying position. PB is the netting switch. Relays can be any suitable type.



The circuit suggested by G3KPT, which can give near break-in working with transmitters like the Codar A.T.5. It is equally applicable to almost any other transmitter, and was evolved to overcome operating difficulties experienced in the last MCC. All values are given in the table.

TYPEWRITER CW SENDER

CIRCUITRY AND DESIGN CONSIDERATIONS FOR AN AUTOMATIC MORSE TRANSMITTER USING PUSH KEYS

E. G. HARRISON, M.Sc. (G3NWT)

Though this article may have little appeal for the competent CW operator satisfied with his ability and performance on whatever type of Morse key he favours, it is nevertheless of considerable interest as an example of how the principles of solid-state logic circuitry can be applied to the practical problem of forming the characters of the Morse Code, cleanly and accurately merely by pressing the appropriate key. It only requires a little thought to realise that to do this electronically could be a somewhat complex process. Even if the treatment does seem difficult to follow at first reading, it is well worth careful study — if only as an intellectual exercise — because the author has succeeded in reducing the problem to practical proportions. The cost of construction is very low and by making up a few of the circuits he discusses, an understanding of how they work will quickly be grasped. The apparatus will send good Morse at almost any speed at which the keyboard can be operated — but it doesn't read the stuff!—Editor.

DIFFICULTIES with CW divide fairly equally between sending and reception. Thus, it may be thought obvious that automatic aids to sending only go half way to solving a problem that most amateurs live with to some extent (even though they may have by-passed it by confining themselves to Phone).

Or is it so obvious? If the purpose of the sending aid is to improve the *accuracy* of CW, and not merely to make it less of a chore, then much good can be wrought at the receiving end, too. Few, however gifted with the key, can attain the precision of timing, rhythm and "flow" that characterises machine sent Morse. This may be devoid of the personality style and so forth that a human operator can put into CW, but no one can dispute that it's the easiest Morse to read.

This standard of telegraphy can be at anyone's command with a Typewriter Sender—press a key inscribed with the required character and this, impeccably formed, comes out.

Since the advent of solid-state logic circuits such devices have come very much more within the range of amateur construction. The Sender to be described is an all-semiconductor design using transistors of the "unmarked, untested" variety, freely available at very low cost. Over 95 per cent of these were found adequate to the uncritical requirements; the same transistors were used as diodes.

The aims set out and fulfilled in the design were as follows:—

General Considerations

Variable speeds, continuous or switched control: Independent adjustment of dots, dashes and spaces: Only momentary operation of keys necessary; this is vital to achieving correct "flow" in Morse at reasonable speeds.

Key cut-off; whilst a character is under way another key may be pressed without affecting it. Automatic inter-character space; this is bound up with the key cut-off as will be explained later. No relays; output that will work a transistor oscillator or power switching device direct. The basic cost of components, including ex-P.O. push-button strips for the keys but without tagstrips (or *Veroboard*) and case work is about £5-£6—and only an AVO-8 was used in the development.

Production of Basic Intervals

Single monostables are used for dot and dash generation and for providing the inter-element and inter-character spaces. These are referred to respectively as MSd, MSD, MSs and MSS.

Fig. 1 shows the monostable circuit. The stable state is Tr1 "off" or non-conducting, with Tr2 "on." A positive pulse to P or a negative one to Q will trigger the device into a quasistable (*qs*) state. The duration of this (equal to the length of the required dot, dash or space as the case may be) is determined

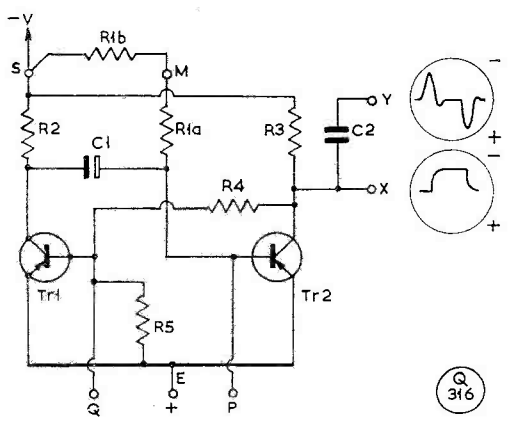


Fig. 1. Monostable circuit for producing dot-and-dash pulses. Timing, in the sense of "dot-dash-space," is determined by the values of C1, R1A and R1B. The wave-shapes shown here should be sharper in outline.

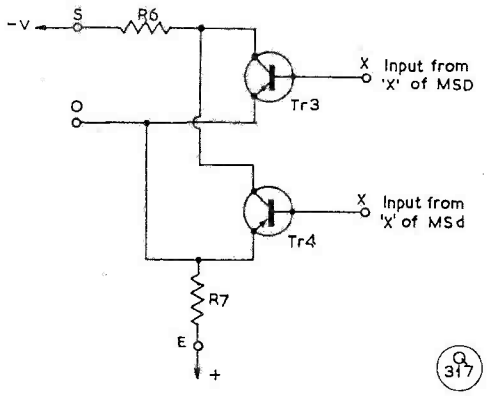


Fig. 2. A transistor switch, producing either a dot or a dash — see text.

by the values of C1 and R1A *plus* R1B. In the Sender R1B is external to the monostable (at the speed control switch), different values providing a sufficient range of *qs* time without varying C1.

During the *qs* time Tr1 is on and Tr2 off, the reverse of the stable condition. Fig. 1 shows the general form of the Tr2 collector potential during the *qs* time (point X) and the pulses derivable (point Y) which mark its beginning and end.

The X potential change may be used to operate a transistor switch which closes during the *qs* time. MSd and MSD have such a switch associated with them; it is the OR device shown in Fig. 2. When MSd *or MSD* is triggered ("fired") a dot *or* dash appears at the keyed output. The elements are reasonably squared-off.

The pulses at Y (Fig. 1) may be used to fire a further monostable either at the beginning or the end of the *qs* time; in this application the latter only is of interest. Y is thus connected to P of the further monostable. This will ignore the beginning-pulse because it is of the wrong sign.

Outline of Operation

Depression of a key for the required character produces a pulse, called the "k" pulse. If the first element is a dot, the pulse is applied as a trigger to MSd; if a dash, to MSD. The first dot or dash appears at the keyed output. At the end of this, MSs is fired over a common trigger lead from points Y of MSd and MSD. MSs inserts the first space and at the end of it produces a pulse from the Y point. This pulse and *each subsequent* end-space pulse during the character is used to *re-fire* MSd or MSD, through preselected "d" or "D" paths, according to whether a dot or dash is wanted at each successive stage.

The paths become effective in sequence, using the same end-space pulses from MSs to do the sequencing. The path preselection is done by the same "k" pulse which starts the character. Fig. 3. shows a logic model which will make this clearer. The devices by which the "k" pulse preselects the paths are represented (for the moment) by relays. The arrows are the possible points of application of the "k" pulse, arranged for by suitable connections from the keys. For example, supposing the character required is "R"; the "k" pulse will have been applied to MSd to start it, and to relays A and D. These relays operate. This is a reasonable assumption because this is only a model; actually, relays could be made to work if they (and the "k" and MSs pulse powers) were tailored to the job.

Relay A having operated, contact A1 closes and A2 opens. The first end-space pulse from MSs passes through A and A1, fires MSD for a dash and releases A (another fair assumption). Subsequent MSs pulses cannot take this path. Contact A2 is now closed; B2 is also closed because no "k" pulse has been applied to B. The *next* end-space pulse from MSs gets through to relay D, fires MSd for a dot and releases D.

If an "L" had been wanted instead of an "R" the dot relay at the next stage would have been set by the "k" pulse and the next end-space pulse from MSs would activate it *via* C2 and D2. As it is, neither of the relays at the next stage have been set and this (last) pulse is a superfluity. However it comes into its own when the inter-character space feature is added (*see* later).

Contacts A2, B2 and C2, D2 have been boxed because they perform the function of *gates*. Their counterparts in the Sender are AND gates which perform a similar function (when both A *and* B are normal the gate is open to the passage of the next pulse). "Relays" A, B, C, D and so on act as memories in storing the information from the keys, which is delivered as an instantaneous pulse. Whether the required speed were 1 or 100 w.p.m., the same

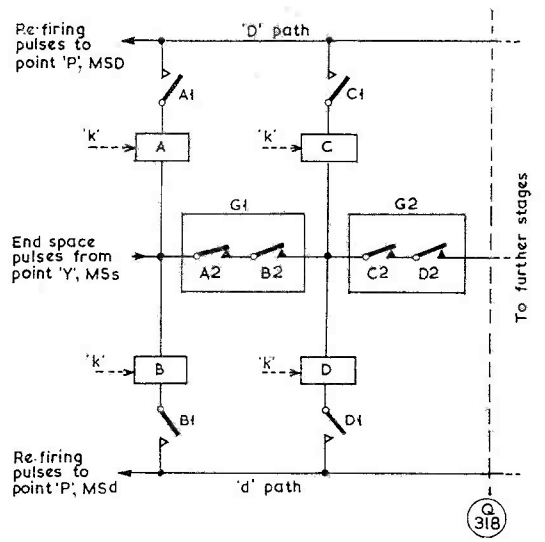


Fig. 3. Showing how paths for either a dot or a dash are preselected by the "K" pulse, as explained in the text. This particular diagram is "for explanation only," and is a logic model to illustrate the working of the system.

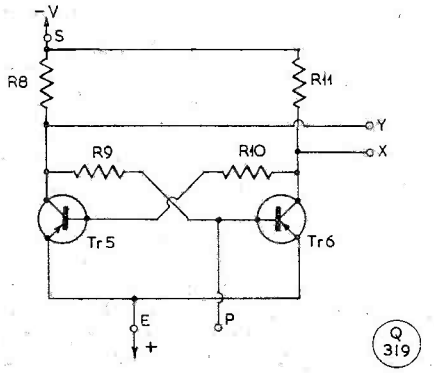


Fig. 4. A bistable, or flip-flop, circuit, actuated by either positive or negative pulses, and working in the same way as the relays in Fig. 3 — only much faster and more positively.

momentary operation of keys would suffice. Note that no memory is required for the first elements of characters.

Code Flip-Flops

The devices A, B, C, D *et seq* are actually flip-flops (bistables) of the simplified form shown in Fig. 4. The two possible states of a flip-flop — Tr5 on, Tr6 off, and Tr6 on, Tr5 off — are known for brevity as the "O" and "1" states. The device will switch or toggle from one state to the other when a suitable pulse is applied to either base — positive to the "on" transistor, or negative to the "off" side. Initially, all flip-flops are at "O," corresponding to the unoperated state of a relay in Fig. 3. Application of the "k" pulse toggles any flip-flop to "1"; this being a negative pulse is applied to point P.

When the MSs pulse comes along it toggles the flip-flop back to "O." This pulse is positive and so is also applied to point P. Upon the toggle back there is a positive-going excursion at the collector of Tr5, point Y. A pulse derived *via* a capactor (not shown) is fed to the "D" path or "d" path, depending on whether this is a "dash" or a "dot" flip-flop. Thus, either MSD or MSd is fired. This firing pulse is in timing and effect exactly equivalent to the MSs pulse.

Subsequent MSs pulses cannot affect the flip-flop, just as they do not affect the other one of the pair, which has not received a "k" pulse. They are offering an "O" toggle to a device which is already at "O." The path is effectively open circuit. The precise analogy with the relay devices of Fig. 3 should now be apparent. The difference is that the whole process is much faster, cleaner and more accurate.

Gates

Fig. 5 shows the circuit of one of the gates, (G) which perform the AND function of contacts (A2, B2) (C2, D2) and so on in Fig. 3. These are called inter-element gates to distinguish them from the end-of-character detector gate which will be described later.

Points X connect to the Tr6 collectors of the preceding pair of flip-flops, *i.e.*, to point X Fig. 4 of these flip-flops respectively. When the "k" pulse has been applied, one of the flip-flops is at "1," its Tr6 collector is practically at supply positive and the corresponding diode D1 or D2 clamps the base of Tr7 to the same potential. Little or no base current flows and the collector is accordingly near to supply negative. Thus diodes D3, D4 are back-biassed and the MSs pulse, applied at P, cannot get through these diodes.

When, however, the "1" flip-flop in the preceding pair is back at "O" (preceding element generated) its Tr6 collector is near supply negative. The base of Tr7 is no longer clamped; Tr7 conducts and its collector comes down to near positive. The back-bias is removed from D3, D4 and the next MSs pulse can get through.

Points O, Fig 5, are connected to points P, Fig. 4, of the next pair of flip-flops. Two diodes are necessary because otherwise the "k" pulse applied to one of the flip-flops would also toggle the other D3 and D4 are back-to-back between points P and thus present an open circuit to the "k" pulse.

Why doesn't the MSs pulse which toggles the preceding "1" flip-flop also get through the gate? Because the latter has an in-built delay, chiefly the time-constant of R14 and various resistance combinations in MSs, in conjunction with C2 in MSs.

Representative Circuit

Fig. 6 shows the circuit plan of the basic Sender without the inter-character space arrangements. The only component variation within the blocks is C1 and C2, Fig. 1. This representative layout avoids repetition of circuitry and also emphasises the "modular" build-up.

Since component numbering is the same within similar blocks, external components have been

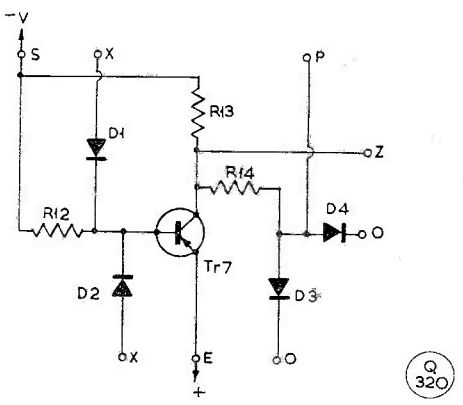


Fig. 5. Transistor gate circuit, performing the function of the contacts A2-B2 or C2-D2 in Fig. 3. This part of the circuit as a whole can be called "an inter-element gate." Point X connects to the X-point in Fig. 4.

treated the same way, where their function is identical. D3 and D4 are numbered thus because they have a similar function to D3 and D4 in the inter-element gates in blocking negative pulses.

Diodes D5 have a twofold purpose; they prevent the "k" pulse toggling of one flip-flop from affecting others, and also ensure that the firing pulse to MSD or MSd is not soaked up by Tr5 in other flip-flops which are at "O." Their back leakage obviates need for resistors to positive at the D5-C5 junctions.

The "k" pulse is derived from the discharge of C7 when a selected key is pressed. It is distributed according to the build-up of the required character by the diodes D6 associated with the key, in the diode field, below the diagram in Fig. 6. These diodes provide in effect the necessary selective "make" actions—up to five—with a single "make" action at the key. In the present Sender, however, two "make" actions are used for the number keys to economise on diodes. Fig. 6 shows how the number 1 is built up from "J" and a single diode, paralleled in, for the last dash; a saving of four diodes. Other numbers can be treated similarly. If two-make contact keys are used throughout, letters can be built up from other letters in the same way. But any used as the basis for numbers must be fully "dioded."

Any back resistance better than 30K is acceptable for the D6's but the forward resistance should be fairly uniform—within 20 per cent or so—otherwise some flip-flops may get setting current at the expense of others.

S1 is the speed control switch which may of course have any number of positions. Resistors RIB, the external resistors of the monostables (Fig. 1), are shown as presets; the value of 30K-50K quoted in the table should cover speeds down to 12 w.p.m. or so. For speeds above about 40 w.p.m. it was found necessary to double Tr2 in MSs. Such speeds are however of academic interest for most amateur purposes (and there is always the risk of getting the same speed back!).

No special measures are necessary to ensure that the flip-flops are at "O" to start with; any full-length character pressed as a preliminary to transmission will see to this.

Inter-Character Space (ICS)

The dotted portion of the "k common" lead, Fig. 6, is occupied by a transistor switch. This is the controlling device for the ICS. It will be realised that there are two ways in which a character can be started (*a*) Switch closed, key depressed, or (*b*) vice-versa. The transistor switch is under control of an auxiliary flip-flop FFK. Initially FFK is at "1" and the switch is closed.

A pulse from MSs at the *beginning* of the first space of any character toggles FFK to "O," opening the switch. The pulse is derived via a capacitor from point X of MSs and is negative. The key for the next character may now be selected and pressed without affecting the character going out.

Table of Values

For All Circuits shown in the Text

C1; MSs, MSd, MSS	= 4 μF electrolytic
MSD	= 10 μF electrolytic
C2; MSd, MSD	= ·005 μF
MSs	= 0·1 μF
MSS	= ·05 μF
C3, C4, C8	= 0·1 μF
C5, C6, C9, C11, C12	= ·05 μF
C7	= 2 μF elect.
C10	= 1 μF
C13	= ·01 μF
R1A: all monostables	= 3,300 ohms
R1B; MSd, MSs	= 30,000 ohms preset
MSD, MSS	= 50,000 ohms preset
R2, R3, R7, R19, R20, R25, R26	= 1,200 ohms
R4, R5, R21, R22, R23, R24	= 2,700 ohms
R6	= 100 ohms
R8, R9, R10, R11, R27	= 330 ohms
R13	= 6,800 ohms
R14	= 4,700 ohms
R15	= 470,000 ohms
R16	= 27,000 ohms
R17	= 68,000 ohms
R12, R18	= 220,000 ohms

Transistors:

Tr1, Tr2, Tr5, Tr6, Tr7, Tr3, Tr4,	= No. 1, Fig. 8
Tr10, Tr8,	= No. 3, Fig. 8
Tr9	= No. 2, Fig. 8

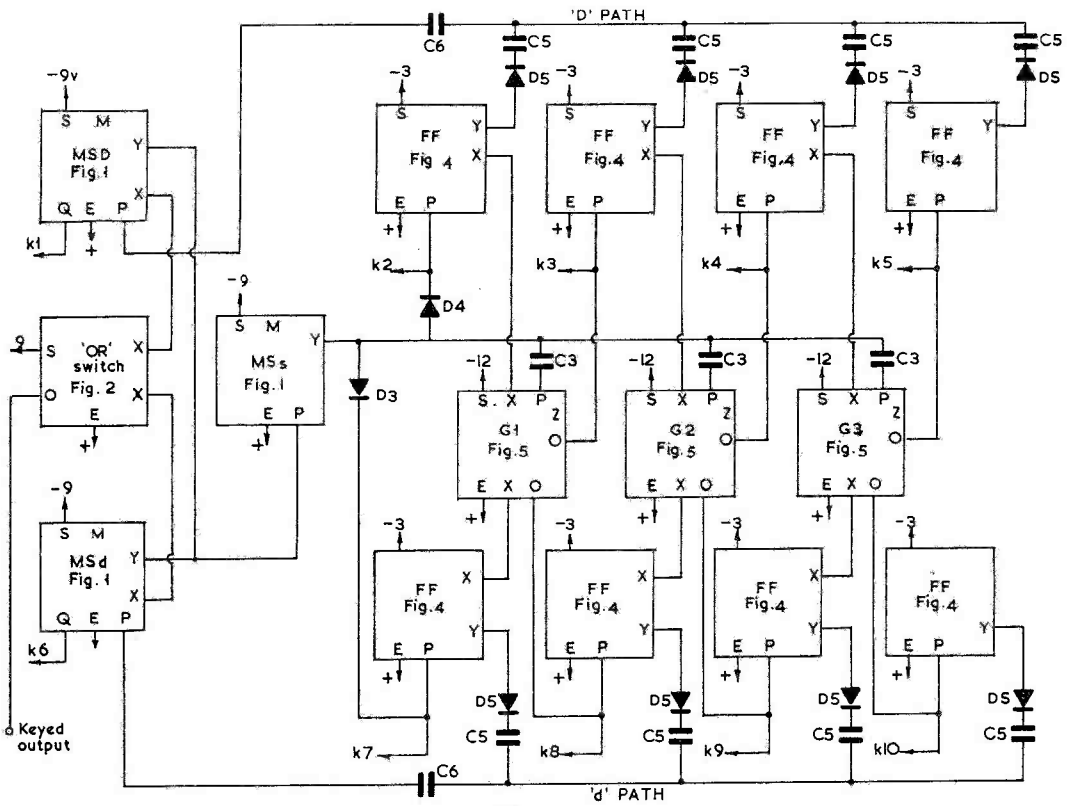
Diodes

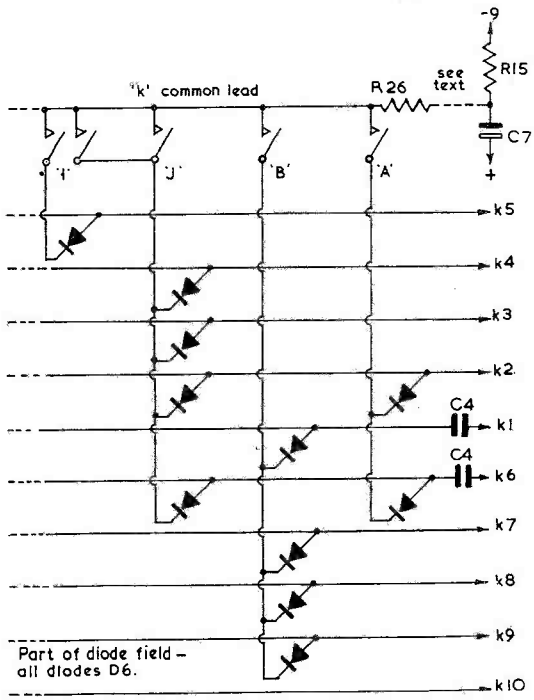
D1, D2, D3, D4, D6, D7, D8, D9, D10, D11,	
D12	= No. 3, Fig. 8
D5	= No. 4, Fig. 8

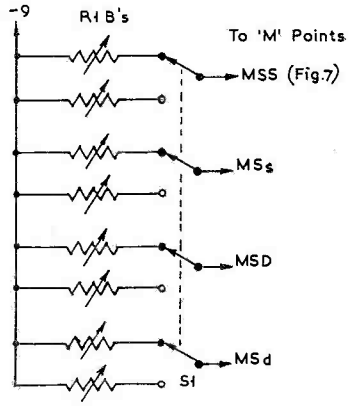
When this ends, the ICS monostable MSS is fired by means to be described. At the conclusion of its *qs* time MSS toggles FFK back to "1," closing the switch again. The toggle pulse is positive and is thus applied to the same base of FFK as the MSs pulse. The key for the next character being down, this now starts at a precisely determined interval from the end of the last one.

The procedure for obtaining the ICS—hold each key just long enough for the character to start, then operate the next one—doesn't conflict with the prescription "momentary operation only." First letters of words *are* operated this way; the feature is implicit in the practical realisation of an ICS. There *is* a vulnerable interval—first dot or dash—when a new key must not be pressed. This disadvantage is slight; it could be overcome by using a further, very short-*qs* monostable to toggle FFK to "O." This could be triggered from the keyed output point.

Fig. 7 shows the ICS circuit. Diodes D7, D8, D9 in conjunction with R16, R17 and D10 form the end-of-character detector gate. Its purpose is to allow MSS to be triggered by MSs when, and *only* when, this is the last firing of MSs, *i.e.*, after the concluding dot or dash of a character. The principle is this: At any previous firing one or more of gates G, Fig. 6, are closed. Their Z points (Fig. 5) being negative, one or more of diodes D7-D9 conduct to place negative at the junction of C8, D10 and the MSs pulse cannot pass through D10. When the character is ended, however, none of the Z points are negative and the back bias is removed from D10, allowing MSS to be fired. Computer-wise the circuit is a species of NOR device; when there is negative at neither Z1 *nor* Z2 *nor* Z3 the







Q 321

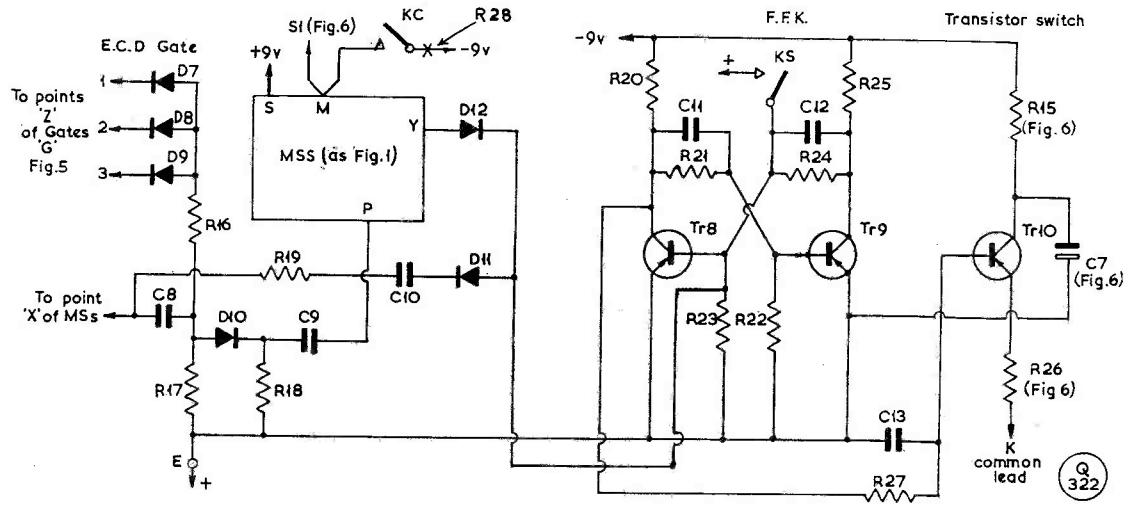


Fig. 7. Circuit for obtaining the inter-character space, as explained in the text. Values are given in the table on p.747 and are applicable to all circuits shown.

pulse gets through. For single-element characters this condition obtains merely because gates G have never been closed; but equally there have been no previous MSs firings. The "0" and "1" toggles are delivered to Tr8 base in FFK *via* R9-C10-D11 and D12 respectively. D11 prevents subsequent MSs (positive) pulses from toggling FFK back to "1" again, whilst D12 prevents possible firing of MSS by the "0" toggle pulse, or subsequent negative pulses from MSs.

KS is a set key to ensure that FFK is at "1" initially. It is also handy to deal with "lock up" (MSS fails to fire, FFK stays at "0") which occasionally happens if two keys are inadvertently pressed at once.

The ICS is intended for letters only but can be extended to numbers by adding an extra gate, Fig. 6, controlled by the last pair of code flip-flops, and a further diode to the end-character detector gate.

Composite Characters

KC, Fig. 7, is a "composite" key. It reduces the *qs* time of MSS to a very short period. Now, the normal ICS is equal to: *qs* time of MSs + *qs* time of MSS (the end-*qs* pulse from MSs is the one used to fire MSS). With KC down, therefore, the effective ICS is substantially the same as the inter-element space. Two characters operated in succession will merge, *e.g.*, U+D will give "?," D+N comes out as "/," and so on. Any six element or other character not on the keyboard can be formed in this way—also continuous dots, dashes or mixtures.

Fig. 6. General layout (left) of the basic sending unit, with components and sections having identical functions numbered the same — hence, D3 and D4 here operate in the same way as D3 and D4 in Fig. 5. The resistor network marked S1/R1B's is the speed control, giving a range of approximately 12-40 w.p.m.

Constructional Notes

The transistors used by the author can only be identified by their shape (Fig. 8). Numbers 1 and 2 refer to a plain and a black-enamelled version of the same-shaped transistor; the latter is similar to the PXA101. It is probable that any general-purpose LF types will serve as well as those used.

Tests on the transistors were confined to a rough ohmmeter-and-wet-finger appraisal, or just the ohmmeter for diode applications. In this latter the mode of use can either be emitter to base/collector strapped, or collector to base. The latter gives higher back resistance. All the code flip-flops with their associated gates and components, FFK, the transistor switch and the EC detector gate were mounted on two 6in. x 1½in. 24-way tagstrips back-to-back. Emitters were commoned as far as possible to save tags.

The monostables were assembled on a similar 20-pair tagstrip and the diode field mostly on three 24-way "fishbone" strips (some were mounted on the keys themselves). The end-tags of the fishbone strips were soldered to short crosspieces of *Radiospares* tag strip provided with mounting lugs, and the "k" leads multipled down the outers. Leads to the keys were taken to the inner fishbone and the diodes wired across the gaps. Anyone with access to an hour or so of computer time might like to work out the order of letters and method of multipling for optimum compactness—it's quite an exercise. Some of the diodes were found to be s/c from casing to collector; it is advisable to sleeve the casings or make sure they do not contact.

With the above construction the electronics occupy about two-thirds the volume of an AVO-8 and could obviously be condensed quite a lot further using printed circuitry. The P.O. keys, however, occupy a lot of space and have too much

operating pressure and travel to be ideal functionally. Solutions to this problem should not be too inaccessible in a push-button era.

Conclusion

It is not claimed that the circuit design is optimal, either overall or in detail. Many of the component values were the first tried; they worked and were left at that. However, an application of this sort is not demanding much of logic techniques; it *should* be uncritical. One aspect that has not so far been investigated is that of ambient temperature effects outside the normal shack range of 50-75°F.

Misoperations during development were almost entirely due to unwanted firing of monostables. The safeguards are (*a*) Low internal resistance of supplies; it is preferable to operate MSS from a separate supply. (*b*) Non-inductive capacitors and reasonably short trigger leads. It seems vaguely outrageous that a device the timing characteristics of which are largely determined by a hefty electrolytic should know anything about microsecond-order pulses—but such indeed appears to be the case.

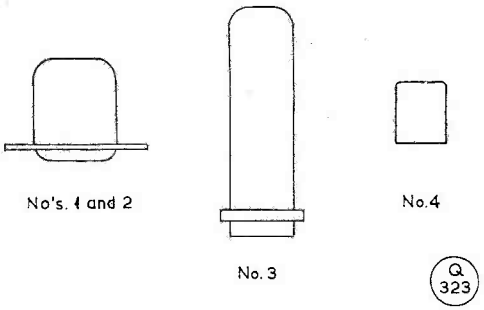


Fig. 8. Profile of the transistors used in the prototype — this sketch is for identification only, in conjunction with data given in the table of values, p.747.

BBC RESEARCH SCHOLARSHIPS

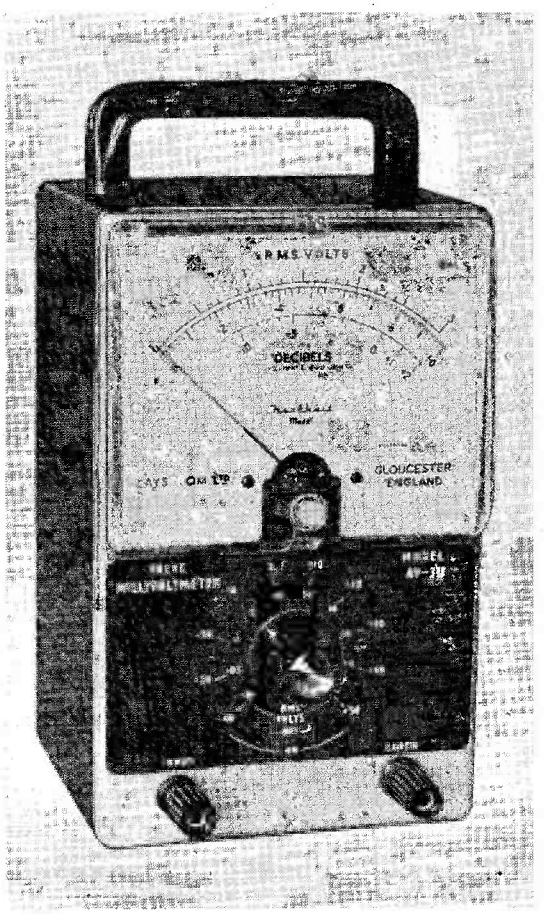
It is not generally realised that the BBC, through its Engineering Division, maintains six research scholars at universities in the United Kingdom. These scholarships are awarded to selected honours graduates working for a higher degree in some subject within the ambit of physics or radio-communication engineering having an application to sound or TV broadcasting. Recently, two such scholarships have been awarded—one to E. Trickett (Durham University), and the other to J. Clarke (Birmingham University). They will both pursue post-graduate studies at their own Universities.

SPECIALLY ON THE AIR

As in previous years, we shall be glad to give publicity under this heading to any group embarking on a special activity—such as a DX-pedition, or the mounting of an amateur station for appearance before the public. Details should be sent in the form as shown here:

GB3TEL, February 28-March 6: In connection with the Birmingham Telephone Area Sports Club exhibition, when all bands 70 cm. to 160m. will be worked. Skeds would be appreciated, and can be arranged through J. L. Simkins, GB3TEL, c/o W.O.1, Telephone Manager's Office, Richmond House, Newhall Street, Birmingham, 3—which is also the address for QSL's.

GD3UW, March 15-22: Cambridge University Wireless Society expedition to the Isle of Man, operating on all HF bands using SSB, and also on 2-4-160m. For sked arrangements and QSL's the address is: B. R. H. King, G3SGK, 1 Cranmer Road, Cambridge.



The new Heathkit Valve Millivoltmeter, known as the Model AV-3U, has a sensitivity of .01v. to 300v. FSD in ten ranges, and an accuracy of within 5% at full scale deflection. The instrument is very handsomely finished, in dark grey against silver grey, and the cost is £16 10s. in kit form, or £22 18s. factory assembled and tested.

S-METER CIRCUIT FOR A TRANSISTOR RECEIVER

SUCH AS THE EDDYSTONE EC-10

W. SMITH

WITH a normal valve communications-type receiver, the addition of circuitry to operate an S-meter is easy enough. But an S-meter for a transistor Rx is not quite so straight-forward. On a transistor receiver, as a station is tuned in the AGC voltage drops against chassis, which is the opposite to the valve type, where it increases. This means that if the normal circuitry is used a backward-reading meter, with maximum indicated signal strength as something less than full-scale deflection, is necessary.

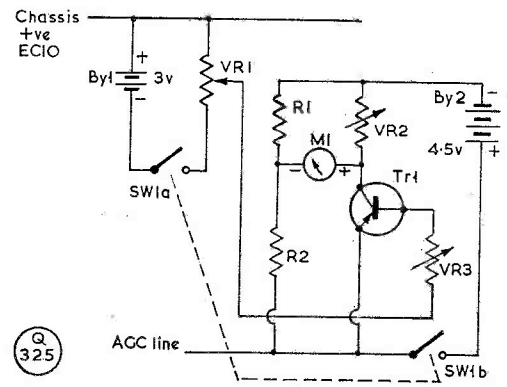
In the circuit shown here, a voltage of the same sign is developed by B1 between the slider of VR1 and the Rx chassis. Then, with no aerial connected, the voltage with respect to the AGC line is zero. When a station is tuned in, the AGC line potential decreases with respect to chassis but goes positive with respect to the slider of VR1. So here we have a suitable circuit in which to use a forward-reading meter for it gives a potential increase as stations are tuned in.

Transistor Tr1 is connected as shown. An incoming signal drives the base of the transistor negative by an amount proportional to signal level, causing Tr1 to conduct—that is to say, the collector-emitter resistance decreases, so that the collector voltage goes more positive. Originally, before any signal is tuned in, the potential across the meter is set in balance, by VR2, the zero-set potentiometer. Then, as signals are received, the potential at the collector varies, and there is a proportional deflection on the meter M1, which can be on 0-1 mA movement.

Putting It Together

As in any DC situation of this sort, construction is not critical. For the prototype (applied to an *Eddystone* EC-10), a small 0-1 mA meter of Japanese origin was used and, by means of stiff wiring, the whole circuit was assembled right on the back of the meter itself—except for the setting controls SW1, VR2 and VR3, which are brought out to the front panel, beside the meter. The sensitivity control VR3 can be split into two, both one-meg. resistors, one on the front panel (variable) and the other a pre-set behind the meter.

Setting up is easy enough. First, with aerial off, the line joining VR1 and VR3 is disconnected. VR2 is then adjusted till the meter reads zero (this should be near the end of its track). VR3 is then put at maximum, and rejoined to the slider of VR1. Now, set VR1 till the meter again reads zero, with the RF gain at maximum. The sensitivity control VR3 is then adjusted till a correct setting is found for the "maximum receivable signal"—which could be the local medium-wave BC station, to give full deflection.



Circuit for an S-meter suitable for a transistor receiver, to give forward reading by reversing the AGC drive voltage. Values are: R1, 100 ohms, ½w.; R2, 2200 ohms, ½w.; VR1, 10K variable; VR2, 10K variable, zero set; VR3, sensitivity control, one megohm (see text), B1, 3-volt battery; B2, 4.5 volt; M1, 0-1 mA meter; and Tr1, OC81M transistor, or similar.

The disadvantage of this circuit is that meter readings are only "true" (in the meaning of comparative) when the RF gain is at maximum at all times. However, a true comparative S-meter reading is obtained when, with the aerial connected, signals are tuned in. In the writer's version, sensitivity is such that, with no aerial on the Rx the meter reads zero on the 28 mc band, this becoming S5 when the aerial is plugged in. The resting value of the meter indication can, of course, be varied by VR3—but one needs to start somewhere, and a strong local signal should be used to find the maximum.

ENTRIES FOR MAY R.A.E.

Those intending to take the Radio Amateur's Examination in May—though it does sound a long time off—are reminded that their entries should be in at least before the end of this month, February. This is because the City & Guilds authorities require the lists two months before the examination date. Candidates can enter either through their local technical college or evening institute, or the office of the local education authority. Any information regarding the R.A.E. can be obtained on application to the latter. It is as well to make enquiries, as some technical colleges have closing dates even earlier than the end of February. And *always* quote "Subject No. 55, Radio Amateur's Examination—City & Guilds" when making any enquiries.

CLOSING DATES—MARCH ISSUE

Though closing dates for the regular features in the next (March) issue of the *Magazine* have already been set, in view of the threat of a railway strike starting on February 14, correspondents are advised to get everything for us (including small advertising) into the post as soon as possible—and anyway before February 14.

NEW QTH's

This space is available for the publication of the addresses of all holders of new U.K. callsigns, 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.

EI3AY, P. J. Whelan, 3 Ballymun Park, Dublin, 11.

G2BJK, G. F. Brown, Brambleys, Draycott, Cheddar, Somerset. *(Re-issue.)*

G3LNO, P. H. Hawkes, Midway, Monks Kirby, Rugby, Warks. *(Tel. Pailton 573.)*

G3TNN, Mrs. Ruth Sinclair, 18 Clarendon Road North, St. Annes, Lancs.

G3UAI, R. J. Caton, 40 Spencer Road, Fifers Lane, Norwich, Norfolk.

G3UCA, P. G. Sinclair, 18 Clarendon Road North, St. Annes, Lancs.

G3UDE, N. W. Roberts, 11 Wilberforce Road, Cambridge.

G3UEH, D. G. Barson, 153 Rantree Fold, Basildon, Essex.

G3UID, P. Baldock, 19 Theydon Avenue, Woburn Sands, Bletchley, Bucks. *(Tel. Woburn Sands 2023.)*

G3UPP, Amateur Radio Club, R.A.F. Station, Chivenor, Barnstaple, N. Devon.

GW3UTG, A. Antley, Fairholme, Fairfield Avenue, Rhyl, Flintshire.

G3UVS, C. A. Mitchell, Kechil Rumah, Green Lane, Yelverton, Devon. *(Tel. Yelverton 986.)*

G3UVU, J. S. Curry, 1 Ennerdale Terrace, Low Westwood, Newcastle-upon-Tyne.

G3UWE, R. B. Simpson, 30 Heathlawns, Catisfield, Fareham, Hants. *(Tel. Fareham 5479.)*

G3UWL, D. Grant, 49 Lisle Grove, High Howdon, Wallsend, Northumberland.

G3UWT, P. W. Myers, 151 Star Road, Peterborough, Northants. *(Tel. Peterborough 3292.)*

G3UWY, J. A. Brighting, 15 Ash Tree Close, Croydon, Surrey.

G3UXD, A. J. N. Eardley, The Grange, Colne, Lancs.

G3UXJ, Flt. Lt. B. Donders, 13 Hawthorne Avenue, R.A.F. Abingdon, Berks.

G3UXR, N. R. Goddard, 10 Brookfield Avenue, London, W.5.

G3UXT, West Park Grammar School, Amateur Radio Club, Eccleston, St. Helens, Lancs.

G3UXU, F. Sharpe, 21 Crofts Path, Bennetts End, Hemel Hempstead, Herts. *(Tel. Hemel Hempstead 54413.)*

G3UYA, Amateur Radio Society, King Edward VI Grammar School, Stafford, c/o M. E. Jolley, G3URN, 80 Rowley Grove, Stafford.

GM3UYF, E. W. Davies, 182 Calder Street, Glasgow, S.2.

G3UYK, P. R. Kemble, 14 Cowley Road, Cranbrook, Ilford, Essex.

G8AIA, A. R. Clemmetsen, 4 Kings Drive, Whitley Bay, Northumberland.

G8AMM, R. H. Turton, 2 Greystones Crescent, Sheffield 11, Yorkshire.

G8AMQ, M. Phillips, 14 Junction Close, Wombwell, Barnsley, Yorkshire.

CHANGE OF ADDRESS

G2FQD, A. L. Rogers, Flat 3, 3 Colsterworth Road, Tottenham, London, N.15.

G2HLU, H. Owen, B.Sc., Ph.D. *(ex-ZD4AM),* 223 Church Road, Earley, Reading, Berks. *(Tel. Reading 61622.)*

G2MX, A. R. George, Harwood, Kirkby Road, Fishpool, Notts.

G3ALC, P. C. Spence, 23 Mill Street, Oakham, Rutland.

G3DPM, J. F. Cooknell, Hangland, Manor Road, Sulgrave, Banbury, Oxon.

G3GLM, R. Lamb, 62 Victoria Avenue, Collier Row, Romford, Essex.

G3GWI, N. Spivey, 92 Oakland Avenue, Heworth, York.

G3HWX, B. J. Whitty, Fourways, Morris Lane, Halsall, Lancs.

GM3ITN, L. Hamilton, 197 Dumbarton Road, Old Kilpatrick, Dunbartonshire.

G3JBC, J. W. Cox, 39 Repton Road, West Bridgford, Nottingham.

GW3KAJ, D. Jagger, 149 Culverhouse Cross Estate, Ely, Cardiff, Glam.

G3KRU, H. Gates, 7 Aberdeen Walk, Upton Priory, Macclesfield, Cheshire.

G3MBT, P. A. Watson, c/o Officers' Mess, R.A.F. Station, Cranwell, Sleaford, Lincs.

G3MOT, C. J. Lambert, 42 Austenwood Close, Chalfont St. Peters, Bucks.

G3MXK, D. R. Paice, 134 Woodgreen Avenue, Banbury, Oxon.

G3NGC, M. Bell, 12 Ramsey Road, Springvale Estate, Winchester, Hants.

G3NPA, G. W. Anderson, 106 Station Road, Crayford, Kent.

G3OSH, A. W. Haines, 4 St. Michaels Close, Nether Stowey, Bridgwater, Somerset.

G3OUQ, H. B. Bird, 344 Coventry Road, Hinckley, Leics. *(Tel. Hinckley 3390.)*

G3PVL, C. F. Beech, 20 Brighouse Close, Ormskirk, Lancs.

G3RYE, J. D. Harris, 502 Chickerell Road, Chickerell, Weymouth, Dorset.

G3STG, G. A. Griffiths, 25 Mordaunt Drive, Four Oaks, Sutton Coldfield, Warks.

G3SXW, R. K. Western, 110 Truro Avenue, Hele, Torquay, S. Devon.

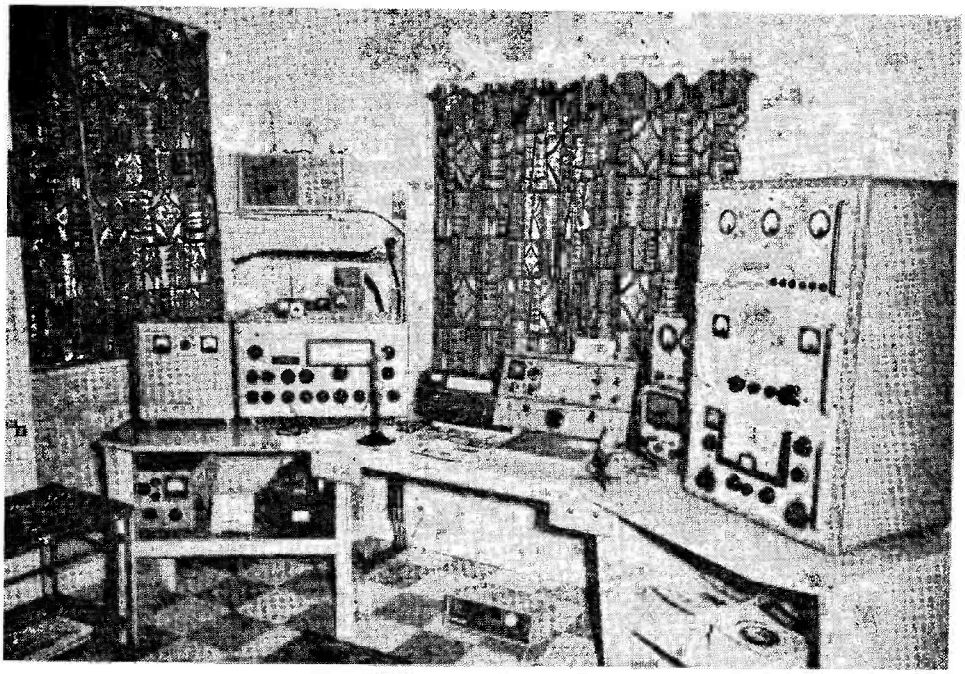
G3TKR, D. J. Raven, Bali-Ha'i, Bingley Road, Cross-Roads, Keighley, Yorkshire.

G3TQI, D. Benson, Plot 5, Laburnum Avenue, Newbold Verdon, Leics.

G3TUW, P. J. Moore, 47 Stuarts Cross, Stanford Rivers, Ongar, Essex.

G4FD, J. Irwin, 10 Winterburn Road, Blackburn, Lancs.

GW8AAP, G. Toulalan, 16 Berwyn Crescent, Prestatyn, Flintshire. *(Tel. Prestatyn 4439.)*



THE OTHER MAN'S STATION

G3MWV

ON p.609 of the December issue of SHORT WAVE MAGAZINE we showed a picture of the three-band Cubical Quad used at station G3MWV—owned and operated by D. G. Blake, Clare House, Clare Road, Cromer, Norfolk. Here now is a photograph of the equipment feeding that beam. G3MWV has been licensed for some six years, and one of the main interests is constructional work. With the obvious exceptions of the Drake-2B and the National NC-200, all the gear you see is home-built.

The main transmitter is an all-band 10-160m. Sideband rig, as shown on the left of the picture, with its PSU. This Tx incorporates a mechanical filter, AF tone oscillator, Vox control and anti-trip circuit. The PA takes 750v. HT on a pair of 6146B's, giving 240 watts p.e.p.

At centre are the Drake-2B and NC-200 receivers. On the right of the (home-constructed) console is a 150-watt transmitter for AM/CW/FM operation over 10-80m., also using a pair of 6146's in the RF power amplifier. The lower deck of this cabinet carries the VFO, exciter and PA units, with a time-sequence keyer circuit. Above is the AM modulator, using 2/KT88's and 6BW6 drivers, with an AF oscillator for CW and monitoring. The top deck carries the HT packs, giving 700v. maximum HT, with high and low power switching and bias supply. The small cabinet to be seen to the immediate left of the big transmitter is a 10-watt job for 80/160m., AM/CW, taking an 807 in the PA modulated by a pair of 6AQ5's; this LF-band Tx has its own power supply.

In addition to the Cubical Quad already mentioned and previously illustrated, other aerials include an inverted-V dipole for 80m., with its centre at 44ft., and a helically wound whip 50ft. long for Top Band, erected vertically and fed at ground level. All these antennae were designed, constructed and installed by G3MWV himself. The feed problem is simplified by the use of 80-ohm coax throughout, terminations being on a plug-and-socket panel, enabling any Tx or Rx to be connected to any aerial.

As with the console, G3MWV did all the interior *decor* for the shack, and the cabinets for the gear (also home-made, incidentally) are finished in a uniform hammer grey. The main switch near the door is double-pole with a neon tell-tale, and the radio room supply cable has 14 outlet sockets rated 13 amps. Constructional work in hand includes a Monitor Oscilloscope (as SHORT WAVE MAGAZINE, January, 1962), a new Rx for 160m. only, and a portable rig also for Top Band.

Everyone reading this will agree that G3MWV—who is 25 years old and in the radio/TV business—has a very well-engineered station, in which he must take great pride, as so much of it is of his own construction. And in case anyone should think "Well, it's all tidiness but what about results," we might conclude by saying that G3MWV has worked 140 countries in all continents on Phone only; and he is just as active on CW.

THE MONTH WITH THE CLUBS

By "Club Secretary"

(Deadline for March Issue: February 11)

(Please address all reports for this feature to "Club Secretary," **Editorial Dept., SHORT WAVE MAGAZINE, Buckingham.)**

NEW Year's programmes have been arranged by those clubs that pride themselves on their organisation. Others, we fear, will just continue to hope that someone will turn up at loosely-organised meetings with no formulated programme.

Ideas? Well, secretaries who read right through this feature every month can't fail to find quite a few new ones, some of which have struck us as exceptionally good. (One mentioned this month is a "tour round the shacks," but in the comfort of the clubroom by means of colour slides and the owners describing the gear shown therein.)

Here's another, all the way from New Zealand. ZL3RB writes to tell us that two well-known amateurs, ZL3RW and ZL3VP, are planning an extended tour of the U.K., and will be arriving around March 3, staying with Peter Lake, 125 Binley Road, Stoke, Coventry. They will be buying a station-wagon and installing their mobile gear (which is quite famous in ZL-land) for 160 and 80 metres.

The two of them are especially interested in meeting U.K. amateurs, and will be prepared and happy to speak at club meetings, rallies, and so on, where they are willing to show some of their superb collection of colour slides of New Zealand.

So . . . anyone wishing to invite these two amateurs to their clubs or homes will have a very interesting time in store, and need only get in touch with them, after March 3, at the address given above. Midland clubs look like being fortunate, and who's the first to get cracking?

ACTIVITY REPORTS

Basildon ran a Film Show on January 20, and their February meeting will be on the 15th, at the Van Gogh Restaurant, Paycocke Road, Industrial Estate, at 8 p.m.; G3DGN will be talking on Communications by Light, and will have with him a working gas laser. This should be good, and visitors welcome. **Acton, Brentford & Chiswick** will also be meeting on February 15, at 66 High Road, Chiswick, and for this date a Film Show has been arranged; all members and families invited.

Loughborough will be having a Photo Night on February 4; a Night on the Air on the 11th; a tape-lecture (Semi-Conductors) on the 18th; and a talk by G3PXP on the 25th. **Leeds** will meet for Part V of "Construction of a Top Band Transmitter" on February 9, and on the 22nd will hold a Mullard Film Show. Part VI of the Top-Band talk will follow on March 9.

Basingstoke heard a talk on Aerials (by Mr. Hartropp of J-Beams) on January 8. For February and March they have arranged talks on SSB, by G3MED, and on Receiver Alignment by G8AKM.

Blackpool & Fylde have a "Questions and Answers" fixture on February 14, and Open Evening on the 21st, and their AGM and election of officers on the 28th.

Purley held a highly successful Christmas Social and are now well away with their New Year programme. On February 18, G3OGO will be talking about the BBC's External Services, and they will later be visiting Bush House to see some of them in action. March 18 is booked for a Junk Sale, and March 4 for a General Natter, when the four-metre rig will be on the air. All meetings at 58 Whytecliffe Road, Purley, 8 p.m.

Reigate, at their meeting on February 17, will be hearing W1BB's tape-lecture on Top-Band DX'ing. Their Dinner and Dance will follow on the 25th. **Spalding** report that their first Winter Junk Sale was a success—at any rate, it made a profit. The next will be on February 11, at 7 p.m. in the White Lion, High Street; buffet refreshments will be available, and there is ample car parking space. A talk-in on 1980 kc will also be provided. Normal meetings are held at the Grammar School, Priory Road.

Spen Valley have two main meetings during the current month, with a talk on Wide-Diffused Hi-Fi on the 10th, and one on Receivers for SSB on the 24th. A "supplementary" meeting on the 17th will deal with Oscilloscopes. **Bristol** have arranged a full programme for the half-year, and on February 10 the subject will be Aerials and ATU's, and the speaker G3JMY. Club coffers benefited by £10 after a recent Junk Sale. A recruiting campaign is going on in the City's secondary schools, and the club hope to project the Image of Amateur Radio by means of exhibitions, demonstrations and talks—sounds like a very worth-while undertaking.

Bromsgrove will be holding a Surplus Sale on February 11—8 p.m. in the Co-Op Rooms, High Street. **Harlow** report quite a success story, with their attendances on Tuesday and Thursday nights averaging 70! Their Mobile Rally was attended by

over 500 people, they have eight new callsigns in the club, and fifteen members passed the R.A.E. last year. Their new Hq. is at Mark Hall Barn, First Avenue.

Havering will hold a Junk Sale on February 16, and at their following meeting, on March 2, will have a tape/film lecture on "DX Aerials." **Northern Heights** will be seeing members' slides on February 16, and on March 2 the subject will be Two Metres, with a talk by G3UI. Meetings are at the Sportsman Inn, Ogden, Halifax—fortnightly at 7.30 p.m.

York held their AGM on January 27, and now meet at 8 p.m. at 61 Micklegate, York. **Wimbledon** report a change of secretary—*see* panel. Their February lecture will be by G3ILY, on "A Blind Person's Approach." **Clifton** report that a fortnightly series of talks and demonstrations following the R.A.E. syllabus will be started in February, with the accent on the practical approach, rather than lectures.

Crawley will get together on February 23 for a lecture by G3FZL on VHF Equipment—and Geoff knows his stuff. At the same meeting the judging of the annual Constructional Contest will be held. The annual dinner is fixed for March 18, when G2BVN will be the guest of honour.

A new club has been formed to serve the Blackburn area, and will be known as the **East Lancashire** A.R.C. They met for the first time on

Names and Addresses of Club Secretaries reporting in this issue:

ACTON, BRENTFORD & CHISWICK: W. G. Dyer, G3GEH, 188 Gunnersbury Avenue, London, W.3.
A.E.R.E. (HARWELL): V. J. Galpin, Building 347.3, A.E.R.E. Harwell, Didcot.
AINSDALE: N. Horrocks, G2CUZ, 34 Sandbrook Road, Ainsdale, Southport.
A.R.M.S.: N. A. S. Fitch, G3FPK, 79 Murchison Road, London, E.10.
AUCHENHARVIE: E. Somerville, 3 Melbourne Terrace, Saltcoats, Ayrshire.
BARNSLEY: J. A. Ward, G4JJ, 44 Northgate, Barnsley.
BASILDON: C. Roberson, G8AAO, Milestone Cottage, London Road, Wickford.
BASINGSTOKE: P. J. Sterry, G3CBU, Ashley, Orchard Road, Basingstoke.
BLACKPOOL & FYLDE: J. Boulter, G3OCX, 175 West Drive, Cleveleys, Blackpool.
BRADFORD: J. D. Midgley, G3SAO, 77 Brantwood Road, Bradford 9.
BRISTOL: E. J. Davis, G3SXY, 72 North View, Westbury Park, Bristol 6.
B.A.T.C.: N. Hampton, G6OUH/T, 19 Grove Crescent, London, N.W.9.
BROMSGROVE: J. K. Harvey, 22 Elm Grove, Bromsgrove, Worcs.
BURSLEM: C. J. Sutton, G3UHV, Brachead, Old Lane, Brown Edge, Stoke-on-Trent.
BURY & ROSSENDALE: K. Drinkwater, G3RHR, 75 Woodville Drive, Marple, Cheshire.
CAMBRIDGE: F. A. Porter, G3CDX, 37 Metcalfe Road, Cambridge.
CARDIFF R.C.C.: E. F. Taylor, GW3SQX, University Hall, Penylan, Cardiff (acting).
CHILTERN: G. Leonard, 13 Priory Road, High Wycombe, Bucks.
CLIFTON: J. Rose, G3OGE, 63 Broomfield Road, Beckenham, Kent.
CORNISH: M. J. Harvey, Oak Farm, Carnon Downs, Truro.
COVENTRY: W. F. M. Hahn, G3UOL, 11 St. Patrick's Road, Coventry.
CRAWLEY: R. G. B. Vaughan, G3FRV, 5 Filbert Crescent, Gossops Green, Crawley.
CRAY VALLEY: S. W. H. Harrison, G3KYV, 30 Plaistow Grove, Bromley.
CRYSTAL PALACE: G. M. C. Stone, G3FZL, 10 Liphook Crescent, London, S.E.23.
EAST LANCS: J. Simpson, 1 Marsh Terrace, Darwen.
ECHELFORD: A. G. Wheeler, G3RHF, 88 Village Way, Ashford, Middx.
EDGWARE: G. S. Fitton, G3RAA, 18 Beverley Drive, Edgware.
GRAFTON: A. W. H. Wennell, G2CJN, 145 Uxendon Hill, Wembley Park, Middx. (acting).
HARLOW: G. O'Donald, G3TLJ, Great East, Roydon Road, Harlow.
HAVERING: P. J. Moore, G3TUW, 1 Bonns Farm Cottages, Stapleford Tawney, Romford, Essex.
LEEDS: S. Tomlinson, 31 The Quarry, Alwoodley, Leeds 17.
LOUGHBOROUGH: D. Winters, G3IPL, 52 Walton Street, Leicester.
LUTON: A. W. Morgan, G8ADS, 97 Victoria Street, Dunstable.
MAGNUS GRAMMAR SCHOOL: R. Wallwork, B.Sc., G3JNK, Magnus Grammer School, Newark-on-Trent.
MAIDENHEAD: E. C. Palmer, G3FVC, 37 Headington Road, Maidenhead.
MELTON MOWBRAY: D. W. Lilley, G3FDF, 23 Melton Road, Asfordby Hill, Melton Mowbray.
MIDLAND: C. J. Haycock, G3JDJ, 29a Wellington Road, Birmingham 20.
MID-WARWICKSHIRE: H. C. Loxley, 51 Guy Street, Warwick.
NEWARK: G. Francis, G3TWV, 93 Balderton Gate, Newark-on-Trent.
NORTHERN HEIGHTS: A. Robinson, G3MDW, Candy Cabin, Ogden, Halifax.
NORTH KENT: C. Westwood, 25 Knole Road, Bexley, Kent.
OXFORD: P. Bradley, G3UJO, 114 Netherton Road, Appleton, Abingdon, Berks.
OXFORD UNIVERSITY: A. J. Garratt-Reed, Brasenose College, Oxford.
PETERBOROUGH: D. Byrne, G3KPO, Jersey House, Eye, Peterborough.
PLYMOUTH: B. J. Curnow, G3UKI, 112, Mount Gould Road, Plymouth.
PURLEY: A. Frost, G3FTQ, 62 Gonville Road, Thornton Heath, Croydon.
R.A.I.B.C.: Mrs. F. E. Woolley, G3LWY, 331 Wigan Lane, Wigan.
RADIO CLUB OF SCOTLAND: A. Barnes, GM3LTB, 7 South Park Terrace, Glasgow.
REIGATE: F. D. Thom, G3NKT, 12 Willow Road, Redhill.
SALTASH: D. Bowers, 95 Grenfell Avenue, Saltash, Cornwall.
SHEFFORD: G. R. Cobb, G3IXG, 75 Ampthill Road, Shefford.
SOUTH BIRMINGHAM: A. E. Bishop, 40 Cecil Road, Birmingham 29.
SOUTHGATE: R. E. Wilkinson, G3TXA, 23 Ashridge Gardens, London, N.13.
SPALDING: L. J. Carter, G3TRO, 53 London Road, Spalding.
SPEN VALLEY: N. Pride, 100 Raikes Lane, Birstall, Leeds.
STOKE-ON-TRENT: E. Swinnerton, G3UBU, 51 Bailey Road, Heron Cross, Stoke-on-Trent.
SURREY (CROYDON): R. Morrison, G3KGA, 33 Sefton Road, Addiscombe, Croydon.
SUTTON & CHEAM: F. J. Harris, G2BOF, 143 Collingwood Road, Sutton.
SWINDON: D. J. Goacher, G3LLZ, 51 Norman Road, Swindon.
TORBAY: Mrs. G. Western, G3NQD, 118 Salisbury Avenue, Barton, Torquay.
UNIVERSITY COLLEGE OF NORTH WALES: P. D. Symes, GW3SWL, c/o Dept. of Electronic Engineering, U.C. of North Wales, Dean Street, Bangor.
VERULAM: G. Slaughter, G3PAO, 5 Leggatts Wood Avenue, Watford.
WESSEX: W. G. West, 23 Palmer Road, Poole.
WESTON-SUPER-MARE: A. E. Seymour, G3GNS, Manor Farm, Hillend, Banwell, Weston-super-Mare.
WEST KENT: R. Trevitt, G3SSE, 28 Delves Avenue, Tunbridge Wells.
WIRRAL: A Seed, G3FOO, 31 Withert Avenue, Bebington, Wirral.
WIMBLEDON: E. G. Allen, G3DRN, 65a Melbury Gardens, London, S.W.20.
WOLVERHAMPTON: J. Rickwood, G3JJR, 852 Stafford Road, Fordhouses, Wolverhampton.
YORK: W. H. Hodgson, 69 Sherwood Grove, Acomb, York.

Overseas

AERONAUTICAL CENTER, OKLAHOMA: Postal Station 18, Oklahoma City, Okla., U.S.A.
EAST AFRICA: R. S. of East Africa, P.O. Box 5681, Nairobi, Kenya.
Ex-G RADIO CLUB: N. F. Thompson, W8YHO, 1368 Roslyn Avenue, Akron 20, Ohio, U.S.A.
S.A.R.L.: P.O. Box 3911, Cape Town, Republic of South Africa.
FOUNDATION FOR AMATEUR RADIO: 2509 32nd Street, S.E., Washington, D.C., U.S.A.
HONG KONG: M. H. Duke, VS6BJ, P.O. Box 541, Hong Kong.

January 6, and future gatherings will be held on the first Thursday of the month at the YMCA, Limbrick, Blackburn, 7.30 p.m. The February meeting took the form of a Junk Sale. A contest committee has been formed, and the club secretary's name appears in the usual panel.

Luton should have had a lively debate just before publication date, their subject being "For and Against Contests." It never fails! On February 8 the subject is the Design of a Miniature Transmitter for the HF Bands; on the 15th, a Mullard Film Show; and on the 22nd a Receiver Demonstration.

Magnus now have two new operators—G3UVT (age 15) and G3UWB (14)—well done, boys—and their R.A.E. classes for next May are well in hand. One of their members, G3TWB, and one ex-member, G3TBK, were invited to help in the operation of the special amateur station at the Schoolboys' and Schoolgirls' Exhibition.

Mid-Warwickshire are booked for every Monday at 7 Regent Grove, Leamington Spa, but alternate meetings are informal. The forthcoming formal ones include a talk on Aerials by G3BGG on February 7, one on Frequency Measurement by G3HCM on the 21st, and a Film Show on March 7. **Torbay** report some very successful meetings, including a visit to Plymouth, when they scored an "away win" in a Quiz. G3UXN is a new callsign among their members.

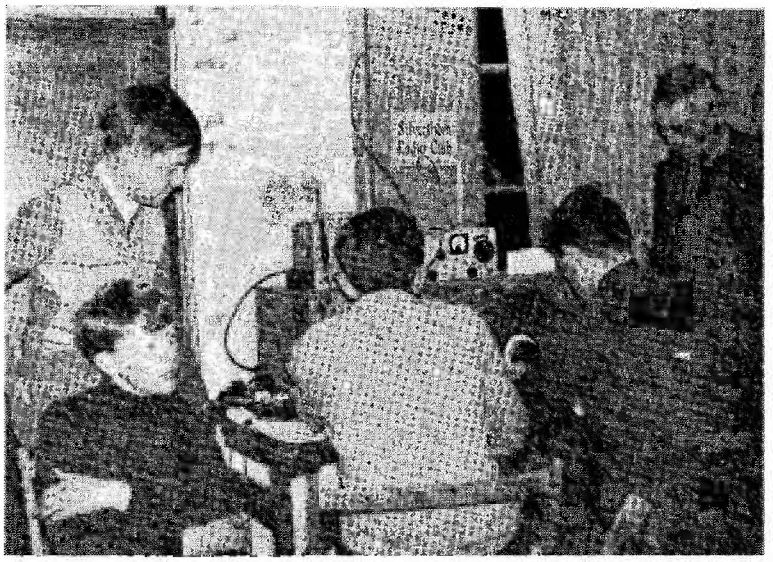
University College of North Wales (Bangor) will meet for talks on February 10 and 24, but the subjects have not been announced. On March 10, G2UJ will be talking to them about Project Oscar, for which he is the U.K. Co-ordinator.

Weston-super-Mare, meeting on the first Friday of the month in the Technical College, intend to run an amateur station there, and some equipment has already been put at their disposal. On February 4 the subject will be Electroplating, and on March 4, Instruction on Model Control.

North Kent are busy preparing for their Annual Dinner and Dance, on February 26, at the Falconwood Community Centre (full details from G3BPE). Recent metings have included an "Any Questions" session, a demonstration of members' gear, and a talk on QSL's by G2MI.

Oxford were recently guests of the University

For the 20th MCC, the South Birmingham Radio Society signed G3OHM/A and made 203 points for 75th place in a field of more than a hundred. The team consisted of G3RUK (at the operating position); G3OMG (right foreground), with G3JFL (standing at back) and SWL's George and Bishop. They used a KW-2000 transceiver, which allows for full BK and gives plenty of gain on the LF bands.



The crew on G3SRA, the Silverthorn Radio Club entry for MCC. Left to right: SWL's Keoghane and King, G3RJI, G3SGF and G2HR. Their Rx was an R.206, the transmitter EF80-EF80-EL84, the aerial a 250ft. wire, and their claimed score 192 points.

Radio Society for a talk by Texas Instruments. They have also seen a Mullard Film Show, and are now getting ready for their Annual Dinner on February 26 (same date as North Kent's) at the New Inn, Shillingford, on the river. They tell us that club members have won every anually-awarded D/F Trophy for which they were eligible to compete—a proud record for Oxford.

Peterborough had a talk about Civil Defence radio in December, and a lecture in January. February's meeting (on the 4th) will be a Film Show. Apart from these, club nights are on Fridays, when visitors will always be welcome at the Old Windmill, Peacock, London Road, from 8 p.m. G3DQW will be operating from there on two metres.

Wessex now get together every Wednesday and Friday (7-10 p.m.) in their Clubroom at 20 Carlton Road, Southampton, with refreshments available. They have organised their own operating contest, to take place on February 19 (2000-2359 GMT) and February 20 (1000-2200 GMT). The first period is for CW only, the second for CW or Phone. As no bands are mentioned, we presume that all can be used.

Sutton & Cheam will be holding their Constructional Contest on February 15, and their Annual Dinner and Dance on March 5, the latter being at the Woodstock Hotel, Stonecot Hill, Sutton. **Surrey** (Croydon) will divide their next meeting, on February 8, between G3BCM (transistorised receiver) and G3MVZ (transistorised SSB exciter). For March 8 they have a Junk Sale, and on April 12 their AGM. A club net is being started, on 70·5 mc, be it noted.

Plymouth set themselves a target of ten new callsigns within the club during 1965. This was achieved, and they were all "home-brew"—*i.e.*, they all obtained their licences after joining the club as SWL's—a fine record for a local group. They hope for twelve more in 1966. February 22 is the date for their Junk Sale, but before that they have their Annual Dinner and Social, on Saturday, February 12.

Grafton ask us to remind readers that their WALT ("Worked All London Town") award is still available to anyone who can furnish proof of having worked 65 out of the 118 London Postal Districts. Full details available by sending s.a.e. to their awards manager, Montem School, Hornsey Road, London, N.7. Next meetings, February 11 (G3KRH and "SWL's Corner") and February 18 (G3LXP on "Antennae in Confined Spaces").

Southgate will be voting on their new constitution on February 10, and the meeting on March 10 will hear about some of the latest developments in the communications and aircraft industries. Plans for future talks and demonstrations include several commercial firms and the GPO.

West Kent, now meeting at the Adult Education Centre, Monson Road, Tunbridge Wells, 7.30 p.m., will hear G6QB's "Mixed Bag" on February 11, and a talk on Computer Logic Circuits, by G3TXZ, on the 25th. **Swindon** continue their fortnightly meetings at the Deer's Leap, Penhill Drive, and the next two are on February 9 and 23.

Melton Mowbray will be holding an "Any Questions?" night on February 17, and this one will be especially for beginners—St. John Ambulance Hall, Asfordby Hill, at 7.30 p.m. **Newark,** now with a membership of no less than 54, are going to add refreshments to their amenities for the Monday and Thursday meetings. Subjects coming up are Aerials, Two Metres, Amateur Radio in New Zealand (ZL2JY), DX-peditions (9M4LX) and many more.

Maidenhead—new to these pages—are going to meet on the third Tuesday, in the Hall of East Berks College, Boyne Hill Avenue, 7.30 p.m. On February 15 there will be a film, "The World of Semi-Conductors," and programmes have been arranged right up to October next. Members will be welcome

to this newly-formed club.

Edgware held their AGM on January 10, and elected G3BZG chairman, G3SJE treasurer, and G3RAA secretary. The coming year's programme is being arranged, and meetings will be on the second and fourth Mondays at John Keble Church Hall, Deans Lane, Mill Hill, N.W.7. The club net is on 1875 kc at 2100 on Wednesdays, when details of forthcoming meetings are given.

Crystal Palace, at their January meeting, heard about the Heathkit "SB line" from G3FZL, and also about Amateur Photography, by Barrie Arundel; February 20 is the date for their AGM. **Burslem** will gather on February 15 for an illustrated talk by H. D. Hemmer; the March 15 meeting will take the form of a Film Show, with two Mullard films on view. Note new secretary's QTH, in panel.

Bradford will be seeing members' Colour Slides on February 15, and on March 1 will be visiting Baird Television Ltd. Their meetings take place in Bradford Technical College, 7.30 on alternate evenings. **Ainsdale** held their AGM in January, and elected G2CIP chairman, the other officials remaining. They are repeating their "Hot-Pot Night" at the end of February, but no date is mentioned.

Coventry, starting with their February 11 meeting, will have their Hq. at Coventry Civil Defence Hq., Drapers Fields (off Foleshill Road), and it is hoped to attract many more members and to welcome old friends. An attractive programme for the coming months is being planned.

Chiltern report to us after a long absence, with the news that they meet at the British Legion Club, St. Mary Street, High Wycombe, at 7.30 p.m. on the last Thursday of the month. The February meeting will be a Surplus Equipment Sale (with the advice "don't bring useless Junk"!). In March they will be showing slides of members' shacks, while the owners describe the contents.

Barnsley had two good meetings and their Annual Dinner in January. On February 11 G3GNK will be describing a Two-metre Transmitter, and on the 25th W. W. Williams will describe "Uses of the Oscilloscope." Both meetings will be at King George Hotel, Peel Street, 7.30 p.m. **Cardiff Radio Contest Club** are holding informal get-togethers on the first Monday, at the Griffin Inn, Lisvane, Cardiff; several have already been held, and policy for 1966 discussed. Anyone interested, please contact the Acting Secretary (*see* panel).

Bury & Rossendale have just formed a library, and would be very grateful for any additions to it which readers may be able to spare. Back numbers of periodicals, handbooks of commercial or ex-Govt. equipment in particular would be most welcome. On February 8 they meet at the Old Boar's Head, The Rock, for a talk on Crystals for Amateur Use, by G3NNW.

Saltash are preparing for their Rally in May, and also hope to have their own clubroom and station during 1966. On February 11, G3UBY will give a talk entitled "Anything Goes," which doesn't give much away; and on the 25th a Mullard film and supporting features will be shown. **Stoke-on-Trent** have erected two *80-foot* masts, supporting a Top Band dipole, at their "country QTH at Hulme," and they hope for success in forthcoming contests—well, with an aerial like that, there should be no difficulty! They publish their own *Radio Rag* monthly, and on February 5 are visiting English Electric, Ltd., at Kidsgrove, to see, among other things, the Apprentices' Club station.

Bristol now have a whole house to themselves, and their club station (with the exception of an AR88 LF) has been built completely by their members. They can operate on Top Band with 10 watts, or on the other bands, 80 to 10 metres, with 50 watts, into a long-wire for all bands. VHF is also used, but the location is not so favourable for two metres.

Hong Kong, having held an AGM, inform us that their officials are now as follows: President, VS6FM; secretary, VS6BJ; treasurer, VS6FF; QSL manager, VS6FE; other council members, VS6DS and VS6FO.

Wirral, having had their Junk Sale on February 2, will meet again on the 16th for a talk on Marine Radio, by G3UMZ. **Shefford** held their AGM and re-elected their president, Mr. W. Howlett; with G2DPQ as chairman, G3IXG secretary and G3TVG treasurer. Coming meetings include talks on Transistors, Crystals and a Mullard Film. Meetings are now every Thursday at the Church Hall, starting with Morse practice at 7.45 p.m.

From the fastnesses of GM, **Auchenharvie** (Ayrshire) report for the first time, with the news that they recently put on a show of Amateur Radio equipment and organised a talk on the subject at Stevenston High Kirk. This was so popular that

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CLUB PUBLICATIONS

We acknowledge, with thanks, receipt of the following Club Publications: **AERE** (*QAV*, Nos. 48 and 49); **ARMS** (*Mobile News*, November and December); **BATC** (*CQ TV*, No. 57); **Purley** (*News Sheet*, December and January); **RAIBC** (*Radial*, December and January); **Radio Club of Scotland** (*GM Magazine*, November and December); **Reigate** (*Feedback*, November and December); **Saltash** (*Tamar Pegasus*, December and January); **South Birmingham** (*QSP*, December); **Southgate** (*Newsletter*, November); **Cambridge** (*Cambeam*, Autumn 1965); **Cornish** (*Cornish Link*, December and January); **Gray Valley** (*QUA*, December and January); **Crystal Palace** (*Newsletter*, Nos. 121 and 122); **Midland** (*Newsletter*, December); **Verulam** (*News Sheet*, No. 20); **North Kent** (*Newsletter*, No. 95); **Wessex** (*QUA*, November-January); **Sutton and Cheam** (*News Sheet*, December); **Surrey** (*SRCC Monthly News*, December and January); **Plymouth** (*QUA*, December and January); **Echelford** (*Newsletter*, December); **Swindon** (*Newsletter*, Jan.-Feb.); **Oxford University** (*Information Sheet*, Hilary Term); **Wolverhampton** (Newsletter, January).

OVERSEAS PUBLICATIONS

Ex-G Radio Club (*Bulletin*, Vol. 5, No. 5); **S.A.R.L.** (*Radio ZS*, December); **R.S. of East Africa** (*QTC*, October); *Foundation for Amateur Radio*, Washington, D.C. (*Auto-Call*, October and November); **Aeronautical Center**, Oklahoma (*Collector and Emitter*, November and December).

another has been requested. They meet twice weekly, and have just initiated a monthly newsletter. Nice to know that all this is going on in Scotland.

Wolverhampton will hear a talk on Local VHF Activity, by G8ACB, in their clubroom at 8 p.m. on February 14. **Oxford University** have elected new officers and planned a full programme for the Hilary Term, including a talk on Communications Receivers, by C. W. Hardman (Racal, Ltd.) on February 9, and a Component Sale on the 16th. On the 23rd the subject will be SSB, with a talk by John Killeen of Labgear, and on March 2 Colour TV will be dealt with by B. J. Rogers of the Rank-Bush-Murphy *ensemble.*

THE QSL BUREAU

The QSL Bureau we operate, which gives a world-wide service, is primarily for the convenience of direct subscribers (which means those who get the *Magazine* from us by annual subscription) who have no other bulk QSL outlet. The correct address is : Short Wave Magazine QSL Bureau, 62 Belmore Road, Norwich, Norfolk, NOR.72.T. We continue to get packets of cards addressed, incorrectly, either to our London office or to "Short Wave Magazine, Buckingham." The latter QTH is for Editorial matters *only* and should not be used as a QSL depository. Failure to use the correct Bureau address leads to delay, unnecessary double-handling and extra postage charges.

PASSING OF THE VALVE

It seems fair to say that the thermionic valve, having been supplanted by the transistor in practically all receiving applications, is now on the way out as a transmitting device—except perhaps in high-power RF amplifiers rated in terms of kilowatts into the aerial. At this year's Paris Show, STC have a silicon transistor capable of 50 watts RF output at 150 mc, as well as other RF transistors covering frequencies from 30 to 400 mc for transmitter applications. In the rectifier category, semiconductors capable of considerable voltage-current output are now commonplace, and there are other important practical applications of the transistor from VHF to SHF, ranging from zener diodes to varactors and thermistors.

Parallel with this situation is the interesting fact that, over the world, manufacturers have tens of millions of capital tied up in conventional valve-producing plant—and valves get better all the time. It is all rather like the evolution of the tubeless tyre, which was invented about 1931, but did not come into everyday use till 30 years or so later ! (And now there are those who are going back to tubed tyres, anyway.)

CHANGES OF ADDRESS—URGENT PLEA

Readers who wish to notify a change of address for "New QTH's" are asked to state clearly whether or not they are direct subscribers—that is to say, obtain the Magazine by post from us by subscription paid in advance—and also to give the old address from which they have changed. This is to ease the enormous amount of work in which we are now involved on the card-index side, particularly by reason of the fact that many non-subscribers (who are, of course, fully entitled to the "New QTH" facility) omit to mention that they are *not* direct subscribers, entailing a fruitless hunt through the index. There is also the complicating factor of readers who not only have the same surname, but the same initial—and this is where mention of the callsign helps. In future, therefore, when writing in for "New QTH's," please make all the facts clear. It will save us many hours of donkey-work.

SMALL ADVERTISEMENTS

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9d. per word, minimum charge 12/-. No series discount. All charges payable with order. Insertions of radio interest only accepted. Add 25% for Bold Face (Heavy Type). No responsibility accepted for errors. Replies to Box Numbers should be addressed to The Short Wave Magazine, 55 Victoria Street, London, S.W.1.

BUSINESS FOR DISPOSAL

ELECTRICAL-ELECTRONIC Business, Components and Equipment for sale. Situated East Midlands village; spacious workshops, show-rooms, living accommodation and grounds. Mail order clientele over one thousand. Site approximately 15,000 sq. ft. Consider Partner. — Box No. 4227, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

TRADE

QSL Cards and Log Books, GPO approved, cheapest and best. Prompt delivery. Samples from:—Atkinson Bros., Printers, Looe, Cornwall.

TV AND RADIO: A.M.I.E.R.E., City & Guilds, R.T.E.B. Certificate, etc., etc., on " Satisfaction or refund of fee " terms. Thousands of passes over the years.—For details of Examinations and home training courses (including practical apparatus) in all branches of Radio, TV and Electronics, write for free 156-page Handbook to: B.I.E.T., Dept. 18 OK, 29 Wrights Lane, London, W.8.

GOVERNMENT Surplus Electrical and Radio Equipment. Our new catalogue No. 16 ready now, 2s. 6d. post free. Cost refunded on first purchase of goods over £2 value.—Arthur Sallis Radio Control Ltd., 93 North Road, Brighton, Sussex.

SILICON PLANAR TRANSISTORS: 18v., 200 mW, 100 mA max., beta = 150-300. Prices: n.p.n. @ 5s. 6d. each ; p.n.p. @ 7s. each. All brand new, and by-return service.—Electrovalue, 6 Mansfield Place, Ascot, Berkshire.

AMATEURS ! Your QSL Cards at reasonable prices, 20s. per 100.—ACE (Dept. Q), 330 Wetmore Road, Burton-on-Trent, Staffs.

NEW YEAR OFFER ! Mullard AUY10 (120 mc, power) only 29s.; and OC170 (100 mc), only 5s. 6d. each. Post free from : EMSAC (S), Ltd., 73 Frenchgate, Richmond, Yorkshire.

ENTIRELY NEW Pre-Selector for SWL's. A tuned pentode amplifier with built-in aerial tuner, 1·8 to 32 mc. Tunes antenna and amplifies signal simultaneously ; self-powered. Only £6 18s. Send s.a.e. for specification.—Hamgear Electronics, 29 Carlyle Road, Norwich, NOR.66.C.

WANTED : Communication Receivers. SALE : An AR88D, £30. Available soon : NCX-3 and NCX/A ; SB-34 with mic.; both as new.—Moecan Electronics, Westbury Road, Cheltenham (24217), Glos.

MARCONI VHF Arrays, Yagi 4-element with matching transformer, designed for use with transmitter-receivers type B.43/R.220, 60-100 mc. State approximate frequency required, although assembly of fully-adjustable construction and can be re-cut to requirements. Aerial weight 15lbs., boom length 9ft. Brand new in sealed crates 10ft. by 12in. by 12in., with instruction manual and 90ft. of heavy-duty co-ax. Price 50s. only, plus 15s. carriage.—Riddys Surplus Stores, 3-5 Walsgrave Road, Coventry (28914), Warwickshire.

5-TON FACTORY CLEARANCE RADIO, TV, ELECTRICAL COMPONENTS IN MIXED PARCEL, 1s. PER LB., ADD 2s. POST/PACKING FOR EVERY 5LBS. SPEAKERS, GRILLES, VALVES, BASES, IF'S, CONVERTERS, CONDENSERS, ETC. HUNDREDS OTHER ITEMS, POSTAL ORDERS AND S.A.E. LIST TO—P. NEWTON, 16 SHALLCROSS CRESCENT, HATFIELD, HERTS.

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3d. per word, min. charge 5/-, payable with order. Add 25% for Bold Face (Heavy Type). Please write clearly, using full punctuation and recognised abbreviations. No responsibility accepted for transcription errors. Box Numbers 1/6 Extra. Replies to Box Numbers should be addressed to The Short Wave Magazine, 55 Victoria Street, London, S.W.1.

SALE: SX-28 Receiver, good condition, £15, no offers. Buyer collects. — G2FZI, Irving Lodge, Keinton Mandeville, Somerton, Somerset.

FOR SALE: Labgear LG.50 Transmitter, with combined modulator, covers 10-80 metres; in brand new condition, with manual. Price £27 10s. — Allwright, G2AON, 333 Seaside, Eastbourne (7039), Sussex.

SALE: Heathkit RA-1 amateur-band receiver, with xtal calibrator, excellent performance and in **mint condition, £33.** PSU for Eddystone EC-10 Rx, 65s.—Box No. 4222, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

WANTED: Transmitter, type Olympic T.150 or similar. Must cover 80/160 metres. Write—Box No. 4223, Short Waze Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SALE: Bush FM-only mains Radio, also new Brown's "F" type headphones. Offers before Thursday. WANTED: 1965 "World Radio Handbook," also "QST."—Box No. 4224, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

WANTED: Two-metre Transmitter, 145·8 mc. SALE: Labgear Top Bander, Model 5051, in mint condition, £15.—Jones, G3PIX, 24 Forest Avenue, Foresthall, Newcastle-upon-Tyne, Northumberland.

WANTED: Handbook for HRO-MX, will buy or would like to borrow. — J. Hassall, G3LZB, 35 Coppice Road, Solihull, Warwickshire.

WANTED: Eddystone 888A, in good condition; please give full details.—Mellor, 34 Southdown Road, Shoreham-by-Sea (4107), Sussex.

SALE: Heathkit RA-1, with crystal calibrator, £34; Heathkit RG-1, with matching speaker, £32; both in mint condition. Mains PSU for EC-10, unused, 65s. Consider EXCHANGES for good camera/s, cash adjustment. — Box No. 4222, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SELLING: Rx, coverage 1·5-25 mc, £15. Monster PSU: 300v., 600v., 1,000v.; 6·3v. at 11 amps.; 6·3v. c.t at 8 amps., £8. Mobile 160m. Tx, £5. 'Scope 2½in., £4. Offers for assorted FT-241 IF range xtals; 251 kc R.C.A. mechanical filter; load of valves and bits.—G3MAO, QTHR. (GULliver 4261.)

FOR SALE: Eddystone S.888A, with S-meter and mounting feet, recently revalved and mains filter added, price £75 o.n.o.? G8VB Tiger TR.200, 813 PA, Exciter mods. for FSK and 160m., CW, £70 o.n.o.? Deliver Central Scotland, elsewhere by arrangement.—GM3OGJ, QTHR. (Ring 041 BEA 3629 after 6.0 p.m.)

WANTED: Xtal filter, 9 mc McCoy "Sentinel" or "Guardian," with carrier xtals.—G3HVX, 10 Longworth Road, Tupsley, Hereford.

SALE: Eddystone 840C, super mint, bought 20 Dec., '65; 500 kc to 30 mc in five bands, AC/DC 100/250v., price £55 o.n.o.?—Abraham, 63 Hunter Street, Briton Ferry, Neath, Glam., South Wales.

WANTED: Small Oscilloscope and Newnes "Radio & TV Servicing." FOR SALE: New 4X150A's, £3; used ditto, £2. Also new 4CX250B, £10. Audio Output Meter, Marconi TF-340, price £8. Also Eddystone S.640 Rx, in good condition, with handbook, £19. — Box No. 4226, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SMALL ADVERTISEMENTS, READERS—*continued*

SELLING: Cossor Type 339 DB 'Scope and companion Wobbulator, £12. AR88LF Rx, in excellent condition, £29. Marconi Valve Voltmeter, Type TF-428/A, £5. Oscillator Type 204, covering 20 c/s to 40 kc, in five ranges, £6. Will deliver 50 miles.—G3PHN, Newfield House, Moira, Burton, Staffs. (Tel.: Swadlincote 7537.)

OFFERING: **Morse Instruction Tape,** eight 25-min. lessons at 3¾ i.p.s., price 50s. **Morse Practice Tape,** eight 25-min. lessons including simulated tests, 50s.—Holmes, 69 Crosby Avenue, Scunthorpe, Lincs.

WANTED: Mobile Tx/Rx for 160m., VFO-controlled, for 12-volt working; commercial or home-built. —B. Little, 28 Fitzgerald Road, Bristol, 3.

FOR SALE: Power transformers, 60 and 100 watt, for transistor 12 to 300/600v. mobile PSU's; some with separate bias winding; ideal for B.44, etc. High efficiency, full data supplied. 60-watt, 35s. each; 100-watt, 40s.; post and packing extra. — B. M. Sandall, G3LGK, 21 Dale View, Ilkeston, Derbyshire.

SALE: PCR-2 receiver, good working condition, mains model, £4 10s. R.1155 Rx, mains PSU, with output stage built in, not working, £3. Codar PR-30 Preselector, working order, £3. All "or near offer." —Young, The Elms, Westhorpe, Southwell (3030), Notts.

SELLING: R.C.A. AR88D, with S-meter and manual, £45; speaker, £2. Perdio "Town & Country" Rx, £10. R.A.E. postal course, with LP record, key and oscillator, £8. Buyer collects.—111 Cobden Road, Southport, Lancs.

SALE: Bendix Transmitter TA2-J, 2·9-15 mc, 100-watt, fully metered, internal modulator, new in maker's case, with circuit, £7. Oscilloscope, 3in., £4. X-Band Test Set and Sig. Gen., £4. X-Band waveguide, balanced mixer with twin klystron mounts, £2. Assorted waveguide couplers and adaptors, 30s.—24 Oakleigh Avenue, Bolton, Lancs.

R.C.A. AR88D and Eddystone 358X receivers, perfect, for SALE or EXCHANGE for light-weight Rx with good bandspread. Buyer collects. Offers to:—G4LS, QTHR.

FOR DISPOSAL: Eddystone 940 and Star SR.600 receivers, both as new; either sell or part-exchange; interested any good Rx's. Offers?—Box No. 4228, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SALE: CR-100 Communications Receiver, in excellent condition, with S-meter and other useful modifications, spare valves, speaker and handbook, £17.—R. M. Tatton, 1 Hillview Drive, Edinburgh, 12.

WANTED: Beam rotator in good order, AR22 or similar. FOR SALE: RCX Panadaptor, IF 450-475 kc, sweep 0-200 kc, 240v., £25. Pye VHF Transceiver, requires two xtals, covers full two-metre band, 12-volt supply, ideal for Mobile rig, with manual, £8 10s. Hickok Signal Generator, 85 kc to 144 mc, 100/1,000 kc crystals, incorporates Valve Voltmeter, £15. — G3SRZ, 7 Broadlands Avenue, Hockley, Essex.

SELLING: A KW-2000 with AC PSU, £175 o.n.o.? Green & Davis Linear, £75 o.n.o.? Both Units perfect, re-valved and modified to latest specification by makers.—G3STL, 145 Benfleet Road, Hadleigh, Essex.

SELLING: R.1155N Rx, with internal PSU, output stage, RF-26 converter for 10m. band, spare valves and transit case, £12. Amplifier Type 6, with pre-amp. and PSU, 50w. rating, new valves and meter, make good modulator, £6. Six-foot rack, 20s. BC-454 modified, 25s. Ekco car radio, 12v., £6. All carriage extra.—Box No. 4229, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SALE: Heathkit RA-1 10-160m. amateur band receiver, in mint condition, £27 10s. Heathkit Q-Multiplier, £5 10s. Both items with manuals.—Hayward, The Chace Gardens, Purbrook, Portsmouth, Hants. (Tel. Waterlooville 3047.)

SMALL ADVERTISEMENTS, READERS—*continued*

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WANTED: A QTH, or news of one, Bristol or near, with space for aerial farm (and XYL). Approx. £3,500 offered, with possession after Easter.—Preece, G3TCO, Top Farm Cottage, Weston Longville, Norwich, NOR.59.X.

FOR SALE: Mk. III 19 Set Tx/Rx; ZC1 Mk. II Tx/Rx, pi-network output; both with 12v. PSU's, recently aligned and in perfect working order, £5 each. Buyer collects, or 10s. carriage.—Field, 36 Kingston Road, Hampden Park, Eastbourne, Sussex.

WANTED: A KW-2000.—Gayton, 1 Stanwell Drive, Middleton Cheyney (489), Banbury, Oxon.

SALE: Complete Sideband Station: G2DAF exciter with 400 watt p.e.p. PA, compact and perfect, over 20,000 QSO's, nearest £45. AR88LF, perfect, with (tatty) manual, £30. Teleprinters: Type 7A, page printer, mains PSU, perfect, £15; Type 3X, as new, only £6. Write:—Hobbs, 3 Cleeve Court, Streatley, Berks.

SHACK CLEARANCE: Radio, electronic, components and equipment, new and dismantled, at 10s. per 10lbs., carriage extra. — Tidswell, High Street, Gosberton, Spalding, Lincs.

FOR SALE: SB-33, very compact transistorised 4-band SSB fixed or mobile outfit for 15-20-40-80m., at 75w.; complete with 13v. PSU giving up to 200w. at 117v. AC, Vox unit, Shure p-t-t-mic., pluggery and handbooks, £100 complete; reason for sale, SB-34. Heath Pawnee, absolutely complete kit for two-metre station, with AC and DC supplies, ideal mobile rig (no time to build), price £66.—G3DKS, Timbers, Greenbrook Avenue, Hadley Wood, Herts. (Tel.: BARnet 4934.)

WANTED: Handbooks for HRO-5T and HRO-MX; bandspread coils for 20 and 80 metres. SALE: Handbook for National NC-100, NC-101X, etc., 25s. Full technical manual (photostat) for R.C.A. AR8516L, 52s. 6d. — Box No. 4230, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

WANTED: Eddystone S.640 or similar Rx. Must be in good condition. Please state price.—G3TYB, 29 Newtown, Ashford, Kent.

SALE: Eddystone EC-10 receiver, as new, only three months old, £38 or near offer?—Nash, 134 Wardrew Road, Exeter, Devon.

SELLING: Command Receivers: BC-453, Q5'er, with valves, 70s.; BC-455, 6 to 9 mc, 25s. ARC5/R.28 two-metre Rx, 40s. APQ-9 70 cm. Tx, 15s. (all less valves). Set Labgear 150w. Tx coils, 15s. BC-375 TU Tx parts: Twin-scale vernier drive, 2s.; 6-way heavy duty rotary switch, 2s. 6d.; 2in. diam. x 5½in. long ceramic coil formers, 2s. 6d.; ditto, 6½in. long, 3s.; widespaced Tx variables, 25-60-80-100-125 mmF, 5s. each. R.89A/ARN-5A cavities for 70 cm. converter, with full data, 40s. Two Type RU-19 Rx's, 195 to 435 kc, 25s. pair. Signal Generator, 140 to 300 mc, AC mains, £3. PSU, input 12v. battery or 110v. AC, output 2,000v. at 250 mA, fan cooled and metered, £3. Collins TCS-12 ATU, 6s. 3,000 valves, tested and boxed, 1s. each. J-Beam two-metre 4-ele Yagi, 15s. New 10-ele Yagi for 70 cm., 30s. Details s.a.e.:—Briscoe, 335 Eton Road, Ilford, Essex. (Tel.: TRE 8141.)

SALE: Heathkit HW-32 20m. SSB transceiver, with AC/PSU, only used abroad for four weeks, in perfect condition, £58. Please ring Calder Valley 3166 after 5.30 p.m., or write:—Fisher, G3UBI, 64 Caldene Avenue, Mytholmroyd, near Halifax, Yorkshire.

SALE: Eddystone percentage-modulation meter, with five coils, £4 10s. SWR meter, 75-ohm, £4. Foster dynamic mic., £3. AP.100386 TU and AP.66863 PSU, £10. Creed auto-Tx, current model 6S6M, £40.—Box No. 4231, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SMALL ADVERTISEMENTS, READERS—*continued*

SALE: CR-100 Rx, good condition, recently calibrated and aligned professionally and fitted with new valves, with manual, speaker and set spare valves, £18 10s. Buyer collects.—Sutcliffe, 22 Westfield Terrace, Queensbury, Bradford, Yorkshire.

FOR SALE: MR44 Rx, not used since re-alignment by makers; call and try it; £25 o.n.o.?—G3LZB, 35 Coppice Road, Solihull, Warwickshire.

WANTED: Instruction manual for Oscilloscope Type 13A, buy or borrow. Also 9·000 mc crystal. —G3NPF, 130 Ashingdon Road, Rochford, Essex. (Tel.: Southend 544096.)

SELLING: Heathkit Mohican Mk. II, factory aligned, in good condition, with batteries and manual, £27 o.n.o.? — G3TDL, 91 Hanbury Road, Dorridge, Solihull, Warwickshire. (Tel. Knowle 2413.)

FOR SALE: Eddystone S.750 receiver, little used, as-new in appearance. Offers?—Goodwin, 4 South Hey Road, Irby, Wirral, Cheshire.

SALE: Heathkit DX-100U Tx, as new, £50. AR88D, very good condition, £32. SX-28 Rx, £25. R.107 Rx with 21/28 mc converter, £10. G4ZU beam, £5. 35-foot pole, £2.—Contact XYL, G3NMQ, Croydon (QTHR). Buyers collect.

FOR SALE: Codar CR-66 receiver, with S-meter and manual, as new, can be seen working, £17.—Wright, 24 Innings Drive, Pevensey Bay, Sussex.

BEGINNER'S BARGAIN: One R.1132 and two R.1155 receivers; three Tx PSU's; one Joystick VFA; white-painted 5-drawer cabinet containing multitude of Tx and Rx valves, crystals, moving-coil mic., meters, keys, formers, switches and relays. A complete station for construction. Owner gone QRT. Price £20 the Lot. Buyer collects.—G2BLC, 37 Aragon Avenue, Ewell (7047), Surrey.

WANTED: K.W. Geloso amateur-band converter, any model since 1963, must be in perfect working order. Details and price to:—Jones, 47 Malefant Street, Cathays, Cardiff, Glam., South Wales.

SELLING: Professionally constructed SSB phasing exciter to specification p.93 "Sideband Handbook." Covers 20/80m. bands, upper and lower. Unit comprises 5 mc VFO, 9 mc SSB generator, with B. & W. audio phase-shift components. Line-up is 6AG7 VFO, 12AX7 speech amplifier, 12BH7 crystal oscillator, 12AT7 dual amplifiers, four-crystal-diode balanced modulator, 6BA7 mixer, and 6BQ5 PA. Housed in attractive grey-crackle cabinet, with chrome handles, relative-power meter, etc. PSU requirements 300v. and 100v. plus 6·3v. heaters. Working but requires final alignment using 'scope. Complete with 1,000-cycle self-powered audio oscillator and "Sideband Handbook." Price, at bare cost of materials, £25, plus carriage. Would consider Command BC-454 (preferably new and unmodified) in PART EXCHANGE with cash adjustment.—Box No. 4231, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

FOR SALE: CR-100 coil pack and tuning condenser, unused replacement, fitted Alladin coils, £3. AR88 dial gear-box, 20s. Two small rotary transformers, input 11·5v., output 310v. at 30 mA, 2in. x 4½in., 15s. each. R.107 in fair condition, with handbook, £7. Prefer buyer collects (Croydon, Surrey, area).—Box No. 4232, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

IF YOU DON'T FEEL LIKE springing a full year's subscription all at once, but yet want to be sure of getting your copy of "Short Wave Magazine" on time, send us a 4s. postal order on the Tuesday before the first Friday of the month, and it will be posted to you on the same day as all other direct-subscriber copies.—Circulation Dept., Short Wave Magazine. Ltd., 55 Victoria Street, London, S.W.1.

SALE: K.W. Viceroy, Mk. II, in perfect condition, £80 o.n.o.? AR88LF with Q-multiplier, £25. — GW3RVG, West House, Bryn Garn, Pencoed, Glam., South Wales.

SMALL ADVERTISEMENTS, READERS—*continued*

WANTED: In new and original condition and complete with all coils, an HRO, Model 7, 5T or MX. Details and price to—Box No. 4233, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SALE: Top Band transmitter, complete with modulator and solid-state PSU, with 6BW6 PA, all in grey stove-enamelled cabinet, £8. Oscilloscope, 9-valve, home built around VCR-139A tube, not in cabinet, price £5. Carriage extra both items.—G3RDG, 40 The Vale, London, N.W.11. (Tel. SPEedwell 8831.)

FOR SALE: Petrol-Electric set on trailer, 3 kVA 110v. 3-phase, in fair condition. Also ridge tent, 14ft. by 14ft. by 7ft. high, good condition; offers?—GW4CG, QTHR.

VHF Receiver R.216 for sale, 19 to 157 mc, AM/FM/CW, with PSU; fantastic film-strip dial, and in FB condition. Price £35 o.n.o.? Carriage extra.—G3UQD, 18A Botwell Lane, Hayes, Middlesex.

SELLING: Geloso G.207-DR 10-80m. receiver, amateur bands only, FB double-super, price £35. Matching G.210-TR Tx, 35w. plate mod., £30. Both in excellent condition, with handbooks; as a pair, £59. Also Heathkit OS-1 'Scope, professionally built, as new, £16.—G3HHD, QTHR. (Tel. Nazeing 2037.)

LOOK! Tx for 80/160m., seven valves, AC, complete and self-contained, 8in. x 6in. x 6in.; bargain £5 10s. (stamp for picture and details). Xtal microphones, 7s. 6d. and 5s. Meter 0-100 mA, 5s. 52 Set ATU, 7s. 6d. Speaker chassis from 5s. Add postage.—G2ANB, 78 Broad Walk, Hockley, Essex.

FOR SALE: Heathkit RG-1 receiver, with crystal calibrator, condition as new, price £35.—Fancourt, 4 Pinfold Lane, Stamford (3174), Lincs.

SALE: Heavy duty power pack, 2 kV at 0·5 amp. DC, with 4-400 18 amp. Variac for the PSU, all as new. Offers? Will deliver heavy items to 75 miles.—B. Cheffings, Grimoldby, Louth, Lincs.

WANTED: Labgear wideband multiplier unit Type E.5026.—D. Ozanne, GC3UMX, Rosehurst, Brock Road, St. Peter Port, Guernsey, C.I.

FOR SALE: Heathkit RA-1 amateur-band receiver, in excellent condition, £30. Wilcox-Gay VFO, £3. Home-built double-super receiver based on Electroniques GC.166 front-end and IFT's, Eddystone 898 dial, all new components, price £20 (less than cost of parts).—GW3GIN, 50 Romilly Road, Canton, Cardiff, South Wales.

SELLING: Johnson Viking-2 Tx, 140w. AM, 210w. CW, all bands covered; auto-transformer supplied; external VFO needed. Offers, please. Owner going overseas.—GM3UTQ, 11 Park Crescent, Eaglesham, Renfrewshire, Scotland.

SALE: Heathkit RA-1 Rx, with xtal calibrator, Q-multiplier, matching speaker, factory built, £40. Two-metre converters: 4 to 6 mc IF, £5; 28 to 30 mc IF, £3 10s. Minimitter Topmobile Rx, £10. Olympic ATU, £5. R.220 Rx for 4 metres, £3. Cossor Type 339 'Scope, £10.—G8AFG, 39 Station Road, Drayton, Portsmouth, Hants.

SALE: Top Band Tx, self-contained PSU and Mod., £10. Also Heathkit Sig. Gen. Type RF-1U, £8.—G3RIT, QTHR.

FOR SALE: Heathkit DX-100U Tx, with SB-10U Sideband unit; in excellent condition, little used. Asking £65, or offers; carriage extra.—Winton, 8 Broomagebank, Larbert (2604), Stirlingshire, Scotland.

WANTED: Rx covering 70-100 mc, such as Hallicrafters SX-27 or S.36, etc.; send full details and price asked. SALE: AF186 pre-amplifier for 70 cm.; improve your reports for 57s. 6d. BC-342N Rx, £10; deliver 50 miles.—P. T. Burt, G3NBQ, 54 Brookford Avenue, Keresley, Coventry, Warwickshire.

WANTED: Geloso 4/102 VFO, with or without dial, etc.; also Woden UM3 mod. xformer, 6146 valves. Can collect.—Tibbert, 397 Uttoxeter Road, Derby.

SMALL ADVERTISEMENTS, READERS—*continued*

FOR SALE: KW-2000, in excellent condition, £155. Matching 600-watt home built Linear, using pair 4X150A's with separate solid-state PSU, £35. Can deliver any reasonable distance. Offers to—P. Smith, 24 High Street, Orford, Woodbridge, Suffolk.

SALE: Heathkit RA-1 Rx, 100 kc calibrator, matching speaker, modified S-meter, £30 o.n.o.? Heathkit GDO, Model GD-1U, with all coils, £8. Jennen Trio, Model JR-101, as HE-30, £20 o.n.o.? VHF Rx R.1949, 28-144 mc, with Type 234A PSU, £10. Prefer buyers collect receivers, evenings or weekends.—Stewart, 82 Peatland Quad, Shortlees, Kilmarnock, Ayrshire, Scotland.

EQUIPMENT For Sale: Panda PR-120V 150w. Tx, 10-80m. AM/CW, FB rig, £38 o.n.o.? Buyer collects. Hallicrafters S.38 Rx, 550 kc to 31 mc, electrical bandspread, built-in speaker, for 240v. AC, £10. Command receiver BC-454, modified for Top Band mobile operation, 12v. heaters, £5. Sig. Gen. Type 1-72-H, range 100 kc to 32 mc, AF and RF output, fine and coarse attenuators, £7.—G3IWE, 36 Wilmslow Crescent, Thelwall, Warrington (64178), Lancs.

SALE: Panadaptor Model PCA2, for 455 kc and 115v. AC input, in excellent condition, price £25.—Ring G3NMY, Cromer (Norfolk) 2664.

WANTED: Receiver HQ-170A or EA-12, without mods.; McCoy 9 mc filter; RF ammeter 0-2 amps. 2in. round; isolation xformer 240v. 500 watts; pair 4X150A's.—Box No. 4234, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

FOR SALE: Two-metre converters, variable-frequency high gain, for Pye "Reporter" radio telephones or Pye Type 704 base receivers, price £10. Write—Sawyer, 556 Wimborne Road, Bournemouth, Hants.

SELLING: Eddystone 840C receiver, only four months old, immaculate condition, fitted dial light transformer, with new lightweight headphones and matched doublet, bargain at £45.—Box No. 4235, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

WANTED: Heathkit SB-10U Sideband Adaptor, or commercial SSB Tx (not home-brew). Also a good specimen AR88.—G2TS, Ascot Cottage, Cropton, Pickering, Yorkshire.

SALE: Two-metre Transceiver, Heathkit HW-30, measures 9in. x 6in. x 5in., with built-in PSU, as new, £15. Command Rx, 160-metres, £6; matching 12v. dynamotor 20s. Command Tx for Top Band, with push-pull modulator, £5. Giant 12v. accumulator, 250 amp. hour (callers only), £5.—G3KNB, QTHR.

AT AMATEUR Prices for the Amateur: Clearing CR-100, £17; LM-14 (Navy BC-221), with charts, £15. Oscilloscopes: Cossor Mini 1039M, £10; Sontranic Mini, £12; Cossor Type 1049, £18; R.A.E. 8in. general purpose, £15; Dumont 214, £18; Dumont 208, £15. Model 7 Avometers, with case, £7; less case, £6 10s. AVO Signal Generator, £8. Marconi BFO, TF-602A, £12. Rotary transformers, 5in. x 2½in. dia., input 25v. DC, output 300v. 300 mA, 20s. All foregoing in good working condition. Following items "as is": Cossor Ganging Osc. Type 343, £6; VHF Rx R.1392, £3; AC/PSU for 1392, 15s.; new boxed VR150/30's, 3s.; ex-equipment 12AT7, 9d.; G.P.O. type dial telephones, 12s. 6d. OFFERS invited for the following: Marconi Video Osc. TF-885A, with handbook; Muirhead Decade Osc. D105-A; Marconi Xtal Calibrator TF-723A; Racal Spectrum Analyser SA18; Navy radar Tx/Rx including klystron KRN3, TTR31, 1B24, 807; Tuning Unit TN17/APR4, 74 to 320 mc; Pye Tx/Rx PTC-262. All prices plus carriage.—G3LSD, Netherton Cottage, The Elms, Stoke Damerel, Plymouth, South Devon.

WANTED: CDR Rotator, any size, with control. Also lattice mast, tilt-over type preferred, and TA-33 or TA-33Jr. Beam. or similar. Details to—Baylis, Holt Farm, Bishopstoke, Hants.

SMALL ADVERTISEMENTS, READERS—*continued*

WANTED: Collins 32S-1. Condition and price to—G3LGL, QTHR.

SALE: Creed 7B teleprinter, silence cover and manual, very good condition but untested, £12 o.n.o.? Moving-coil milliammeters, 2in. flush round, 50-100-200 mA FSD, three for 10s., plus 2s. 6d. post/packing. New bridge units, used originally to drive pen recorders; stacks of components plus precision filters; in nice case with lift-up lid, 20s. each to clear. Buyers collect.—Swinborne, 6 Comberton Road, Clapton, London, E.5.

FOR SALE: Receiver type R.209, 1·0 to 20 mc, ten miniature valves, resprayed, chrome handles, with handbook, £12 10s. Top Band Command Rx, 1·5 to 3·0 mc, neat conversion, £5. E.M.I. VHF GDO, 70 to 150 mc, brand new, 40s. Wilcox-Gay VFO, 2 to 10 mc, FB condition, with handbook, £3 10s. Thordarson multi-match mod. xformer, new, rated 135w., 40s. C-core transformer, 960-920-0-920-960v. 250 mA (cool!), £2 10s. Low-pass filter, ex-Govt., new, 15s. Lucas dynamotor, 12v. input, 250v. and 6·5v. output, new and boxed, 15s. Double-beam CR indicator unit, VCR-97 tube, make a 'scope or monitor, 30s. Condenser blocks, 10 mF 700v., four for 20s. Side-lift hydraulic jack, for Ford, B.M.C. makes, etc., new, £3 10s. Collect, or deliver Salop/Liverpool area. Postage extra.—G3RRN, Greystones, Shrewsbury Road, Church Stretton, Shropshire.

SELLING: KW-160 Top Band Tx, has worked all 98 U.K. counties. U.S. Eico 723 Tx, xtal controlled, provision for VFO and modulator, includes coax relay, spare valves, 110v. transformer, and handbook. RF-40 Unit. Offers for Lot, or individual items.—Noakes, 359 Chester Road, Little Sutton, Wirral, Cheshire.

CHANCE FOR The HRO Enthusiast to obtain Model HRO-50T/1, with built-in PSU, crystal calibrator, product detector, etc., bandspread coils 10-80m. (including 15m.) recently laboratory realigned, £70 o.n.o.? Also Panda PR-120V Tx, 150w. phone/CW, £30 or nearest. Delivered within 50 miles or buyer collects. Going Transceiver.—G3SRX, 23 Lady Bay Road, West Bridgford, Nottingham (83106).

WANTED: Circuits or manuals for CR-300 and ART-13. Buy, or loan against deposit.—Brooks, 5 Farrant House, Winstanley Road, London, S.W.11. (Tel. BATtersea 4759.)

SALE: Geloso G.209R receiver, 10-160m., £40. Two-metre converter, £6. T.1540 two-metre transmitter, £3. Geloso receiver front end, cabinet, £8. Minimitter 160m. whip, £3. New Kokusai filter, £7 15s. AVO RC Bridge, £5. Command Receivers and Transmitters. Professionally-built "Elizabethan" AM/CW transmitter, 10 to 80m., with PSU and Z-match, £20 o.n.o.? Cossor 339 'Scope, £4 (needs attention). BCI-130 Test Set, £2. Signal Generator, coverage 7 mc to 210 mc, £5. Advance B4 Sig. Gen., £10. Send s.a.e. for bargain list of valves, meters, xtals, transformers and components.—G3IDW, Orchard Cottage, Hook, Swindon, Wilts. (Ring Wootton Bassett 603, evenings.)

FOR SALE: KT-320 (HE-30), in excellent condition, six months' old, with manual, speaker and ATU, £25 o.n.o.? An ADO (as "Short Wave Magazine," October '62), with coils, uncalibrated, £5. Converter for 14-21-28 mc, three-valve battery, £2.—G. Cree, 20 Longwood Lane, Amersham, Bucks.

SALE: Sphinx transmitter, relay controlled, £50. Two Mk. I vertical aerials, 3 gns. Transmitter cabinet, 30s. Mullard 5-10 Amplifier parts, £3. Octal valves, 5s. each. Offers for copies "Short Wave Magazine" and "Bulletin."—G3JFL, 11 St. Edwards Road, Bournbrook, Birmingham, 29.

WANTED: Copies pre-war, 1937-'39, "Short Wave Magazine;" and "RSGB Bulletin" prior to 1950. Also various copies "Short Wave Listener" and "Short Wave News."—G3OPP, 7 Standard Road, Downe, Orpington, Kent.

SMALL ADVERTISEMENTS, READERS—*continued*

WANTED: To buy or borrow, instruction manual for the HRO-5T.—Bowker, 8 Lytham Drive, Heywood, Lancs.

MOVING QTH: Getting married, so regrettably my robust full-size 20-metre 4-element Yagi on its 50ft. steel self-supporting tower (well known landmark in Lancashire!) will have to go. The tower and beam can be completely dismantled for ease of transport. What offers? Also my Collins 75A-2, with many modifications, including 2·4 kc Collins mechanical filter. And a BC-221M with PSU. Offers to—Stephen Pilkington, G3NNT, 23 Southport Road, Ormskirk (3209), Lancs.

WANTED: Manual for AR88LF or AR88D. Prefer to buy but would gratefully accept loan of copy for short period. All letters answered.—G3FHH, 41 Clarendon Road, Morecambe, Lancs.

WANTED: Simon Radioguide SCR-503A crossed-loop direction finder with service handbook; also R.1155 Rx with D/F section in perfect condition.—Philp, Cavendish Mount, Cavendish Terrace, Carlisle, Cumberland.

SALE: Geloso G.207 amateur bands only double-super, £27 o.n.o.? Would EXCHANGE for QRO AM/CW Tx with perhaps cash adjustment.—G3PTZ, 25 Wimborn Avenue, Grimsby (2344), Lincs.

FOR SALE: HRO Senior Rx, fully reconditioned to original specification in December '64, with PSU, six GC coils, speaker and manual, £18. Hallicrafters S.36 Rx, 27 to 143 mc, with R.C.A. speaker, manual and spare valves, £20. Buyer collects.—Shrimpton, 23 Rotherwood Road, London, S.W.15.

WANTED: Matching speaker for Minimitter MR44/II; also G.E.C. Miniscope double-beam attachment.—Box No. 4236, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

OFFICIAL MANUALS: SCR-522, new, £2 (post 2s. 6d.); R.107, £1 (1s. 6d.). **Modulation Transformers:** SCR-522, new, 10s. (2s. 6d.); TR.1986, 5s. (1s. 6d.). **Rotary Transformers:** 12v./300v. 216 mA, 15s. (4s.). Set of six valves for 46 Set, 7s. 6d. (2s. 6d.). Postage as brackets.—Box No. 4237, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

FOR SALE: Transmitter ART-13, in good condition, with conversion handbook, £10. Prefer buyer collects.—Finch, 57 Lower Drayton Lane, Portsmouth, Hants.

WANTED: Replacement mains transformer (700v.) for Minimitter 120-watt Tx—alternatively, offers invited for Tx as it stands, in good condition and working order except for the PSU.—G3UHS, 9 Bayard Street, Gainsborough, Lincs.

SALE: National HRO receiver, 1·6 to 30 mc, with ATU, Mullard crystal calibrator and some "Short Wave Magazines," price £15. Globe-King "Sky Ranger" S/W Rx, £5. Recorded Morse Course, 20s. 40 valves, 20s. 500 resistors and condensers, 20s. 25-watt soldering iron, 10s. Test meter, £2. Transistor audio amplifier, 15s. Large parcel useful components, 15s.—Wilson, 45 Suffolk Road, Maldon, Essex.

FOR SALE: Mosley TA-33Jr. three-band beam, £12. Buyer collects.—Mark Niman, G3LGN, 9 Montgomery Drive, Unsworth, Bury, Lancs. (Tel. WHI 2942.)

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