

*The*

# SHORT WAVE

*Magazine*

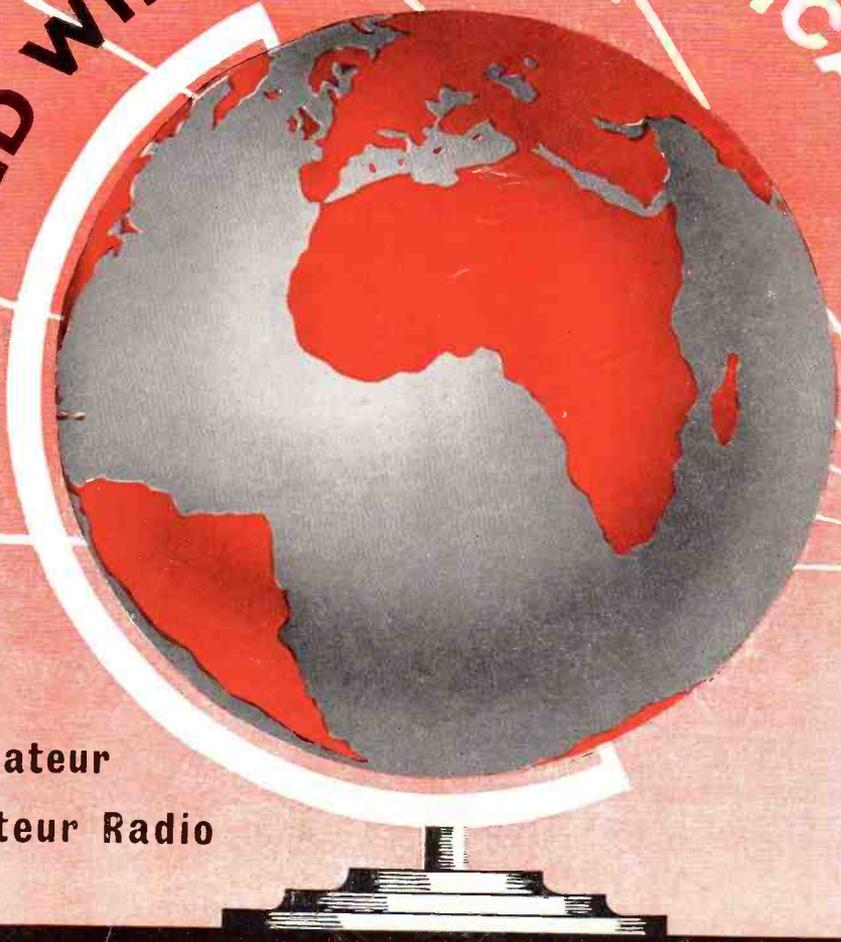
2/6

VOL. XVII

OCTOBER, 1959

NUMBER 8

**WORLD WIDE COMMUNICATION**



For the  
Radio Amateur  
and Amateur Radio

Another  
PAT ON THE BACK  
for the

EDDYSTONE

888A

RADIO SOCIETY OF GREAT BRITAIN  
**RADIO** OFFICIAL JOURNAL **G.3DO.**  
MEMBERS' CORRESPONDENCE *Please address your reply to*



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24th February, 1959.

A.C. Edwards, G.6XJ,  
Messrs. Stratton & Co.Ltd.,  
Eddystone Works,  
Birmingham, 31.



Dear Mr. Edwards,

I feel that you may be interested to know that I have used an "888" on all bands for well over two years, and assure you that I am most impressed with the outstanding performance of this reliable receiver.

The high sensitivity, good signal to noise ratio, coupled with excellent band spread and ease of operation on Phone and C.W., are welcome features in this sound engineering product.

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Yours sincerely,

D.A.C. Edwards,  
G.3DO.

The real criterion for any piece of equipment is the actual performance obtained under practical operating conditions. The letter above concerns the "888" receiver and leaves no doubt at all about the capabilities of this model. The newer "888A" is even better than the original "888," particularly for reception of c.w. and SSB signals, and it is confidently recommended to the serious amateur. The "888A," like other Eddystone models, is built to function consistently and reliably over a long period of time. There are Eddystone stockists throughout the British Isles and in many countries of the World. We shall be happy to put you in touch with the nearest Agent.



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- 0— 25 V.
- 0— 100 V.
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- 0— 1000 V.

**A.C. Voltage**

- 0— 10 v.
- 0— 25 v.
- 0— 100 v.
- 0— 250 v.
- 0— 1000 v.

**D.C. Current**

- 0— 100 micro A
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**Resistance**

- 0—20,000 ohms
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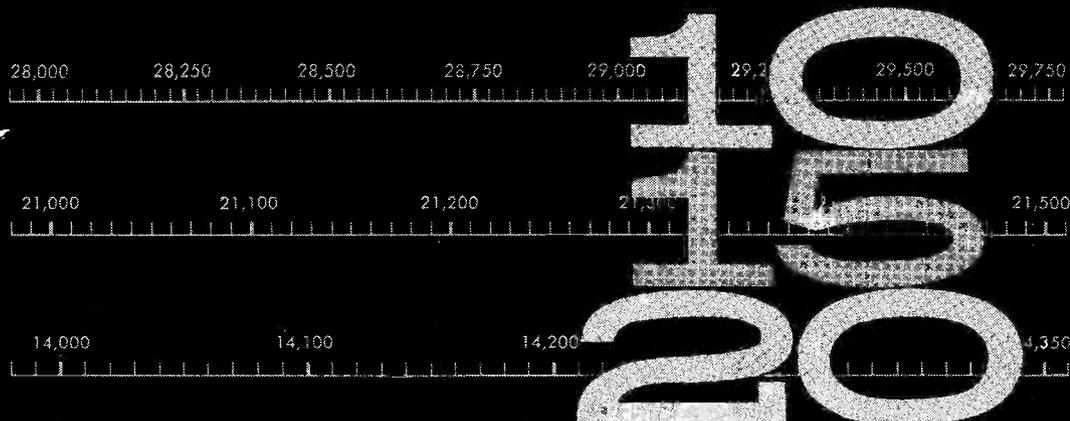
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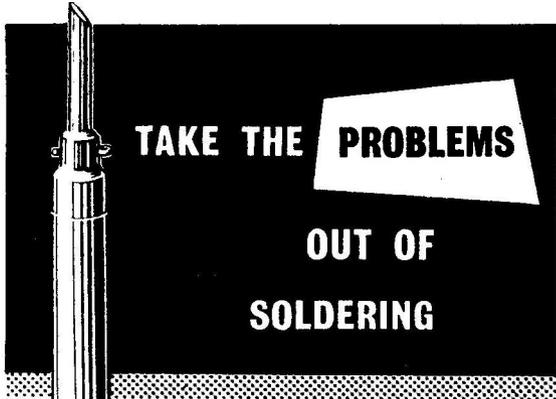


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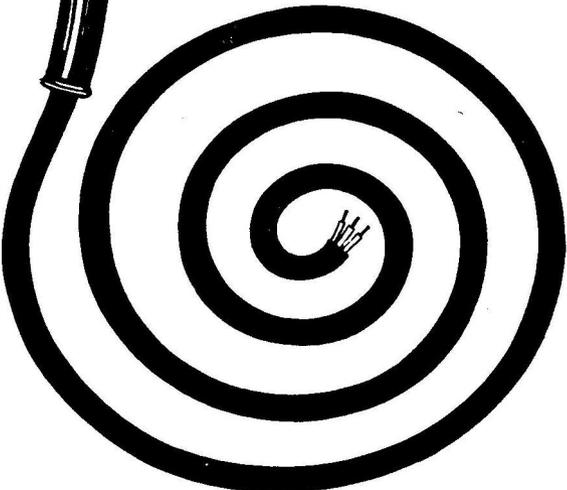
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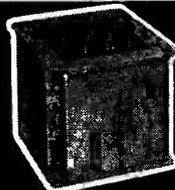
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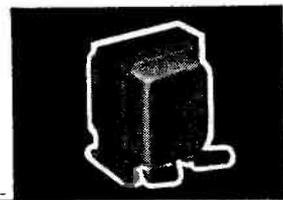


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# SHORT WAVE MAGAZINE

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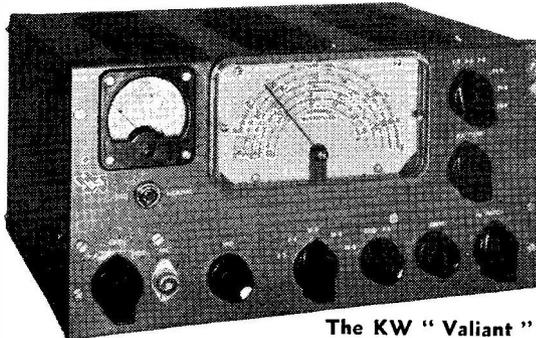
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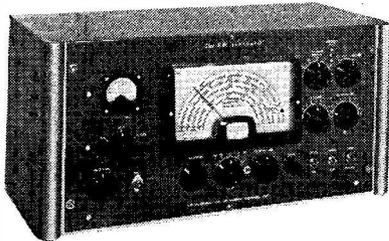
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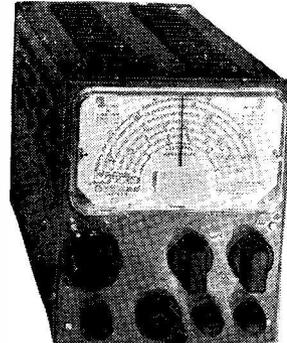
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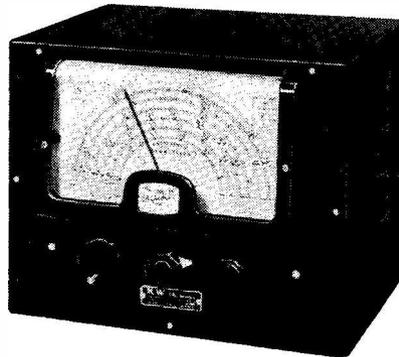
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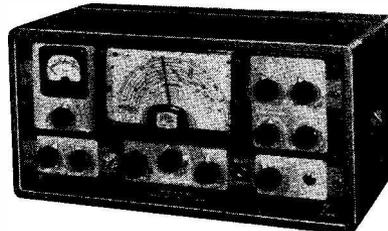


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# The SHORT-WAVE Magazine

## E D I T O R I A L

**Trends** *For the last financial year, out of the Budget total of £5,000 million, the cost of the three defence Services together was estimated at £1,200 million. It has been stated that out of this not less than £500 million (or about 10% of the National Budget) is expenditure through the electronics industry alone. It follows that if "total disarmament in four years," now being talked about all over the world, is a realisable conception, the electronics industry (for one) would be brought to the verge of disaster, because by far the greater proportion of its output is still to Government contract. As is already happening in aviation, the industry would suffer all the consequences that flow from a sharp contraction.*

*While it is not our business here to moralise on the prospects for disarmament — total, partial, controlled, or whatever — it is as well that the possible consequences should be realised. The fact is that the whole of the national economy would be seriously disrupted by any considerable falling-off in the present very high level of defence expenditure. For large sections of many industries, there would just be no work.*

*And what, you may say, the heck has all this to do with Amateur Radio — unless it means that there might be a release of enormous quantities of most attractive surplus! While the latter could well be one consequence, a much more important consideration is that the radionics industry as a whole would have to be prepared to develop a demand for electronic products in fresh markets and in new directions. Automation is one obvious direction which is being actively explored by many firms, who have already produced much electronically-controlled apparatus — it is nearly always electronic — for the automatic factories of the near future (which pose obvious problems of their own).*

*For the time being, however, the hundreds of firms, big and small, up and down the country, busily engaged on defence contracts involving large quantities, have neither the time nor the incentive to think of what is going to happen if Government work dries up, or even slows down.*

*But if disarmament on any considerable scale becomes a reality, as we must all hope, then they will have to find new outlets or go out of business. And in the radio context, this concerns us all, amateur and professional alike.*

*Austin Fobyl  
GtFo.*

# All-Band CW/ Phone Transmitter

MODERN—TVI-PROOF—  
MEDIUM POWERED—DESIGN  
AND CONSTRUCTION

## Part I

C. L. WRIGHT, B.A., B.Sc. (G3CCA)

*As the photograph illustrating this first part of his article shows, our contributor has produced a five-band transmitter of exceptional interest. While it may not be possible—and, in some cases, desired—to copy the design in detail, there will be many constructors who will be able to incorporate some of G3CCA's ideas into their own equipment—in particular, the transistorised control circuit and the TVI-proofing methods.—Editor.*

HAVING been virtually off the air for approximately two years due to his professional activities, the writer now finds himself able to commence operating again. Reflecting upon the old equipment it was decided that this was obsolete and should be rejuvenated without delay. With this in mind much consideration was given to new techniques, both in transmitter circuit design and efficient control systems. As a result of these investigations a completely new transmitter has been evolved, using modern components wherever possible.

Originally it was intended to construct a self-contained table-top unit, but in the interests of stability it was finally decided that the modulator output circuits, together with the RF power amplifier HT supply, should be in a separate cabinet. TVI filters, which are essential in this modern television age, have also been incorporated and all mains and power supply leads have been wired with screened cable. An RF filter circuit has been included in the mains supply lead.

The theme of this design has been the production of amateur-built equipment which compares favourably with the better class commercial transmitter, so particular attention has been given to the layout and wiring. Frequently, the writer has examined well designed amateur equipment only to find the wiring and layout are so poor that the final result appears like a species of bird's nest. A few hours spent on carefully planning the layout and arranging the wiring accordingly

will result not only in a tidier job but in a transmitter free from instability and parasitics—and this is apart from making servicing easier, should the occasion arise.

It was decided not to waste time on the construction of a VFO and driver stage when a good commercial product is available, complete with a large calibrated dial assembly. It was, however, thought desirable to include some form of transmitter remote control, though whatever form this system was to take, it had to be both simple to operate and reliable. Numerous relay circuits were tried before the final switching circuit was evolved; this is a unique arrangement by which all normal operating sequences are controlled by a special switch in the microphone handle. For CW operation a single switch on the transmitter panel changes the control circuits over to a "send-receive" control located at the base of the key.

It is interesting to note that the control circuit operates at a very small voltage below earth, so apart from being safe to handle, no high voltages or currents flow in the external control leads.

The transmitter has been designed for an input of 90 watts on CW and 60 watts on phone, and covers all amateur bands from 3.5 mc to 28.0 mc. It is, however, rather costly to construct, but in the opinion of the author, this cost is well justified by its performance. Realising that the financial side of Amateur Radio is often a factor that must be taken into consideration, some suggestions are made to enable a cheaper version to be constructed without a great loss of efficiency.

### Special Quality Valves

Before describing the circuitry it is important to discuss one of the major differences of this transmitter when compared with other amateur transmitting equipment; this is the use of Brimar "T" or "trustworthy" valves in the place of the normal domestic types. These valves have been developed for use in equipment where maximum efficiency and reliability are the prime consideration; a specification which most definitely applies to amateur transmitting equipment.

Extensive tests have been carried out on these valves by the author in his professional capacity, and based on the result of these investigations, it was decided to incorporate them in this transmitter. It has not been possible to substitute a "T" type valve in every case as only a limited range is at present available, but full use has been made of those which are obtainable. It should be noted that the base

connections and electrical characteristics of "T" type valves are identical with their standard counterparts, but their cost is slightly higher than domestic valves.

To enable ordinary valves to be used, if desired, and therefore reduce the cost, the references relating to "T" valve types are given first in the text, followed by the equivalent domestic type, in brackets, e.g. 6062 (or 5763).

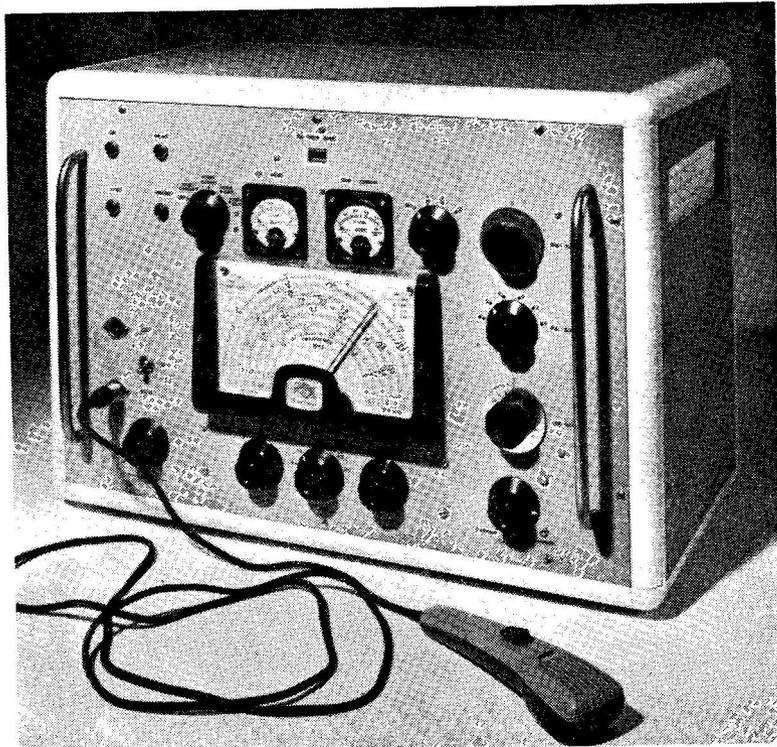
### Variable Frequency Oscillator

The VFO consists of a Geloso Model 104/4 "signal shifter" unit employing a 6CL6 pentode as an oscillator and a 5763 as a buffer/doubler. This circuit, shown in Fig. 1 (a), was fully described in the August, 1958, issue of *SHORT WAVE MAGAZINE*<sup>(1)</sup>. The 5763 valve has, for reasons stated, been replaced by its equivalent in the Brimar "T" range, the new type number being 6062. No alteration is necessary to the Geloso unit in order to make this valve substitution.

The appearance of the transmitter has been enhanced by the use of the Geloso calibrated dial assembly Type No. N/1646. This dial is specially made for the VFO unit and enables a direct frequency reading to be obtained at any point throughout the following frequency ranges: 3.5 to 4.0 mc; 7.0 to 7.3 mc; 14.0 to 14.6 mc; 21.0 to 21.9 mc; 26.96 to 28.0 mc (this frequency band is not available to British amateurs) and 28.0 to 29.7 mc. The desired frequency range is selected by a six-position switch located beneath the dial assembly.

The Geloso VFO unit is aligned when received from the suppliers, but it does need slight "band-edge" trimming to ensure that a direct frequency reading is obtained at any position of the dial pointer on all ranges. (The full alignment procedure is given in the section relating to transmitter adjustment.)

For CW operation the keying is carried out in the cathode of the 6062 (or 5763) valve by the application of approximately 100 volts positive, which blocks the valve in the keep-up position. Obviously with such a high voltage



Full-face view of the transmitter by G3CCA, described in the article. At centre at the top of the panel is the PA transmission-hour meter with the signal lamps at top left. From left to right, above the tuning dial, are the meter switch, PA meter, grid meter, coarse tuning control, and aerial fine tuning. On the left of the dial are the key and microphone sockets, the CW/Phone switch, and the modulation control. Other controls are VFO tuning, VFO band change, and PA grid drive, PA band change and PA tank condenser. In this model, the microphone is a Grundig, and all operating sequences are controlled by a switch in its handle.

on the cathode, the heater cannot be tied down to earth like the other valves in the transmitter, otherwise a cathode to heater insulation breakdown will be liable to occur. To prevent this, a separate heater winding, or transformer, is necessary; in this design a separate transformer is used. One point which is not often realised by users of 6062 (or 5763) valves is that the heater is only rated at 6.0 volts, 0.75 amps., which according to the manufacturer's data sheet, must not vary by more than  $\pm 10\%$ . To ensure that this value is not exceeded, the secondary winding of the heater transformer supplying the 6062 valve should not be rated greater than one amp. Should it, however, be more convenient to use a transformer with a higher rated winding, it will be necessary to insert a resistor between pin 4 on the 6062 (or 5763) valveholder and the appropriate connection tag (9) on the Geloso unit tag strip. Two resistors, of one ohm each, connected in parallel will suffice, but it is advisable to measure the actual voltage across the valve

heater pins under full load conditions.

### Power Amplifier

The output of the VFO/driver unit is capacity-coupled to a Brimar 6146 in the anode of which is a pi-section tuned circuit, as shown in Fig. 1 (b).

A VHF parasitic suppressor consisting of 5 turns of 1/16th inch dia. copper welding rod, wound to an inside diameter of  $\frac{1}{2}$  inch, is connected between the RF anode choke and the top cap of the 6146. This coil is air spaced and self-supporting; a 33-ohm two-watt carbon resistor is connected in parallel with it (R3, L1).

To ensure maximum drive over the entire frequency range the 25  $\mu\mu\text{F}$  variable capacitor in the grid circuit (C1) of the 6146 must have a low minimum value. A J.B. type C.804 has been used in this position and found quite satisfactory.

The grid current is permanently metered by a 0-1 mA f.s.d. meter (M1) in conjunction with an appropriate shunt resistor (R2). This enables a continuous check to be kept on the 6146 grid current under all conditions. Should it be found necessary to economise, the meter (M1) may be omitted and the grid current observed on the anode/screen meter (M2). This can be done by replacing the existing metering switch (Sw3) by a two-pole five-way, the extra metering position being used to measure the grid current.

A screen clamp valve, Brimar 6061 (or 6BW6) prevents the flow of excessive anode current should the excitation be removed from the 6146, either through a failure within the drive unit, or during operation under CW conditions. A 10 Henry 40 mA low frequency choke has been included in the screen circuit to assist the anode swing on modulation (L2).

The action of the clamp circuit is easily understood when it is realised that under normal operating conditions a large negative voltage is developed across the PA valve grid resistor (R1) due to the flow of grid current. This voltage is applied as a bias to the grid of the 6061 clamp valve, cutting off its anode current and ensuring that only the 6146 screen current flows through the dropper resistors (VR1 and R6), thus permitting that valve to operate correctly. Should the drive to the 6146 fail, the current flowing in its grid circuit will cease and there will be no PD across R1, therefore the bias on the grid of the clamp valve will be reduced to zero so the 6061 conducts heavily. As the PA screen resistors (VR1 and R6) also form part of the anode load of the clamp valve, the large current will flow through these resistors, reducing the voltage applied to

the screen of the 6146. Now, the characteristic of most beam tetrodes is such that the anode current, for a given bias voltage, is almost independent of anode voltage, being instead a function of the *screen* voltage. So by the use of a screen clamp circuit, similar to the one described, the anode current of the 6146 will fall to a value well within its anode rating, should the drive fail.

Use has also been made of the anode/screen voltage characteristic to reduce the power input to the PA stage, should the occasion arise, and the variable resistor (VR1) is incorporated in the screen circuit of the 6146 for this purpose.

The output of the 6146 is capacity-coupled to a Geloso pi-coil assembly through a T.C.C. type M4WHO (5000v. test) mica condenser (C4). A J.B. type SE18 variable condenser has been used for anode tuning and a SE40 for aerial loading. As the maximum capacity of the SE40 is only 380  $\mu\mu\text{F}$  a coarse tuning adjustment in the form of mica condensers can be switched in parallel with the variable aerial loading capacity as and when required. This tuning method ensures that a low minimum, as well as a high maximum, capacity can be easily obtained. If desired, this fine/coarse tuning system can be replaced with a 500  $\mu\mu\text{F}$  double-gang variable condenser with the two sections connected in parallel.

To ensure maximum efficiency in the output circuit, Belling Lee B.N.C. coaxial connectors are used. These have been designed for Uniradio-43 coaxial cable and when they are used as specified the standing-wave ratio introduced by the connector is less than the characteristic impedance of the cable. It is also interesting to note that these connectors can be used at frequencies up to 3,000 mc with little loss—but UR-43 cable must be used in every case otherwise there is no point in going to the expense of fitting them.

### Meters and Switching

Identical meters are provided for both voltage and current measurements and comprise two 0-1 mA f.s.d. square flushing-mounting type. The first meter is shunted with a 7-ohm 1% high stability Painton type 72 resistor and is for the measurement of the PA grid current. The other meter is used for the anode and screen voltages and currents; each function is selected by a two-pole, four-position switch. For current measurement shunt resistors have been incorporated to extend the readings to 50 mA full scale for screen current and 200 mA full scale for anode current.

The shunt resistors were constructed by

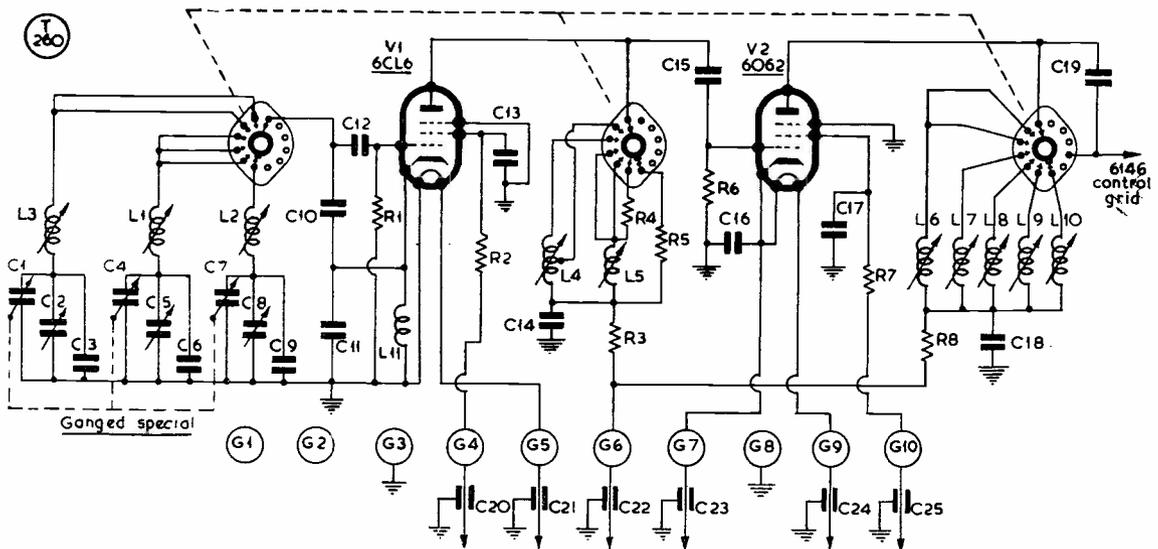


Fig. 1 (A). Circuit diagram of the Gelson VFO Type 104/4 used as the driver source in the transmitter by G3CCA. Condensers C20-C25 are all .001  $\mu$ F, Dubilier BPS.643, rated 1,000v. Valves are 6CL6 for V1 and Brimar 6062 for V2. All other parts are incorporated in the Gelson 104/4 unit as received.

winding a small length of ordinary 1 kW fire bar element wire on to a one watt, high value, carbon resistor and soldering each end to the resistor lead-out wire. (The actual value of the shunt resistors will depend on the type of meter used and its internal resistance.) In this transmitter the meters had an internal resistance of 63 ohms, making the shunt resistors 1.36 ohm and 0.316 ohm respectively. These were constructed by the method stated and trimmed to the final resistance value by measuring them on a Wheatstone bridge.

Two Painton type 75, one megohm, high stability 1% carbon resistors are connected in series with the meter for voltage measurement; one for anode voltage and one for screen voltage. These resistors extend the meter reading to 1,000 volts full scale in each case.

Special attention should be paid to the type of switch used for meter position selection, otherwise serious damage can occur to the meter when changing from one metering position to another. (This is dealt with in greater detail in the section relating to some difficulties encountered during the initial transmitter tests.)

A series tuned circuit, tuned to the appropriate channel, has been included in the output stage to suppress any harmonics that are liable to occur around the local television frequencies.

The PA valve, and its associated tuning circuit, is mounted in a heavy gauge screening box; the harmonic filter, L4 and C10, is assembled on a bracket at the side of the B.N.C. output coaxial connector. An aerial change-over relay is fastened to the back panel

of the RF unit cabinet and coupled to the pi-network through UR-43 coaxial cable.

The aerial relay is a modified Benson and Robinson type B.02 and operates on 6 volts DC; this voltage is obtained from the RF unit low voltage power supply and ensures that no stray 50-cycle magnetic fields appear near the aerial circuit. The relay modifications consist of substituting the operating bar supplied with the relay for a P.T.F.E. rod,  $\frac{1}{4}$  inch diameter, and replacing the contact paxolin spacers with 1/16 inch thick P.T.F.E. sheet. These modifications assist in the reduction of any RF leakage that may otherwise occur at the high frequency end of the wave range.

**Modulator Pre-Amplifier**

A microphone pre-amplifier utilizing three Brimar type 8D8 valves is incorporated in the RF unit, the circuit diagram being given in Fig. 2. The pre-amplifier output control VR1, situated on the front panel of the transmitter, enables the modulation level to be easily adjusted; the output signal is coupled to the modulator input by coaxial cable and B.N.C. connectors.

The input stage, V1, of the pre-amplifier has been designed to match a Grundig type GDM503 dynamic microphone. This microphone is very compact and incorporates a three-position control switch and indicator lamp within its handle. It has, however, been necessary to make two simple modifications to the switch assembly in order to obtain the operating sequences, required for netting and

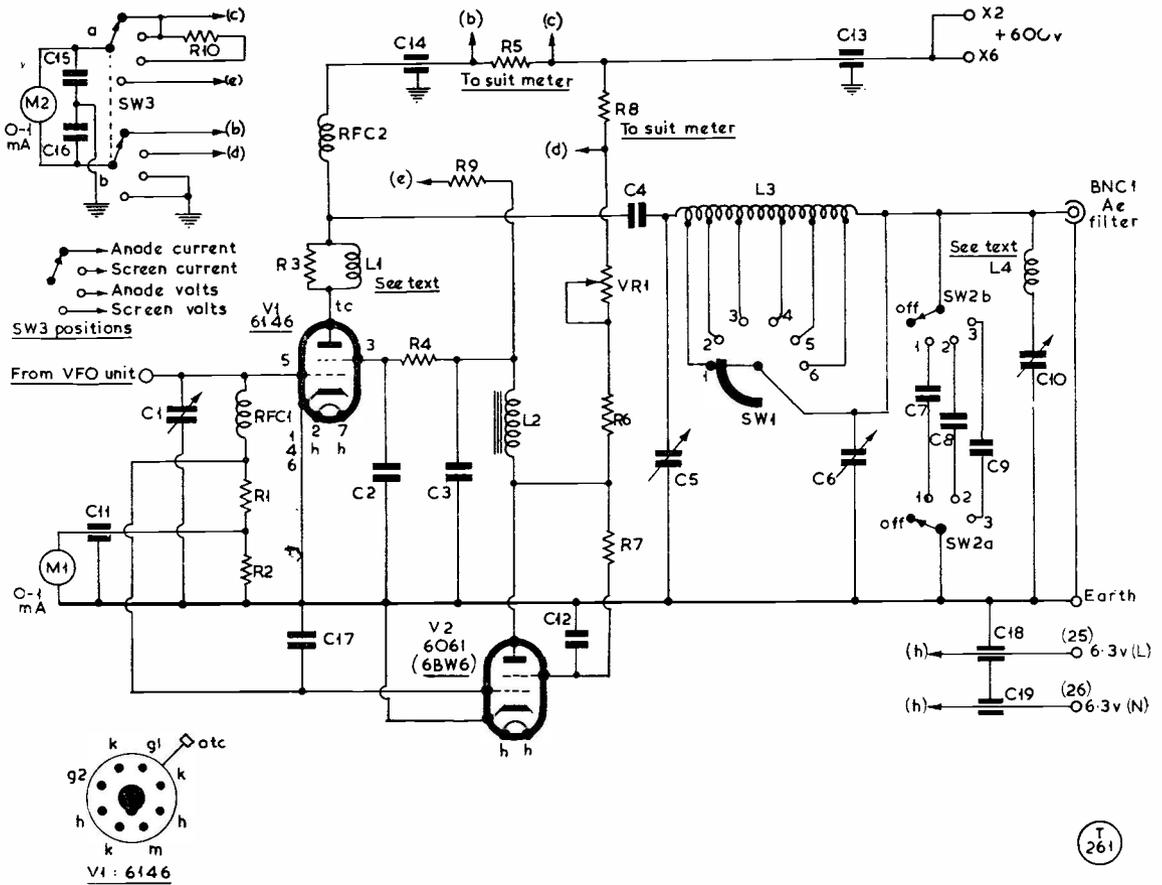


Fig. 1 (B). Circuit complete of the RF section of the transmitter, driven direct from the Gelsco 104/VFO. The PA valve is a 6146 and the clamper a 6061 in the Erimar "trustworthy" series: this is equivalent to the 6BW6. The meter M2 is on a four-position switch to read PA current and voltage. The switch Sw2 brings in a series of condensers in parallel with C6, so that the correct output impedance can be achieved.

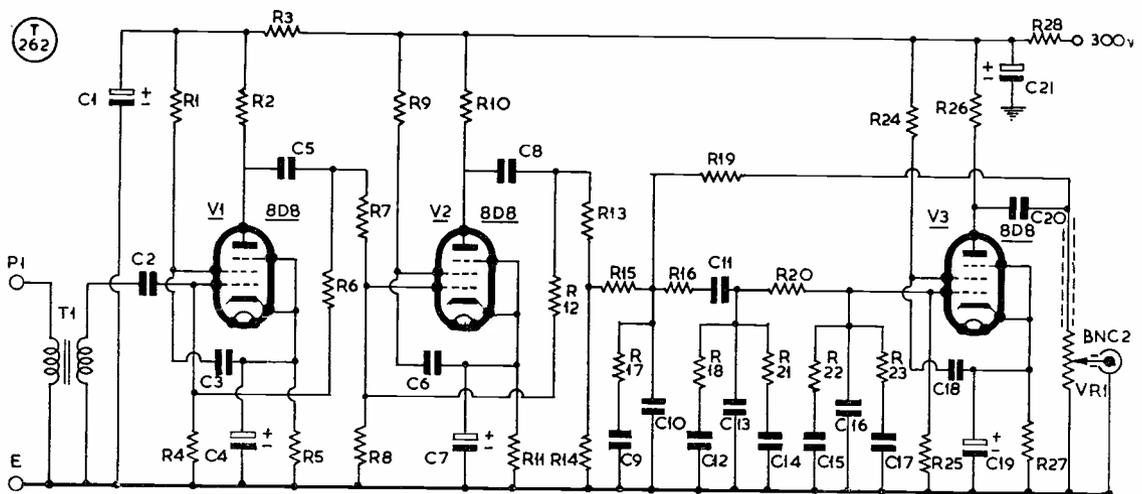


Fig. 2. The modulator pre-amplifier circuit in the G3CCA transmitter uses three 8D8's, and some special points about this amplifier are discussed in the text. Its audio output characteristic is shaped for speech, and all values are given in the table.

**Table of Values**

Fig. 1(b). PA Circuit of the All-Band Transmitter

C1 = 25 $\mu$ F max variable	R3 = 33 ohms 2 watt carbon
C2 = .001 $\mu$ F, 1,000 volt wkg. TCC type 2043	R4 = 33 ohms 1 watt carbon
C3 = .001 $\mu$ F, 1,000 volt wkg. TCC type 2043	R5 = Meter shunt (to suit meter used)
C4 = .002 $\mu$ F TCC mica type M4WKO, 2,500 volt wkg.	R6 = 56,000 ohms 2 watt carbon
C5 = 165 $\mu$ F variable J.B. type SE18	R7 = 33,000 ohms 2 watt carbon
C6 = 367 $\mu$ F variable, J.B. type SE40	R8 = Meter shunt (to suit meter used)
C7 = 300 $\mu$ F TCC type M3U, mica 750 volt wkg.	R9 = 1 megohm Painton type 72 H.S., carbon 1%
C8 = 2 x 300 $\mu$ F TCC type M3U mica 750 volt wkg.	R10 = 1 megohm Painton type 72 H.S., carbon 1%
C9 = 3 x 300 $\mu$ F TCC type M3U mica 750 volt wkg.	VR1 = 50,000 ohm potentiometer, Colvern 5 watt W/W
C10 = 25 $\mu$ F air-spaced trimmer J.B. type C.804	RFC1 = Geloso pi-choke, Cat. No. N.17634
C11 = .001 $\mu$ F, feed through, Dubilier type BPS.643, 1,000 volt	RFC2 = 2.5 mH RF choke (Eddystone or Denco)
C12 = .001 $\mu$ F, 1,000 volt wkg. TCC type 2043	L1 = (see text)
C13 = .001 $\mu$ F, feed through, Dubilier type BPS.643, 1,000 volt	L2 = 10H. 50 mA, LF choke
C14 = .001 $\mu$ F, feed through, Dubilier type BPS.643, 1,000 volt	L3 = Geloso Pi-coil assembly complete with switch (150-watt type recommended)
C15 = .001 $\mu$ F, Silver mica, 750 volt wkg. TCC type 701 SMB	L4 = TVI filter, 9 turns $\frac{1}{16}$ in. diameter, 12 swg tinned copper
C16 = .001 $\mu$ F, Silver mica, 750 volt wkg. TCC type 701 SMB	Sw1 = Included in Geloso coil assembly
C17 = .001 $\mu$ F, 1,000 volt wkg. TCC type 2043	Sw2 = 2-pole 4-way switch
C18 = .001 $\mu$ F, feed through, Dubilier type BPS.643, 1,000 volt	Sw3 = 2-pole 4-way switch (see text)
C19 = .001 $\mu$ F, feed through, Dubilier type BPS.643, 1,000 volt	M1 = 0-1 mA. F.S.D. 2in. square type
R1 = 27,000 ohms $\frac{1}{2}$ watt carbon	M2 = 0-1 mA. F.S.D. 2in. square type
R2 = 7 ohms Painton type 72 H.S. carbon 1% (or to suit meter used)	ENC.1 = Belling Lee Type L.1331/CS BNC connector for RF screening compartment, and Belling Lee Type L.1352/BS bulkhead adaptor mounted on back panel of cabinet.
	V1 = Brimar 6146 (or Mullard QVO6-20)
	V2 = Brimar Series "T" 6L61, (or Brimar 6BW6)

**Table of Values**

Fig. 2. M dulator Pre-Amplifier Circuit

C1 = 8 $\mu$ F, electrolytic 350-volt wkg., T.C.C. type CE11L
C2 = .01 $\mu$ F, paper 500-volt wkg., T.C.C. type 543
C3 = 0.1 $\mu$ F, paper 500-volt wkg., T.C.C. type 543
C4 = 50 $\mu$ F, electrolytic 12-volt wkg., T.C.C. type CE77B
C5 = 0.1 $\mu$ F paper 500-volt wkg., T.C.C. type 543
C6 = 0.1 $\mu$ F paper 500-volt wkg., T.C.C. type 543
C7 = 50 $\mu$ F electrolytic 12-volt wkg., T.C.C. type CE77B
C8 = 0.1 $\mu$ F paper 500-volt wkg., T.C.C. type 543
C9 = 168 $\mu$ F, silvered mica, Radiospares
C10 = 270 $\mu$ F, silvered mica, Radiospares
C11 = 820 $\mu$ F, silvered mica, Radiospares
C12 = 168 $\mu$ F, silvered mica, Radiospares
C13 = .0018 $\mu$ F silvered mica, Radiospares
C14 = 470 $\mu$ F, silvered mica, Radiospares
C15 = 220 $\mu$ F, silvered mica, Radiospares
C16 = 560 $\mu$ F, silvered mica, Radiospares
C17 = 470 $\mu$ F, silvered mica, Radiospares
C18 = 0.1 $\mu$ F, paper 500-volt wkg., T.C.C. type 543
C19 = 50 $\mu$ F, electrolytic 12-volt wkg., T.C.C. type CE77B
C20 = .025 $\mu$ F, paper 350-volt wkg., Hunts type A319
C21 = 16 $\mu$ F, electrolytic 350-volt wkg., T.C.C. type CE19L
R1 = 1 megohm, Painton type 74 carbon, 1% H.S.
R2 = 220,000 ohms, Painton type 72 carbon, 1% H.S.
R3 = 22,000 ohms, $\frac{1}{2}$ -watt carbon
R4 = 2.2 megohm, Painton type 75 carbon, 1% H.S.
R5 = 2,200 ohms, Painton type 72 carbon, 1% H.S.
R6 = 2.2 megohm, Painton type 75 carbon, 1% H.S.
R7 = 220,000 ohms, $\frac{1}{2}$ -watt carbon
R8 = 470,000 ohms, $\frac{1}{2}$ -watt carbon
R9 = 1 megohm, Painton type 74 carbon, 1% H.S.
R10 = 100,000 ohms, Painton type 72 carbon, 1% H.S.
R11 = 1,000 ohms, Painton type 72 carbon, 1% H.S.
R12 = 10 megohm Lab. Histab $\frac{1}{2}$ -watt, type H31
R13 = 68,000 ohms, $\frac{1}{2}$ -watt carbon, 5%
R14 = 220,000 ohms, $\frac{1}{2}$ -watt carbon, 5%
R15 = 68,000 ohms, $\frac{1}{2}$ -watt carbon, 5%
R16 = 47,000 ohms, $\frac{1}{2}$ -watt carbon, 5%
R17 = 10 megohm, $\frac{1}{2}$ -watt carbon, 5%
R18 = 10 megohm, $\frac{1}{2}$ -watt carbon, 5%
R19 = 1 megohm, $\frac{1}{2}$ -watt carbon
R20 = 47,000 ohms, $\frac{1}{2}$ -watt carbon
R21 = 10 megohm, $\frac{1}{2}$ -watt carbon, 5%
R22 = 10 megohm, $\frac{1}{2}$ -watt carbon, 5%
R23 = 10 megohm, $\frac{1}{2}$ -watt carbon, 5%
R24 = 1 megohm, Painton type 74 carbon, 1% H.S.
R25 = 470,000 ohms, $\frac{1}{2}$ -watt carbon
R26 = 220,000 ohms, Painton type 72 carbon, 1% H.S.
R27 = 2,200 ohms, Painton type 72 carbon, 1% H.S.
R28 = 27,000 ohms, 1-watt carbon
VR1 = 250,000 ohms, log, Radiospares, miniature V/C
T1 = Microphone transformer: Ratio 50:1 overall Woden Potted Type No. MT.101A (for low impedance microphone only)
BNC2 = Belling Lee B.N.C. Connector: Chassis Socket No. L.1331/CS
V1, V2, V3 = Primar 8D8 Low noise Pentodes
P1 = Part of Grundig six pin plug

transmitting. These modifications are easily carried out and are fully explained in the section dealing with the control circuit.

The input impedance of V1 has been reduced by the application of feedback, the audio voltage at the anode of V1 being fed-back through resistors R6 and R4. Analysing the valve circuit it will be seen that these resistors shunt the grid-cathode circuit of the valve<sup>(2)</sup>, thus reducing the input impedance to a value less than R6 + R4.

The audio signal from the microphone is fed,

through a Woden type MT101 mu-metal screened transformer, to the grid of V1 via a 0.01  $\mu$ F non-inductive condenser. The microphone transformer is one-hole fixing, the final position being found by rotating the transformer during test to give the minimum hum pick up.

Shunt feedback has also been used in the circuit of V2, the values of the feedback resistors, R8 and R12, being chosen to give an input impedance to match the output impedance of V1. This reduces any effect that is liable to occur in the interstage coupling due to impedance changes, usually associated with feedback circuits<sup>(3)</sup>.

(To be continued)

(1) "New Geloso VFO Unit 4/104," Short Wave Magazine, August 1958.  
 (2) Thermionic Valve Circuits, Pitman  
 (3) "Design for a Pre-Amplifier — High Quality Sound Reproduction," Mullard Publication.

# Taking Facsimile Transmissions

THE AUDIO FILTER —  
 MARKING THE PAPER —  
 CONTROL CIRCUITRY —  
 SETTING-UP PROCEDURE —  
 MET. TRANSMITTING  
 STATIONS

J. B. TUKE (G3BST)

*This concludes what many readers will agree has been a most interesting and instructive article. Our contributor has shown considerable ingenuity and resource in tackling what, from the amateur point of view, were nearly all new problems in design and construction. The result is a great credit to him. Speaking editorially, this article — the first three parts of which appeared in our April-June issues— has been a pleasure to process for publication because it has revealed so much original thinking.—Editor.*

THE last stage of the construction concerns the signal amplifier with its highly selective filter. The amplifier itself is quite conventional. A 12AT7 is used in a two-stage voltage gain circuit to feed a 6AQ5 output valve. The arrangement is shown in Fig. 9. The values of the condensers in the resistance-capacity coupling are deliberately kept on the low side to give the amplifier a rising frequency/amplitude characteristic; this is done so that "full black" tone (the highest) will produce a greater output than "grey," which is a tone of a slightly lower frequency.

Also mounted on this chassis is the power supply. It is not necessary to give details of this as it is quite conventional in design, using a 350-0-350 volt mains transformer, giving about 300 volts DC for HT supplies, through a 5U4G rectifier. The current rating should be around 100-120 mA.

## The Audio Frequency Filter

Between the receiver and the audio amplifier is fitted the selective filter mentioned earlier. *The whole success or failure of the facsimile equipment depends on the correct operation of this filter.* The removal of the "full white" tone is done by an AC bridge circuit—known as a Wien Bridge. The circuit is shown in Fig. 10, and the theory of operation is simply

that at one particular frequency the bridge is balanced both in amplitude and phase and there is no output. This frequency is restricted to an extremely narrow band, the complete *null* occurring over a bandwidth of only a few cycles. Quite a severe overall attenuation occurs also, so the reason for the three-stage amplifier following becomes apparent.

Correct operation of the bridge can only be obtained providing it is balanced properly and stray capacities between the various points are at a minimum. The entire unit is mounted in a small metal box and the leads between this box and the input transformer on one side, and the grid of the amplifier on the other, must be kept as short as possible. The input transformer can be any small audio transformer with a 1:1 ratio, preferably with a screen between primary and secondary. If a screened transformer cannot be obtained it is necessary to experiment a little with the connections to avoid any appreciable capacity coupling between the two windings. Experiments have shown that with an unscreened transformer minimum capacitive coupling takes place when the inner winding is connected to the bridge and the outer winding to the receiver. The outer winding should have its inside connection earthed, and the outside connection "live." If the transformer is not marked with inner and outer winding terminations (as well as IP, OP, IS and OS), then

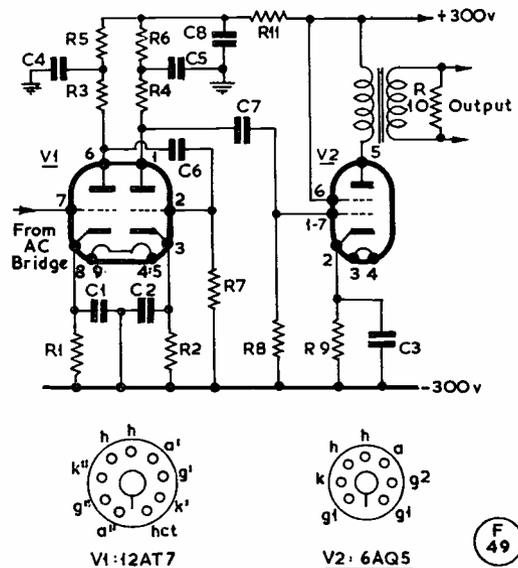


Fig. 9. The two-stage voltage amplifier, for which the values are: C1, C2, C3, 25  $\mu$ F; C4, C5, C8, 16  $\mu$ F; C6, C7, .005  $\mu$ F; R1, R2, 1,500 ohms; R3, R4, 68,000 ohms; R5, R6, 10,000 ohms; R7, R8, 270,000 ohms; R9, 470 ohms; R10, see text; R11, 10,000 ohms. Valves are a 12AT7 for V1 and a 6AQ5 for V2.

the only thing to do is to experiment with the connections to see which gives the best bridge balance, as described later.

The audio signal from the receiver should be of reasonably good quality. If the tones contain appreciable harmonic content it will be difficult to reduce the "full white" tone to zero, as although the bridge will completely "null out" one frequency, it will not cut out harmonics of that frequency. Consequently, the receiver should be operated at a reasonable audio level to prevent distortion occurring in its output stage.

### Balancing the Bridge

When the signal amplifier and bridge have been constructed the bridge must be balanced. Using a loudspeaker or phones together with some sort of indicating meter on the output of the 6AQ5, an audio tone of variable frequency should be applied from the receiver. (This may conveniently be obtained by tuning in a locally-generated carrier, such as a VFO or frequency meter.) As the BFO in the receiver is rotated so varying the output tone, there should be some audio frequency where the output from the signal amplifier shows a marked drop. Be careful not to vary the audio frequency too rapidly—the *null* is so sharp that it is possible to go right through it without noticing it, particularly from an audible point of view, though some movement of the output meter is likely to be noticed. Having found the frequency where there is a falling off of output, the balancing control on the bridge should be adjusted to reduce the output still further. While this is being done, the incoming audio frequency should be "rocked" to and fro, until an adjustment is obtained which results in a perfect *null* occurring at one audio frequency.

When adjustment is first attempted it may be found that a condition of "no output" is not possible at any frequency. If this is so, then the output should be listened to very carefully to find out whether the remaining signal is a fundamental, or several octaves higher than the actual *null* frequency. In the first case, the bridge is passing a certain amount of fundamental, indicating it cannot be balanced, and the input transformer connections should be changed around to see if an improvement can be made. If the residual tone is a harmonic, then the trouble does not lie in the bridge, but in the receiver, indicating that it has appreciable harmonic distortion, which must be corrected before proceeding further.

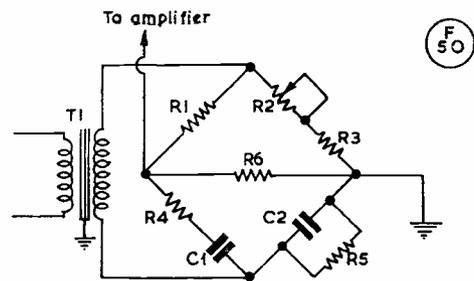


Fig. 10. The Wien bridge, the function of which is described in the text. Values are: C1, .03  $\mu$ F; C2, .01  $\mu$ F; R1, R3, 10,000 ohms; R2, 30,000 ohms variable; R4, 5,000 ohms; R5, 40,000 ohms; and R6, 47,000 ohms. For T1, see text

If it proves impossible to balance the bridge, the condensers forming the bridge should be tested, as proper operation is not possible if they are "leaky." Although they do not have to stand any high voltage, these condensers should be of the mica type if possible. It must be emphasised again that if good picture results are to be obtained, the bridge must function correctly.

### Matching the Amplifier to the Paper

The "impedance of the paper" is somewhat indeterminate; a voltage somewhere in the order of 150-200 volts is required, the marking current being about 12-25 mA. Very satisfactory results are being obtained with a transformer having a 1:1 ratio between the 6AQ5 and paper. For convenience the writer uses two output transformers. The 6AQ5 is matched by one transformer to 600 ohms; this 600-ohm line is carried up to the facsimile board to where a second transformer steps the impedance up to about 5,000 ohms, the output being applied between stylus and paper. Whatever system is adopted, some form of safety resistor *must* be used across the output to safeguard the output valve and transformer(s) in case a signal is applied when the stylus is not in contact with the paper, in which case there will be no load on the output valve. If a 1:1 transformer is used, then a resistance of about 10,000 ohms across its secondary should be satisfactory—R10 in Fig. 9.

### The Control Panel

This is fitted for convenience and the electrical connections are shown in Fig. 11. The right-hand meter has a full scale deflection of 100 mA, and measures the anode current taken by the 6V6's driving the synchronous motor. The centre meter has an f.s.d. of 5 mA, and measures the signal voltage applied to the stylus in purely arbitrary units. It is fed from

the secondary of the output transformer through a small half-wave rectifier and a variable resistance in series (*see* "Setting Up"). The variable resistor should be 50,000 ohms wirewound.

The left-hand meter indicates the difference in frequency between the locally generated 50 c/s and that of the mains. It has an f.s.d. of 10 mA and is fed *via* a resistance and rectifier with 6 volts from the mains supply in series with 6 volts from the locally generated 50 c/s, obtained from the "heater" winding on the output transformer of the 6V6's. Connected in this way it measures the instantaneous sum of these two voltages, which will be 12 volts if they are additive and zero volts if they are in opposition. Since the mains frequency is seldom exactly on 50 c/s, the two voltages will be going slowly in and out of phase, resulting in a slow movement of the meter between zero and full-scale if a suitable series resistance is used. This resistance will to a certain extent depend on the rectifier—in the writer's equipment it is 1,000 ohms.

The object of this frequency meter is two-fold. Since the mains voltage is unlikely to vary much either side of the nominal 50 c/s, a slow movement of the meter indicates that the fork is functioning correctly. Also, if the series resistance chosen gives exactly half scale reading with only the "mains six volts" applied, a steady movement from zero to full scale with both 50 c/s supplies switched on will indicate that exactly six volts is being given by the locally-generated 50 c/s supply; it then follows that the motor is receiving around 100-110 volts, which is the correct value.

The other items on the control panel are a phone jack for monitoring the signals—this is fed from the secondary of the output transformer in series with a 250,000-ohm resistor, which provides a comfortable signal into 4,000-ohm phones; two small signal lamps fed from the two six-volt supplies which work the frequency comparison meter; and a switch which reverses the direction of the driving motor as required for 60 or 120 r.p.m. operation.

### Setting Up

When all the various parts of the receiver have been constructed and individually tested—the tuning fork oscillator, the 50 c/s amplifier, the Wien bridge, the signal amplifier, and the mechanical arrangements, then they should all be connected together as shown in Fig. 12, the final layout. In the writer's equipment liberal use is made of plugs and sockets for inter-connection, but this is something which

the individual will decide for himself.

The first step is to ensure that the drum rotates smoothly at its correct speed—with the (Benson's) ex-Govt. motor in use, if the voltage is too low, it runs at about 55 r.p.m.; this is indicated by the anode current of the 6V6's varying, and the motor running irregularly. An increase of driving voltage will cause it to "lock on" quite satisfactorily.

The second step is to arrange for a suitable indication of "black" and "white" levels on the signal strength meter. A piece of paper should be loaded on the drum, set to run at 60 r.p.m. The stylus should be lowered on to the paper and a steady tone applied from the receiver; this tone is then varied in frequency until it is "nulled out." The frequency should then be increased by 800 c/s (this is not critical and BFO calibration will be sufficiently accurate) and the gain advanced to a point where a steady black mark is made on the paper. The variable resistance in series with the signal-strength meter should be adjusted until the meter shows about 2/3 full scale. Then, steadily reduce the signal in amplitude (by the Rx audio gain control) until the stylus ceases to leave a mark, and note the meter reading.

The drum speed should now be changed to 120 r.p.m., and the procedure repeated. The meter readings corresponding to "black" and "white" may either be marked on the meter face, or simply noted down.

### Signal Characteristic

A facsimile signal can now be tuned in. These have a characteristic sound which is difficult to describe on paper—they consist of very rapid frequency-shift keying, with one tone much more in evidence than the other. The 60 or 120 r.p.m. repetitive signal is very easily recognised. In the large majority of cases the tone of longer duration indicates the "white" and the BFO should be adjusted until this is "nulled out." The other tone, consisting of a number of rapid pulses, corresponds to the "black" tone and should be of a higher audio frequency than the one which has been bridged out. If it happens to be lower, then the "other side" of the BFO beat must be used. The receiver gain is now advanced until the signal-strength meter is kicking well up into the region above the "black" level, and by this time some sort of picture should be appearing on the drum. The whole essence of a clear picture depends on *careful adjustment of the gain control to give a good black mark*. If the gain is increased too much, random noise will

cause marks to occur on what should be "white" portions of the picture.

There may be a little difficulty at first in setting the BFO correctly, since the tone corresponding to "black" often consists of such rapid pulses that it does not seem to have any particular audio frequency. In this case, one simply adjusts the tone corresponding to "white" into the *null* point by watching for minimum overall deflection of the signal-strength meter—which is, of course, unable to do more than follow the average signal strength. The first attempts at picture making are best limited to 60 r.p.m. transmissions as these are much easier to follow audibly.

Once a map of sorts is under way, the final adjustment of the tuning fork frequency can be made. Using a 60 r.p.m. signal, it is not difficult to observe the map as it rotates and it will be seen that the edge of the picture is represented by a black bar, or pair of parallel lines. If the motor speed is correct, this line will build up horizontally along the drum as it rotates, whereas if the motor speed is incorrect the line will have a slope. If the bar slopes *downwards* as the picture is being drawn, then the motor is running *slow*, whereas if it slopes upwards, the motor is running *fast*. Appropriate adjustment should be made to the paper clips on the fork, trying to get as near perfection as possible with the resistance control on the fork in the central position. Final adjustment should be made with this control.

Remember that with the tuning fork oscillator, the frequency does not change immediately the control is moved—when making small adjustments, allow about a minute to see their effect before making further alterations.

When starting off, it will almost certainly be found that the finished picture is not central horizontally on the paper—that is, the bar representing the edge of the picture may come anywhere on the paper instead of at the left or right hand edge of the picture. This is because although the drum *speed* is correct, it is not in the same "instantaneous position" as the transmitter drum—that is, it is not in the same phase or true synchronism. To arrange for automatic phasing is rather complicated—commercially, a phasing signal is sent just at the beginning of each transmission (it sounds like a buzz) and this operates a clutch starting the drum. In simple apparatus such as described here, it would be difficult to arrange for this; a very easy method, quite suitable for the amateur application with which we are concerned, is used instead:

Before a transmission starts, a tuning signal is radiated, usually for several minutes, consisting of the black tone with short white pulses. These pulses correspond to the position of the picture edge. To phase our drum correctly, these pulses are listened to, and the 50 c/s gain control is advanced to a point where the drum runs at about 50 r.p.m. only. When, after a little listening, it is observed that the join in the paper is under the stylus position just when a pulse occurs, the motor gain control is advanced fully, suddenly, thereby locking the motor on to its synchronous speed. To prevent stylus travel until the picture actually starts, the grub screw on the 19t. pinion driving the lead screw is loosened, and when the picture starts, this is tightened up. (The lead screw revolves so slowly that this is quite easy to do even while it is moving.) Using this method, the edge of the picture can easily be brought within a quarter of an inch of the join in the paper, and with a bit of practice even closer than this.

### Results to be Expected

The amount of detail present in the finished picture is limited almost entirely by the quality of the received signal. About the only faults in the equipment which can produce poor pictures are failure of the Wien bridge to *null* completely on the "white" tone, or a faulty stylus. Remember that the gramophone needle stylus will not do more than two or three maps before detail becomes poor. On the writer's equipment the detail is such that black lines separated by only one-fiftieth of an inch are quite clearly reproduced.

Hum present in the output will result in a grey patterning, but it needs to be quite power-

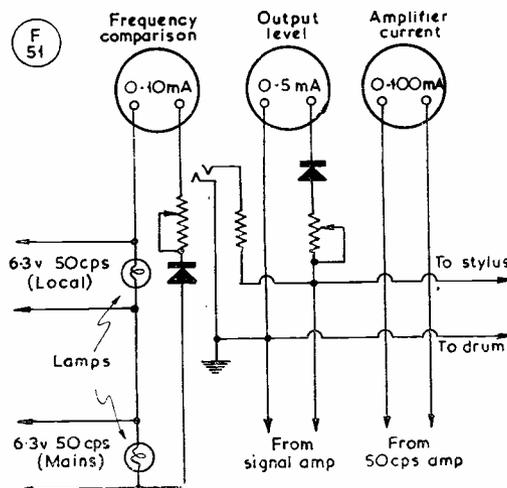


Fig. 11. The control panel for the G3BST Facsimile Receiver.

ful before this will occur.

Fading will produce a "patchy" picture, particularly if it is a picture with "grey" shading, which will vary in its intensity. It makes for a picture which looks poor to the layman, but meteorologically it may be quite satisfactory. Rapid fading does not give much trouble due to the low scanning speed. Even temporary fade-outs may not affect the overall picture too badly.

Interference does not spoil the result as much as might be expected. Continuous wipe-out interference will of course, ruin a picture, but it is surprising how much intermittent QRM can be tolerated. Never try to adjust the receiver to remove interference—this will only bring the "white" tone out of the *null*, and the loss of picture quality is much more severe than that caused by interference. The crystal can be used—it must be peaked on the carrier corresponding to "black." It results in an apparent thickening of the trace, due to the crystal ringing under the application of the pulses. This will spoil fine detail such as writing, but the overall picture may be acceptable.

The receiver must be stable. Any frequency drift will result in the "white" tone appearing in the output with resultant loss of picture contrast. If the receiver drifts continuously, the tuning will have to be constantly adjusted—a tiring procedure. If your receiver is not stable, switch it on for half an hour before starting a map. It is also advisable to switch the fork oscillator on about 15 minutes before operations are commenced.

If the receiver will operate with the AVC and the BFO on at the same time, quite a worthwhile improvement will result. If not, then the gain control must be adjusted manually if best results are required.

### "DX" Pictures

Quite apart from the meteorological point of view, there is a fascination in picking up maps from distant parts of the globe. This may particularly appeal to the keen SWL—apart from anything else, no one can ever doubt that you received such and such a station if its picture is there as proof!

Good pictures can be obtained from several parts of the world—Washington transmits on frequencies around 8.1, 11.06, and 16.4 mc and signals are well received in this country. Tokyo can be found around 13.4, 15.7 and 20.8 mc. Montreal puts out a good picture on 11.07 and 13.9 mc. Washington and Tokyo are on 60

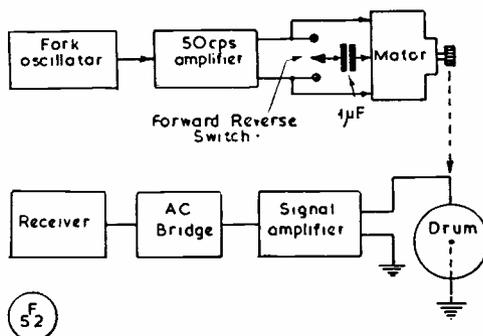


Fig. 12. The final layout for the Facsimile Receiver, showing the inter-connection between units.

r.p.m, while Montreal is on 120 r.p.m.

One must not expect as good results on "DX" pictures as on local transmissions, unless propagation conditions are really good. Some loss of detail is inevitable due to the signal pulses coming over several paths, thereby effectively lengthening the pulse and producing a thicker line on the picture. Sometimes marked "ghosts" appear, due either to reception from direct and scatter sources simultaneously, or to receiving the signal both ways round the world with a slight time lag.

From the meteorological point of view, the most interesting "DX" maps are those of the North Atlantic and Polar regions, and those received from Oslo (8075 kc and 4532 kc) covering Scandinavia and Northern Europe.

### Conclusion

For those interested in meteorology, a receiver of this type is a valuable aid, not so much from the point of view of obtaining ready-made maps from several places, but as a means of getting information which otherwise takes too long to copy down and transcribe in the time available to an amateur. Charts are broadcast from our own Met. Office at Dunstable containing actual and forecast observations of upper-air data which would take hours to obtain by other methods. Tabulated upper winds and "Tephigrams" are also transmitted.

For those interested in a "different" method of communication, particularly the SWL or the transmitting amateur who likes to pursue some aspect of the radio hobby other than the purely QSO angle, the reception of Met. charts opens up a completely new line of experiment.

### Facsimile Transmission

While the construction of the receiver was undertaken primarily from the meteorological angle, this method of communication has proved so interesting that the writer is now

considering transmission. He would like to hear from any other amateur who would care to co-operate in such experiments.

If a successful QSO is made, at least we shall not have to wait for "QSL's *via* the bureau"—they will be there on the receivers at the conclusion of the contact.

(Concluded)

#### AMENDMENT NOTES

In the circuit on p.241 of our September issue, it is suggested that a resistor of about 250,000 ohms should be put across the key in order to guard against excessive voltage rise between cathode and heater; for the 6AG7, the maximum permissible heater-to-cathode voltage is given as 100v.

Also in the last issue, for the circuit on p.258 G3AEX suggests that it would be desirable to return R6 to cathode (top end C6.R5) in case some crystals are "sticky" as oscillators. He also points out that the equivalent of the EC90 is the 6C4, and not as given. And on p.259, the comment on the NC-400 receiver sensitivity should, of course, read 1  $\mu$ V and not as stated.

#### SERVICE INTERFERENCE ON BBC TV

It is reported that the persistent interference suffered by fringe-area viewers on the BBC's Band I TV has been traced to high-power N.A.T.O. transmitting stations on the Continent, using the forward-scatter propagation mode in the 40 mc frequency area. While it is almost inconceivable how such links came to be set up on a band specifically reserved for TV, it does show what pressure there is on VHF space. If your neighbour, with a look at you, starts about TVI, tell him what may be the cause and suggest that he takes the matter up with the Post Office. The interference takes the form of horizontal lines and "tweed" patterns.

#### RUSSIAN MOON-SHOT FREQUENCIES

The space vehicle so successfully landed on the moon by the Russians at 10.2 p.m. B.S.T. on Sunday, September 13, was using the following frequencies: 19-997, 20-003, 39-986 and 183.6 mc, this latter being for the last-stage approach to the moon, when altimeter measurements were being radiated. The main telemetering frequency is believed to have been 39-986 mc, with the two lower frequencies used for tracking and early condition reporting. It should be noted that all these frequencies have been employed before by the Russians for their various rockets and satellites—so they are the ones to watch when any future space vehicle departure is announced. It is unlikely that this pattern of frequency selection will be changed because for one thing it has proved itself at extreme range and for another Russia has a vast internal monitoring system with apparatus calibrated to these frequencies.

On the evening of September 13, the BBC made an enterprising live sound broadcast on the Home

Service from the control room at Jodrell Bank; as the rocket was coming in to land on the moon, the signal as received by the Telescope could be heard to cut at the right moment. As far as could be judged from this broadcast, even with the enormous gain being given by the Telescope the rocket signal was not much above noise as landing time approached—though the filtered re-broadcast in the eight o'clock News on Monday morning sounded a good deal cleaner. The rocket signal would probably not have been audible at all with anything less than a high-gain beam.

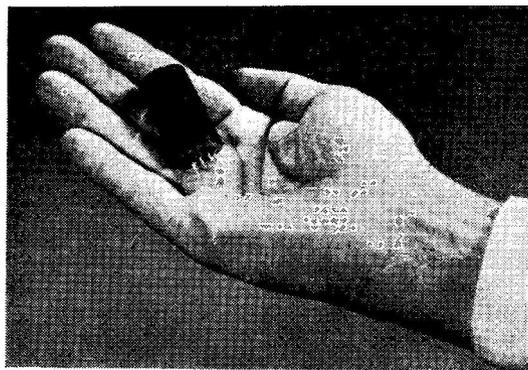
#### BC SETS IN CARS

By the end of July, the G.P.O. says, there were nearly 400,000 licences out for car radio receivers.

#### THE MAY R.A.E. RESULTS

By courtesy of the City & Guilds of London Institute, 76 Portland Place, London, W.1, we are able to give the figures for the last Radio Amateurs' Examination, held in May. A total of no less than 1,102 candidates tried, of whom only 657 passed, giving a failure figure of about 40%. This is far too high for an examination of this sort; the reason is clear enough from the Institute report "... a feature this year was the number of students who failed to make the grade in the compulsory section on licence conditions, and it appears that quite a number of them had thought that technical knowledge alone would carry them right through the paper." This will not be lost on those who are taking the next R.A.E.—nor, we hope, on their instructors—for surely the compulsory questions on licence conditions can be regarded as the gift section of the paper!

The Examiner's own report adds that "... the general standard was noticeably lower than in previous years though in some individual cases quite excellent papers were received. The chief cause of failure was the superficial treatment given to the paper as a whole." Here again, the conclusions to be drawn are obvious.



This is a hermetically sealed silicon rectifier designed as a direct, pluggable replacement for the 6X4 valve rectifier. It will give 500 mA, and the peak inverse voltage rating is 1,600v. per section. The makers are the American firm of Sarkes-Tarzian, for whom Ad. Auriema, Inc., are New York export agents.

# DX COMMENTARY

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

**T**HIRTEEN years have passed since your present commentator wrote the first of his offerings under the above title, and many changes have taken place since that month of October, 1946. No apology is therefore necessary for a few remarks on the present situation in the world of DX, compared with things as they were in those comparatively quiet and peaceful days.

As always, there are several kinds of DX, and several types of operators interested in it. We are all, with very few exceptions, "DX men" for part of our time, at least. Those very few exceptions are to be found alike among the experimentally-minded, the "ordinary chaps" and the frankly-confessed local-natterers who would sooner work with S9 phone both ways than scratch around for weak signals of any kind.

It has always been the aim of "DX Commentary" to cater for *all* types of DX-chasers. As has often been said here, the very few whose only interest in life is the snapping up of the latest "new one" have imparted a legitimate twist to their hobby, but have restricted themselves to a very narrow section of it. They number only a few hundred, throughout the world, and probably 80 per cent. of those few could be found in the U.S.A.—and mostly the Western half, at that. In the U.K. it is doubtful whether one could find twenty of them. Therefore we state once more that this Commentary will never turn into a mass of information solely concerned with new ones worked, new ones coming on the air, and new DX-peditions for the delight



W8HNX

## CALLS HEARD, WORKED and QSL'd

of those whose score of countries is already above the 275 mark. To cater mainly for such a minority would be a certain way of inflicting sheer boredom on 95 per cent. (or more) of our readers.

Back in 1946, every other station one worked was a "new one," and the leading DX-ers had not even reached their first century in the post-war scramble. Hence, annual Marathons, ladders showing Country and Zone scoring, and so on, were all the rage. Nowadays, however, a few of the old timers are very near the maximum *possible* score; very many of them have notched up 200 countries or more; and the majority of them can no longer be bothered to count, anyway.

Today, therefore, "DX" simply means the working of stations that are not locals, not *too* easy to raise, perhaps, and so situated that they at least demonstrate the efficiency of one's transmitting and receiving equipment under moderately difficult conditions—which, of course, includes the competition

from others also trying to raise the DX.

From this it follows that this feature should be prepared and run in such a manner that it is of interest to *everyone* except the avowed local-natterer — and we hope and suspect that even he will steal a quick glance at it, if only to discover what he's missing!

It is *your* contributions that make this feature—we only sort them out and write them up to make the story. So don't think that your doings are unimportant, just because you are a beginner, or only a very mild case of DX Fever. Whatever you achieve is of interest to someone, somewhere, on roughly your own level. Let's hear about it!

### DX Gossip

Tina Wright, VQ1TW, and Ronnie Tester, VQ1RET, put Zanzibar on the air with a surprise visit on August 14-15. VQ4HE was able to charter a plane in a hurry, and he also signed VQ1HE while there. They spent about 20 hours on 14 mc CW, with a few

excursions into the phone band. The W's monopolised the whole thing (the G's didn't show up at all) but it was a useful sortie, as CW from VQ1 has not been too plentiful in the past. Tina, VQ1TW, was the first YL ever to operate from Zanzibar.

The rumoured CR10 expedition by VK5BV proved abortive, as Timor now has internal troubles and licences have been suspended . . . AC3SQ has now become AC5SQ, and there are hopes of getting AC5PN on SSB if some enterprising firm cares to present a suitable transmitter to the King of Bhutan, in whose service AC5PN works . . . And yet another tie-up with royalty is that the King of Nepal hopes to become an amateur soon, with the call 9N1AA!

The OK7HZ expedition have now got as far as Lebanon, whence they have been signing OK7HZ/OD; they couldn't get a licence in Turkey; next stops, Syria and Saudi Arabia.

VQ8APB is reported to be on St. Brandon, 250 miles from Mauritius, which might conceivably count as a new one . . . VS9AZA is in Mukalla, Qaiti State, which could be likewise . . . HKØAI, the one-and-only on San Andres Island, now has a tri-band beam (not yet in use).

The KWM-1 SSB rig which has been living with I5GN for some time is due to go, during mid-September, to VQ6DP; its next destination after that is ZD6DT.

VS9OM, after a short leave in Aden, came back on the air with higher power — but he's just as difficult to work! EAØAF has put Spanish Guinea back on the DX map with some spasmodic activity . . . YA1IW will be leaving Afghanistan shortly, but has applied for permits to operate from VU4, VU5 and AC5. If this comes off, it will not be until early 1960.

FB8XX (Kerguelen) is back on the air after a break . . . LA2TD/P is back in Norway from Spitzbergen . . . LA1NG/P is, or was, on Jan Mayen . . . VQ8BA is a YL (VQ8AL is her brother).

VK2AXN, who has been very active on 14 mc and worked by many Europeans, is described by

VK2QL as a pirate. He's in VK all right, but not legit.

7G1A (Guinea) has been heard on 14 mc CW around 1800 GMT . . . FR7ZD also active, same band . . . VQ6AB is on 21 mc phone . . . MP4QAO is very active on 21 mc phone.

For the 7 mc enthusiasts: VS1JU has been on the band, working W6's and 7's; no reason why he shouldn't get out in other directions . . . 9G1BQ will be active on 7 mc SSB (7090 kc) between 0600 and 0700, Sundays; he will listen above 7200 for W's, but might spare an ear for us, too. Other unusual ones known to be on Forty include VP7ND, ZP5AY, YV4AS, CX2TF and, of course, a huge bunch of PY's. If you can't sleep, have a listen.

XR2A is not a pirate, but a ship, usually in South American waters . . . 4S7FJ (Frank Johnstone of G3IDC and VS1FJ) is packing up by now and returning

home with his family; during his short stay in Ceylon he notched up 150 countries for his third DXCC.

**VR1 in the Clear**

Restrictions on amateur stations operating from Christmas Island (Pacific) have recently been removed. Unfortunately, most of the RAF types who were granted call-signs when they were out there have returned by now; but F./Lt. Hathaway, G3JHI, has recently flown out and hopes to be on the air almost at once. (Thanks to reader D. Mulcaster, Dagenham, for this gen.)

**News from Overseas**

MP4BBW (Awali) has worked the terrific total of 201 (168 confirmed) on two-way SSB alone, since May, 1958. He has applied for WPX/SSB, and has other trophies to his credit. Ian's recent new ones have been a little scarce,

**FIVE BAND DX TABLE  
(POST WAR)**

Station	Points	Countries					Station	Points	Countries						
		3.5 mc	7 mc	14 mc	21 mc	28 mc			3.5 mc	7 mc	14 mc	21 mc	28 mc		
DL7AA	921	113	171	249	203	185	267	G8DI	302	30	59	88	72	53	125
G3FXB	803	75	131	222	213	162	261	G2BLA	291	32	54	69	71	65	116
G2DC	775	84	113	232	192	154	260	G3DNR	282	10	23	89	77	83	127
G5BZ	773	64	118	263	201	127	273	G3BHH	272	8	27	37	128	71	156
G3DO	683	24	47	246	187	179	273	G3MCN	264	4	6	60	132	62	163
GW3AHN	654	16	55	199	240	144	260	VO2NA	261	19	35	107	64	36	117
G3ABG	576	51	88	186	131	120	212	G3WHP	256	17	34	80	24	101	138
W6AM	566	40	68	296	96	67	296	G2DHV	245	22	27	127	52	17	141
G2YS	521	72	92	164	118	75	181	W3HQO	212	3	8	67	105	29	140
G3IGW	447	44	73	112	119	99	163	G3JFF	207	12	52	107	33	3	113
G6VC	438	38	57	155	112	76	181	G3LHJ	194	5	23	94	55	17	111
G3LET	436	26	85	173	112	40	193	VQ4GQ	173	1	10	72	59	31	106
GM2DBX (Phone)	427	34	31	160	102	100	176	G3MMP	173	5	25	36	45	62	88
W6AM (Phone)	422	23	62	277	49	31	277	G3MJL	173	8	40	33	29	63	92
UR2BU	418	17	39	138	126	100	176	G3NAC	162	6	20	46	65	25	85
G3AKU	380	47	80	147	43	63	147	G3DNF	156	7	31	45	41	32	68
G3FPK	378	36	79	123	87	53	153	G3IDG	139	12	15	41	34	37	63
G6TC	321	18	68	128	67	40	146	G3NOF (Phone)	80	1	4	10	47	18	66
UR2BU (Phone)	313	4	13	99	108	89	148								

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

but they include PY7SC, XE1AE, OK7HZ/OD5, I5GN, 7G1A, M1, HR, FO8AX, PX1DE and two VS5's. His "routine DX" normally includes daily WAC between 1300 and 1900 on 14 mc; when this can't be managed he still raises some good stuff. MP4BBW tells us that MP4DAA and MP4QAO are now licensed as MP4MAA and MP4MAB, for operation from *Muscat*—but no activity until the political angle has been well checked.

VQ4GQ (Forces Broadcasting Station, BFPO 10) says that there is a lot of interest in 7 mc. out there in VQ4. Listen for him, along with VQ4AQ, 4FK and 4HT—all on CW. VQ3HG also joins in the party.

VS5PM (Bruncei Town) sends a

QSL to tell us that he is on the air most evenings, on 14 mc CW.

From R.A.F. El-Adem, near Tobruk, 5A2CV sends some photographs and brings us up-to-date with doings "on the edge of the Libyan Desert." As 5A2CV is a club station, operation is pretty regular and it is on the air as often as duties permit. They are always on the look-out for the U.K., the operating band chosen normally being the highest one suitable for European contacts. Since December last, 120 countries have been worked from 5A2CV.

#### Ten Metres

The 28 mc band is back in business again, although one would hardly call it exciting; but East-West openings are more and more frequent and there has been some really good DX on the band.

G3WP (Chelmsford) worked an OA and a DL8 for two new ones on Ten, also LX3PF. G3MMP (Pinner) raised LA1MB on phone.

G3NOF (Yeovil) reports for the first time, although he has been operating the Club station G3CMH for some years. He confirms the W openings on Ten, and says it has been open to Africa most days. Worked (all phone) were CR6CA and 7IT, FQ8AT and 8OD, OQØPD, TI2CMF, VQ2JS, ZE6JT, ZS3U/P and ZS9G, 4X and sundry W's. Also heard, ET3XY, OR4RW, VQ3HH and 5GF.

G3IGW (Halifax) worked ZS3OW (phone); many others report a handful of European QSO's but nothing particularly noteworthy.

#### Fifteen Metres

G3ABG (Cannock) worked LX3PF, FQ8HI, VQ2BK, ST2AR, VQ4HT, ZS9P, 7G1A and LU8FBH — and all on CW. G3NAC (Yatesbury) used phone only, and collected ZP5CF, VP6ZX and EA8BB.

G3MMP, also on phone, raised I1HL (Trieste), ZD2AMS and 9G1BV. G6VC (Northfleet) booked in HI8GA on phone and SV1AI (Rhodes) on CW.

G3MCN (Liverpool) added several new ones for this band, such as EA9DE (Ifni), DU1PAR, HP1SB, PY7SC, MP4QAO,

ZS9G, KB6BH, MP4TAE and VQ9ERR—a pretty bunch, and all on phone. Others raised were DU6MV, YA1IW, VS9AZA, VS1, 9M2, KA and VP5.

G3EHT (Wadebridge) worked VU2EJ, VS9AZA, ZK2AD, FP8BF, PZ1AX, KG4AW, YN4CB, XE1CW and VP 1, 4, 5, 6, 7, 8 and 9; he adds that VK and Africa were coming in well around September 9.

G3JFF (Kinswear) is ex-VS1HU and VS2MA. After worrying somewhat about aerials (he lives in a flat) he settled for a tri-band vertical, and his first DX contact was VR5AC; with 40 watts, this made him pretty happy. Since then he has collected VR5AZ, VE7, JA, KL7, ZL, ZB1, KH6 and the like.

GW3AHN (Cardiff) has a commanding lead on Fifteen, having brought his score up to 240 worked on 21 mc, out of a total of 260 on all bands! We know of no one else within striking distance of this figure. Among the recent catches were the following: CW: CE9AF, CR5AR, FP8BF, FY7YF, KM6BT, LA3SG/P, FX1PF, UL7GL, VP8DL, 8DM, 8EP, VQ9AIW, VS5GS, VS9OM, XZ2TH, ZC5AF, ZE8JJ/ZD6, 7G1A, 9K2AD. Phone: DU1AP, KB6BH, KR6GF, PX1PF, VK9AD, VQ8AD, VR2BC, 2CC and 2DF, VS9AZA, VS9OM, 7G1A and 9G1CT. (Any complaints?)

G3NOF chalked up CT3AF, HE9LAA, HP1SB, HR1HP, KG6AIM, MP4QAO, OQ5PE, VP5EM and 8BN, VS9AZA, ZD1PB, ZP5CF, 9G1's and many other less difficult ones. He found the early mornings very good for long-path work with ZL and VK, and the afternoons for almost anything.

G2YS (Filey) added LA3SG/P (Jan Mayen) to his list, and also raised VQ9AIW; gotaways were OR4RW, VP8DL, VS5GS and EA6AM. G3IGW's phone got through to HH2CB, PZ1AP, XE1DT, YN4CB, ZP5's and 9M2GA; CW raised HC1ARE.

G2VV (Sunbury) after seven years on the LF bands, built an 80-watt band-switched affair for 28-21-14 mc. On the whole he prefers 21 mc, where he raised

#### TOP BAND COUNTIES

##### LADDER

(Starting Jan. 1, 1952)

Station	Confirmed	Worked
G2NJ	98	98
G3AKU	98	98
G3JEQ	96	97
G6VC	96	96
G3JHH	94	94
G3FMV	93	95
G2AYG	88	88
G3KEP	86	86
G2CZU	81	82
GM3COV	71	73
G2CZU (Phone)	67	68
G3APA	65	75
G3ADZ	65	72
GM2UU	64	67
G3LBQ	63	69
G3MCY	63	64
G3KEP (Phone)	62	64
G3LHJ	62	67
G3KQN	60	72
G3LWQ	60	67
G3JSN	57	64
G6QN	57	63
G3NFV	55	63
G3MCP	54	67
G3LNR	46	52
G2AAM	35	35
G3JFF	33	37
G3LNO	23	41

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



Station GB2SM at the Science Museum, South Kensington, which is fully operational and can be seen in action during the Museum visiting hours. The receivers are a Racal RA.17 and Eddystone 888 (left). The transmitter is a Labgear LG.300, with matching power supply unit and modulator. To the left, above the Eddystone receiver, is an electric minute-clock, and on the operating console is the beam rotating indicator. In spite of a difficult location with a high local noise level, much DX is worked from GB2SM, on both CW and phone. The demonstrating operator is usually G3JUL, of the Museum staff. On the roof is a three-section beam array for the 10-15-20 metre bands.

K3CCJ/MM on his very first call, as well as W's, VK and ZL. Noteworthy is the fact that he uses a 68-ft. indoor wire only 17 feet high.

G3BHI (Norwich) put CW across to 7G1A, PX1PF, UA0SL, VQ9AIW and VS1EB. Phone was successful with DU1AP, FM7WU, MP4QAO, PJ2AF, PZ1AA and 1AG. VE3EGD/SU, VP3HAG, VQ9ERR, VS9AZA and 9OM. XW8AL, ZD1PB and 9M2FR.

G3MOJ/A (Compton Bassett) worked CE9AF and FY7YF on CW; on phone he got CX3AA, VP8DH, VQ2CH, VS9AZA and ZD2CKH, among others.

G3LET (Westcliff) was mostly on the LF bands, but on 21 mc he raised OD5CI, VQ9AIW, YA1AO and 7G1A—all on CW.

(He says he'll build a modulator one day, though.)

#### Twenty Metres

G3JFF, searching for new ones, found OH1ST/Ø, 3A2AE, UC2AA and UN1AH. G3EHT found VK's and ZL's pounding through with S9 signals in the mornings, and a few PY's and Africans in the evenings.

Two new ones on phone for G3MCN were PX1BO and UP2KAB. G6VC winkled out 7G1A, on CW, for an all-time new one. G3MMP collected VO1AT on phone, W9KLD/KL7 on CW.

G3NAC managed to raise the elusive VE6QG/SU on phone. G3ABG extracted DU1OR and EA9IA (Ifni) on CW.

G3LET's CW raised ET2US, FP8BG, HH2GR, MP4BCT,

UM8AD, VQ9AIW and 3A2AE. GW3AHN worked EA9IA (Ifni) for a new one. G3MOJ exchanged CW with VP8DL and 3A2AE.

G3BHI worked UM8AD (CW); G3IGW, same mode, pulled out EA9IA, UG6AB, UH8KAA, VP2GAK and VP7BT; G3NOF, on phone, raised TF2WEE, XE3CW, ZL and W's.

#### Forty Metres

Everything goes to prove that 7 mc is a real DX band, and if one has the patience and keeps the right hours there's practically no limit to what can be done. To the casual observer, as ever, it's just a mess, but the DX is overlooked by so many that it's relatively easy for the crafty ones to work it.

VQ4's have been numerous,

sometimes as early as 1830 GMT, and with wonderful signals at times, but even they need the wrinkle treatment, and with a pretty sharp pin at that!

G3IGW worked HP1SB and VS1FZ, and had an SWL report from 9M2. All W districts except 7 were raised one morning within two hours, and over 30 W's (6's included) on SSB were worked; they were on 7210 kc, G3IGW on 7100 kc CW.

G3LET concentrated on Forty, and his chief complaint is about the non-DX-conscious types and their interminable CQ's. He mentions the terrific signal from VQ4HT (who has a rhombic) every Sunday evening around 1715 GMT on 7039 kc. After a contact with UA9CM, G3LET was called by JA8HO, but couldn't hear him although the JA was getting him at S 5/6. DX worked on the band: VQ2W, VQ3HD and 3HG, VQ4HT, ZS5FY, VP8EP, FP8AY, CX2TF, KP4, VO, PY1-7, ZC4's and PX1PF. Also heard, ZD7SA, CE and LU.

G3MMP cut his power down to less than ten watts because of TV1, but raised OE2TO. G6VC, also on CW, managed to work 5A2CV and OY8RJ.

### Eighty Metres

There is every sign that 3.5 mc will carry its fair share of DX this winter, and already things are stirring. G3LET worked VQ4HT, whose signals were 579 (3541 kc, 1830 GMT). He also raised PX1PF and heard VQ2W (1815).

G2DHV was pleased to receive a QSL from KX6AF for a contact on this band, but he doesn't say when it was. G3JFF spent some time trying to improve his WAE score and raised such things as EI, GW, LA, OK, OZ and SM, all new for this band.

We know that others have been working some real DX on 80 metres, but they are keeping very quiet about it. Whether this means that they're modest, or whether they want to discourage too much of a rat-race, we just don't know... but we do listen!

### Top Band Topics

Queer band, this one! Half our correspondents seem to say that

they just took a look and found it dead, while the others remark on the excellent state of things up there.

G3JFF was collecting counties and raised GM3IQO/P, GI6TK, GM3IAA, and GD3UB. Being an ex-VS1 himself, Mike naturally had a long chat with Mac of GM3IAA, who used to be well-known as VS1AA.

G3MCY (Tangmere) has found summer operation very difficult owing to static, but around the beginning of September the band suddenly opened up, he re-erected his dipole, and found conditions almost perfect; HB9 was worked with no difficulty at all, and Gordon thinks we are in for an excellent season.

G3NFV (Ashted) is well on the way to his WABC; new ones worked were GW3CSG/P (Mont.), GM3IQO/P (Dumfries and Bute) and GI3GRY (Derry). A sked with G3JEQ/P was kept for a fortnight, which gave G3NFV all English counties; but he would like to see much more activity from GM-land.

G2YS has been active with his mobile, and has increased his personal record to 70 miles—thanks to GD3HQR while G2YS was in Birkenhead. G3IGW reports some very high signal-strengths from GDX phones—the best for about two years, he thinks. There have also been some good early-season openings to OK, and the prospects look much better.

G3CNM (Cheadle Hulme) has received UA3BS's QSL for the contact mentioned last month. He has heard him again (449 on August 18) and has worked plenty of OK's, as well as GW3CSG/P (Mont.) and GM3IQO/P (Bute). He says that G3CHN, down in Devon, is frequently 5-and-9 plus up there in the North-West, and that his own daylight-DX tests are progressing. He recently worked GI3NEB and GI6TK in daylight (170 miles) and has raised 20 counties during daylight hours.

G2VV complains that a large number of CW stations are breaking the "gentleman's agreement" and operating up at the HF end, although the LF end is reasonably clear of CW. One reason seems to be that in certain parts (GW-land

is mentioned) there are lots of phones at the LF end, so the CW boys have got mad and operate in the HF section.

G3JHH (Hounslow) missed out on the Scillies station (G3IXZ/P) but put his Counties score up to 94 with GM3KAI (Berwick).

With scores of 86/86 on CW and 64/62 for phone, G3KEP (Bingley) continues his progress up the Top Band Counties ladder—but he mentions some dozen or so "exotic counties" still wanted in GC, GI and GM.

### Top-Band DX news

From our old friend W1BB, who is fairly champing at the bit for the real DX season to start, we glean the following items: PJ2CK, although not allowed to transmit on the band, will be listening and logging for all he is worth. He can be contacted on 14100 kc.

HC4IE will again be active, and skeds can be arranged through W6KIP, who has worked him many times. W8GDQ has had his vertical aerial "resonated with very precise instruments" and should be putting out an even more potent signal this season.

The ZL's are trying to obtain for themselves the use of 1800-1825 and 1975-2000 kc (at present they are only allowed 1875-1900). Incidentally ZL3RB sends a photograph of his Top-Band QSL's, which include G3PU, G6CJ, G6GM, EI9I, VK2AFD and W's from seven districts! (Yes, we said 160 metres!)

The boys at El-Adem plan to have 5A2CV on 1825 kc, with a half-wave aerial aligned for the U.K. They are 510ft. a.s.l. and have a good getaway.

W1BB himself has been busily working on a more efficient aerial at the local Yacht Club, where it runs mostly over salt water. He has also been experimenting with loop aerial reception, which has produced some startling results.

With this sunspot cycle definitely climbing down the far side, there is every hope of much better 160-metre conditions for this year's Trans-Atlantic tests. We know the dice are heavily loaded against us (that little matter of 10 watts!) but anyone who can put up a reasonably good piece of wire ought to

stand a chance of being heard or worked. The more the merrier !

### The "CQ" World-Wide DX Contest

With the object of stirring up a representative number of entries from the U.K. (they have been very poor the last two or three years) we are publishing a fairly extended version of the rules herewith.

I. **Contest Period:** *Phone*, 0200 GMT, October 24 to 0200 GMT October 26. *CW*, 0200 GMT, November 28 to 0200 GMT, November 30.

II. **Bands:** All bands from 1.8 to 28 mc.  
 III. **Type of Competition:** 1. *Phone Section:* (a) Single Operator. (b) Multi-operator, single transmitter. (c) Multi-operator, multi-transmitter. 2. *CW Section:* as above. 3. Inter-Club (DX Clubs affiliated to a national body).

IV. **Equipment:** No limit to the number of transmitters and receivers, and maximum power allowed by licence.

V. **Serial Numbers:** *Phone* stations, four numerals (RS and Zone). *CW* stations, five numerals (RST and Zone). Zones 1 to 9 will use 01, 02 etc.

VI. **Points:** Three points for contacts between stations on different continents; one for stations on same continent, but not same country; stations in the same country allowed one contact (no score credited) for the purpose of obtaining country and Zone credit in the multiplier. Only one contact with the same station on any one band.

VII. **Multiplier:** (1) A multiplier of 1 for each Zone worked on each band. (2) A multiplier of 1 for each Country worked on each band.

VIII. **Scoring:** For each single band, take the sum of the Zone and Country multipliers, and multiply by the total contact points for that band. Repeat for each band, and add all the band totals together. Those sending in logs for a single band are eligible for a Single Band Award only. If the log covers more than one band, indicate which band is to be judged, otherwise it will be taken as an All Band entry.

Single-operator contestants must show a minimum of 12 hours' operating to be eligible for any award; for a Single Band Award, 12 hours on that band. Multi-operator stations must show a minimum of 24 hours' operating.

IX. **Zones and Countries:** The CQ Zone Map and the ARRL and WAE country lists will be the standards, and the continental boundaries used for WAC will denote the continents.

X. **Awards:** (1) To the highest scoring station on each Single Band in the following areas: (a) Each call area of the U.S.A., Canada and Australia. (b) All other countries. (2) Similarly for the highest All Band score.

**General:** We are not listing, on grounds of space, a large number of special Awards available. Log Instructions are as follows: (1) Fill in Zone number and Country only the first time it is contacted. (2) Use a separate sheet for each band, and a tally sheet or report form. (3) All times GMT. (4) Compute your own scores. (5) Sign a declaration that all rules have been observed.

Log sheets are available (send large self-addressed envelope and three IRC's for return postage) from CQ Magazine, 300 West 43rd Street, New York 36, N.Y., marked "Att. Contest Committee."

The organisation of this Contest is such that, in the first instance,

entrants from one prefix area are competing only between themselves. They can take either a single band or the all-band section, and the final listings sort out entrants by country, continent and world-wide placings. Thus, a given operator could win, say, the GM award for 21 mc CW, and yet be well down the list for single-operator European stations on that band. Similarly, the leader in a single-band European list could also be the world-high scorer for that band, giving him three awards. There is also ample scope for interesting team entries, in the multi-operator category, where three or four good operators can get together to run one really efficient DX station. But don't leave the planning till too late—time is getting short.

What it all comes to is that this Contest is worth entering not so much to compete with the high-power boys across the Atlantic, but with other EU stations—and one's own neighbours.

### Miscellany

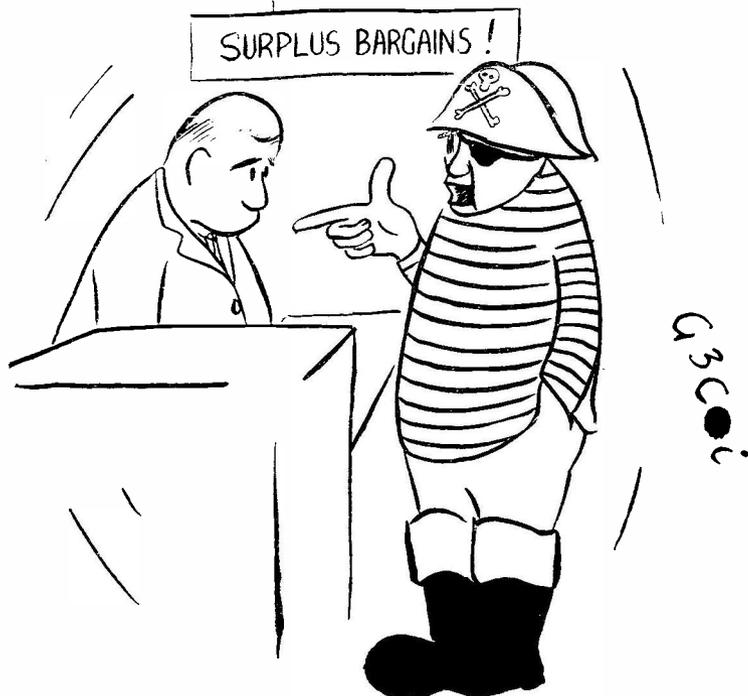
G3DNR (Broadstairs) says he has little to report, but has put up

a home-built beam and thinks that his next few offerings may be worth while.

G3JHH has just received the DLD Award and says it's a very attractive certificate. QSO's with members of the Allied Forces in Germany do not count for this one, and he had to dig out three replacement QSL's. He is now chasing WALT and WASM.

It doesn't seem long ago that we were reporting ex-GW3DNF starting up from Wembley as G3DNF. Well, now we have to record that ex-G3DNF is very nearly ready to go into battle as GM3DNF! The new QTH is in Aberdeen, and just at present he is only active with 10 watts on Forty. Progress on five bands will be reported later, and we wish him luck from the new location.

G3FPQ (Elstead, Sy.) the latest holder of our "Magazine DX Award"—probably the most difficult certificate in the world to get, not excepting a phone WAZ—writes that he is "all home-brew, including the receiver, a 29-valve job with all the trimmings." Just at the moment, G3FPQ is re-



" . . . . Gimme a 19 Set . . . . "

building for SSB, with a three-band Quad, 60ft. up, for 10-15-20 metres and two 272ft. Zepps also in hand. Then, he will start working DX again!

#### SWL Corner

With this issue we announce a change in the treatment of this section. Herein, in future, we shall publish items of DX news sent in by our SWL friends, but *not* lists of stations heard by them, which mean so little in these days of good conditions that we can no longer devote space to them.

The following paragraphs will serve as a pattern for future SWL contributions, and we hope that all our listener readers will take due note of the new policy.

Peter Day (Sheffield) is always good for some interesting gossip, and here is his contribution: MP4QAO now has permits to operate from 9K2, MP4M and MP4T, and has already been signing MP4TAE (21 mc phone) . . . XE4B was a very poor show as far as Europeans were concerned—few even heard him . . . VQ9 Expedition — QSL's for VQ9AIW should go to WØAIW; for 9ERR and 9TED via W4IYC. 50 mc DX has been at a high level, and G4LX has been successfully monitoring ZE2JV's signals.

Peter also tells us that "VQ8NS" is a pirate in the Sheffield area, the same that made some unsuccessful attempts to disguise himself as ZC3RF some time back. Lastly, VP2GV, 4MM and 4LR all engage in a net on 7245 kc, Sundays at 0030 GMT.

Vernon Porter (now in Hadley Wood) says CE3AGI lives on a Satellite Tracking station, and responded nicely to a QSL telling him that he was S9 over here when he obviously wasn't getting any replies from Europe to his calls. On another occasion Vernon overheard a South American saying that he wanted a recent *Magazine* article on Cubical Quads, so he cut it out and air-mailed it to him; back came confirmation and thanks by return. Eskil Eriksson (SM) has the reputation of being one of the world's leading SWL's (phone only) and Vernon says he is a walking DX directory!

The same might be said of our



WIACC of West Roxbury, Mass. has a Collins KW-1 kilowatt CW/AM phone transmitter, with separate beams for each band 10-15-20 metres. The receiver is a Collins 75A-4. Since starting up in March, 1954, WIACC has worked 125 countries, and is one of the U.S. amateurs authorised to handle third-party phone-patch traffic for American servicemen in remote parts, such as the Polar regions, the Canadian North-West, and certain Pacific bases. WIACC also runs a KWM-1 for mobile/portable SSB on 10-15-20 metres, and has worked into Europe under /M conditions. He is active mainly on phone on the HF bands, and all contacts are QSL'd.

own Geoffrey Watts, of Norwich, who now has 272 countries *confirmed* in 40 Zones. His latest QSL was from XE4B.

K. Parvin (Farnborough) is a very old correspondent of ours (not in age, but in standing!) and he comments on the use by the Russians, on Ten Metres, of their RA prefix; among others he has heard RA6JAB, 6JAV and 9CAR on phone. These calls were allotted for their 72 mc band, but they seem to be breaking out in fresh places. K. P.'s Five-Band score (phone only) as an SWL amounts

to 761, with a total of 252 countries. Philip Evans (Shrewsbury) also mentions the RA prefixes.

J. E. S. Paterson (Hatch End) tries hard to dispel the impression, which he is sure exists, that SWL's are just a nuisance. He says that short wave listening is a hobby on its own—not just a prelude or apprenticeship to a transmitting career—and that SWL's pursue their hobby for the fun of it and the enjoyment they get out of their own efforts. He adds that an EA8 is a great friend of his and ready

to help at any time; that some Italians have asked him to visit them; that a UA1 wrote and requested his card for "XAC." It all boils down to what we have said so often—that there *is* a definite place for keen SWL's, who can often be of help to the transmitting fraternity. After all, some of the latter spend so much time nattering that they can't possibly have any time to *listen*—and the SWL's can do this for them, and tell them of things that they otherwise would not have known.

#### Late Flashes

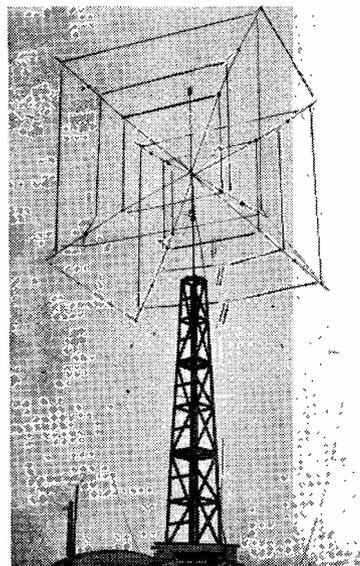
LA4PF/P has returned from Spitzbergen to Norway . . . ZD1FG has left Sierra Leone . . . W9IOP will be operating HV1CN, on CW, during the CQ DX Contest. It is probable that HV1CN will also be in the Phone contest, but the operator has not been named.

UR2BU (Tartu) writes, "I have got some signals that the fellows in G.B. have not received my QSL cards. I do QSL 100 per cent, and

you may let them know that I shall send on application a duplicate, when the contact is O.K. with my log." He has not been very active of late, but took part in the All-Union Field Day in July and also the UR-National Field Day in August.

For those wanting Co. Armagh : G13JEX/P will be there with 160-metre CW and phone on the night of Saturday, October 3, 1900 GMT until full daylight on Sunday 4th, continuous working. Other operators are to be G13AV and G16TK. Snappy contacts will be given, with quick QSY. Cards to G13JEX, QTHR, QSL 100%.

And so to the end of another Commentary, with the reminder that next month's deadline is **first post on Friday, October 16**. (The last date for the December issue will be *November 13*). Address everything to "DX Commentary," *Short Wave Magazine*, 55 Victoria Street, London, S.W.1. Until we meet next month, then, 73, Good Hunting, better bands and — BCNU.



The Cubical Quad, sometimes called a "comical quad," at 5A2CV, near Tobruk. It is a three-band job using 3/8 in. conduit for the main supports, with the three elements separately fed. The array is fully rotatable through 360° and is driven by the differential gear from an old lorry.

#### MOBILE RALLY NOTES

On August 30, the South Manchester and Stockport Amateur Radio Clubs organised, jointly, a Mobile Rally which began as a treasure hunt. This involved the solving of 12 clues in the course of a 30-mile journey to the Bull Hotel, near Buxton, Derbyshire. Some 60 cars were started, of which 26 were entered for the mobile element of the contest—this called for solving the clues and exchanging code-words with the control stations by radio while on the journey. The winner of this interesting event was G3KCB, operating two-metre /M on a motor-cycle, with G2ALN second and G3FOE runner-up. At the close there were about 300 people present at the Bull Hotel, and the whole affair is reported as having been very successful.

The Mobile Rally at Woburn Park on September 13 was organised this year by the Amateur Radio Mobile Society, and once again drew a large attendance—though not quite as many as last year, in terms of either cars or visitors. However, by the middle of the afternoon there were about 150 /M vehicles in the Rally park, and some 220 callsigns in the attendance book. The Top Band talk-in station G3NMS/P had by far the most to do, there being few stations on 80 metres for G2CAJ/P and only about

15 mobiles worked by G3FZL/P on two metres.

In the contests, the first prize went to G31VP/M, of Salisbury, for his ingenious 160-metre SSB outfit mounted on the carrier bracket of his motor-cycle; he can operate safely while travelling at 60 m.p.h. This is a transceiver layout, using 10 transistors and 6 valves, with certain sections of the circuit performing dual functions, receiver or transmitter, wherever possible. The prize for the safest mobile installation was awarded to G3WW/M, Wimblynton, Cambs., who has a well-fitted rig in his Volkswagen. The winner for the greatest distance travelled to and from the Rally was G2ADR, of York, well known as a keen attender of mobile rallies.

#### NEW ADMIRALTY W/T STATION

Marconi's have recently completed the supply and installation of the transmitting equipment for the new Admiralty W/T station at Inskip, near Preston, Lancs. This station is one of the largest in the country, comparable in size with the G.P.O.'s Rugby Radio Extension. Thirty transmitters, ranging in output power from 40 kW to 3½ kW, have been installed, together with appropriate drive units, a coaxial line exchange, an open wire automatic aerial exchange and a considerable amount of ancillary equipment.

*More than 80% of licensed U.K. amateurs are regular readers of Short Wave Magazine*

## SSB Topics •

FREQUENCY CONVERSION FOR SSB — MIXERS, MODULATORS and FILTERS — INPUT IMPEDANCES FOR G-G LINEARS

Conducted by J. C. MILLER, DJØBX (W9NTV)

**S**INGLE-SIDEBAND is one of the most efficient methods of voice communication by radio. It provides for more effective use of available frequencies and of potential transmitter capability.

By eliminating one sideband it is possible to reduce the transmitted bandwidth, so that it is no greater than that of the applied audio or speech frequency signals. This enables the equipment designer to control the bandwidth by restricting the audio frequencies to those required for transmission of maximum intelligence. Further, it is possible for an increased number of stations to operate in a given band of frequencies.

In the transmitted SSB signal the radio frequency power is directly proportional to the original audio frequency power—and with the carrier suppressed, there is essentially *no* RF output when there is *no* audio input. By suppressing the carrier and one sideband, the entire power capability of the final amplifier can be utilised to radiate the remaining sideband, which contains all the required voice intelligence to be transmitted. This means that the typical AM transmitter final amplifier—modified for linear operation—can provide *four times the effective power output* when driven by a single-sideband exciter.

Single-sideband not only offers spectrum and power economy, but also is less susceptible to the annoying effects of selective fading and interference than amplitude modulation. The elimination of the transmitted carrier and the improved performance of SSB during unfavourable propagation conditions produce the principal advantages of the SSB method of communication.

### Frequency Conversion Problems

The design of a band-switching single-sideband exciter, in which the SSB signal is generated at a low frequency, requires the use of multiple-frequency conversion systems to obtain output on the higher-

frequency bands. This heterodyning process combines the original SSB signal with a second signal of a different frequency, to produce two new additional signals whose frequencies are the sum and the difference of the two original signal frequencies, respectively. The circuit which performs the heterodyning function is called a *converter, mixer or modulator*. The heterodyne process is often described as: *convert, mix, beat, heterodyne or modulate*. It should be recognized that all of these imposing terms mean exactly the same thing. Fig. 1 shows a basic block diagram of a mixer stage fed by two signal generating stages to produce the desired output frequency.

The actual output of each mixing stage contains the two input signals, all harmonics of the two input signals and, in addition, all possible combinations of the sum and difference frequencies of all the harmonics! (The desired output frequency is normally either the sum or difference frequency of the sideband generator frequency and the conversion injection frequency.) *All products except the one desired output signal frequency* are considered spurious signals and adequate precautionary measures must be included to prevent radiation of these spurious signals from the transmitter output.

The stages following the mixer circuit should include at least two high-selectivity tuned circuits at the desired output frequency, as a means of obtaining adequate spurious signal suppression. Cascading a number of tuned circuits—ganged and tracked together—would be an excellent arrangement. Such a method is often found in commercially designed equipment. With a Q of 100 in each tuned circuit, attenuation of 50 dB (100,000 to 1 in power), or more, will be obtained for spurious signals which are within plus or minus 10 per cent of the mixer output signal frequency. In practice, the two input signal frequencies and their harmonics should not

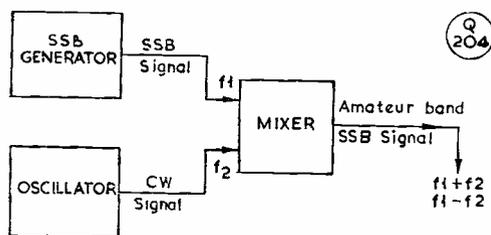


Fig. 1. A mixer stage fed by two signal generating stages. The SSB signal,  $F_1$ , and the RF carrier,  $F_2$ , are heterodyned to produce two new beats, the sum and difference of  $F_1$  with  $F_2$ . Careful selection of the two signal frequencies is necessary to eliminate the possibility of spurious beats appearing with the wanted signal.

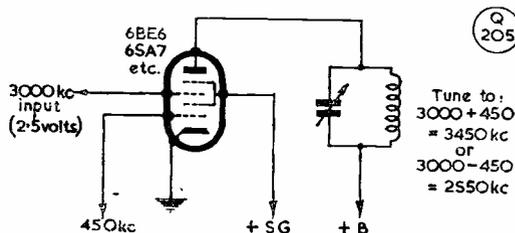


Fig. 2. Pentagrid mixer suitable for SSB frequency conversion. A 450 kc SSB signal is fed to grid 1, and the conversion frequency RF signal to grid 3. The plate circuit is tuned to the sum or difference of the two input frequencies; in this example, the output could be either 3,450 or 2,550 kc.

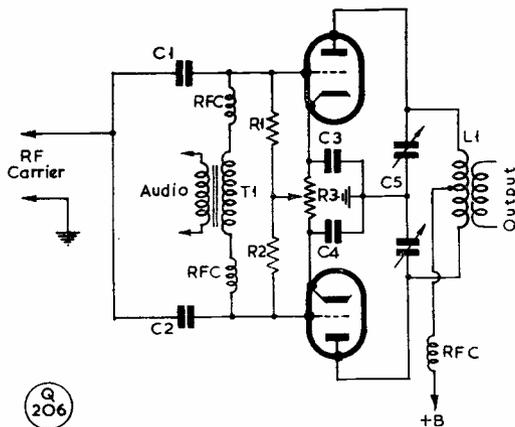


Fig. 3. Typical push-pull balanced modulator. The RF drive is introduced in parallel in both valves and the audio modulating frequency in push-pull. The carrier is suppressed in the push-pull tuned output circuit, with only the two sideband frequencies remaining—thus, a double-sideband suppressed-carrier signal. In practice, C5 is tuned to the RF input signal and the cathode bias potentiometer R3 adjusted for maximum carrier suppression.

**Table of Values**

Fig. 3. Push-Pull Balanced Modulator

C1, C2 = 100 $\mu\mu\text{F}$	R3 = 1,000 ohm potentiometer for carrier balancing
C3, C4 = .01 $\mu\text{F}$	RFC = RF chokes
C5 = 150 $\mu\mu\text{F}$ , variable, split-stator	T1 = Audio transformer, plate to grid
L1 = Plate coil tuned to carrier frequency	
R1, R2 = 15,000 ohms	

appear within this 20 per cent range, or they may also appear in the output.

There are a number of different types of mixer circuits, most of which will generate harmonics of both input signal frequencies, even though the harmonic content of the input signals is very low. These harmonics should not appear within 10 per cent of the desired mixer output frequency. The ideal way of avoiding spurious frequencies resulting from harmonics of the input signal is to place both the mixer input frequencies higher than the output signal frequency. This is often impossible—for example, when heterodyning the output of a 400 to 500 kc filter-type generator to a higher frequency.

In a phasing-type or HF crystal filter-type SSB generator the operating frequency is not restricted. Therefore, the signal may be placed higher in frequency than the amateur band on which output is desired. For design convenience, this may not be

**Table of Values**

Fig. 4. The Push-Push Method of Balancing

C1 = 150 $\mu\mu\text{F}$ , variable, split-stator	C5 = 0.001 $\mu\text{F}$
C2, C3 = .01 $\mu\text{F}$	R1 = 1,000 ohm carrier balancing potentiometer
C4 = 150 $\mu\mu\text{F}$ , variable	T1 = Audio transformer, plate to grid
L1 = Grid coil, centre-tapped. Tuned to carrier frequency	RFC = RF choke
L2 = Plate coil tuned to carrier frequency	

always followed—as in the case of the popular 9-mc phasing generator, which is used for operation in the 14, 21 and 28 mc bands.

The *General Electric Ham News*, Volume 11, No. 6, for Nov.-Dec., 1956, includes a “mix-selector” chart, which is helpful in determining spurious products for various different mixing frequencies.

**About Mixers**

In single-sideband applications the mixer is often referred to as a “modulator.” Its circuitry can be simple or complex, single-ended (as used in a receiving converter circuit) or push-pull (commonly called a balanced modulator) and may use either diodes or multi-element valves. The single or balanced diode mixers are more foolproof than the average multi-element valve mixers. However, the diode is likely to have high harmonic output and will provide no power gain.

The use of pentode or other multi-element valves designed for mixer service in receivers usually results in less harmonic generation than in a diode circuit. In order to avoid distortion of the output signal it is necessary carefully to control the operating conditions. The conventional mixer circuits for these valves feed each mixer input signal to a separate grid. A tuned circuit resonant at the desired output frequency is connected to the plate of the valve.

A pentagrid mixer circuit using a receiving type mixer valve is shown in Fig. 2. The output signal from the 450 kc SSB generator is fed into the No. 1 injection grid and the conversion frequency is fed into the No. 3 grid. Although this is the reverse of the normal grid connections, it has been found to produce an improvement of 10 dB in distortion. The SSB signal is fed to the mixer at a low level to avoid distortion. The conversion frequency is fed at about 20 dB higher level. This results in very low harmonic generation of the SSB signal in the mixer valve.

(Over

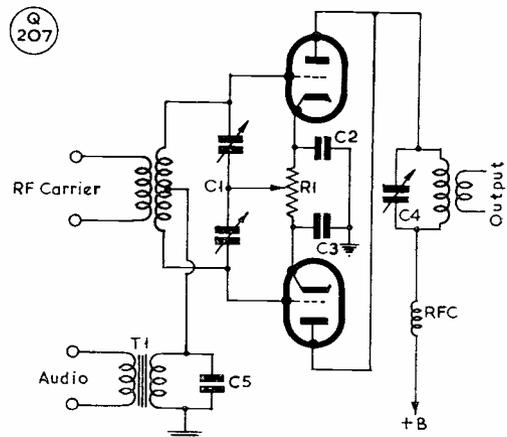


Fig. 4. The push-push balanced modulator with grid and plate circuits resonated for the RF carrier frequency. Both the RF excitation and the audio are in push-pull, with the output in parallel. C1, C4 are tuned to the carrier frequency, and R1 set for minimum carrier output. As in the case of Fig. 3, a DSB signal appears in the tank circuit.

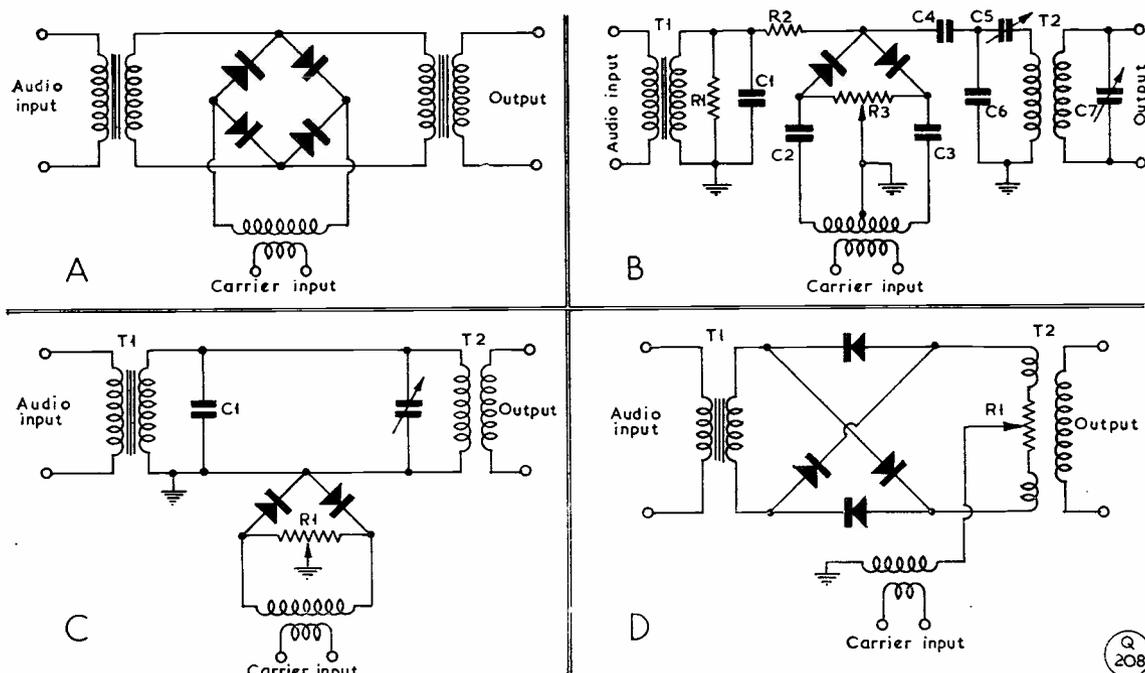


Fig. 5. Rectifier type balanced modulator circuits. The individual rectifier may be germanium crystal diodes, copper oxide rectifiers or silicon diodes. Each rectifier is selected to match closely the characteristics of the other three. In (A) is a shunt-type balanced modulator, a bridge arrangement as used in many commercial applications. The circuit at (B) is a practical adaptation of (A), the values specified being for a 450 kc carrier frequency; this type of balanced modulator can be used to feed a crystal lattice filter. (C) is a series-type balanced modulator, and (D) is a ring modulator, with input and output impedances of approximately 500 ohms; this circuit is more suitable for frequencies of 50 kc and below.

The balanced modulator mixer stage offers the main advantage of cancelling the fundamental and certain harmonics of at least one of the input signals. It is usually possible to balance this circuit for maximum attenuation of the fundamental of either input signal, but not both simultaneously. The circuitry for a balanced modulator may appear in several different forms. In the push-pull arrangement shown in Fig. 3, the conversion signal is fed to the valve grids in parallel and the audio in push-pull, with the plates of the valves connected in push-pull. The circuit illustrated in Fig. 4 is called the push-push balanced modulator. In this case the RF drive and the audio are applied in push-pull and the output circuit is in parallel. Both circuits will operate with equal effectiveness to balance-out the RF carrier. Under perfect balance conditions, there will be no output with no audio signal input.

In the diode-type balanced modulator circuits shown in Fig. 5, the diode rectifiers are connected so that no RF can pass from the carrier signal source to the output circuit through the two possible paths. If the diodes have equal forward resistances, no RF will get through to the output. The circuit is unbalanced with application of an audio signal and some RF will appear in the output circuit. As is the case for all balanced modulator circuits, with an RF carrier and audio signal inputs, the output is a double-sideband suppressed-carrier signal.

### Table of Values

Fig. 5(B). Shunt type balanced modulator

C1, C2,	R3 = 1,000 ohm carrier
C3 = 330 $\mu\mu\text{F}$ mica or	balancing pot.
ceramic	T1 = Plate to 500 ohm
C4, C6 = .001 $\mu\text{F}$	transformer
C5, C7 = To tune primary	T2 = 1F xformer, with
and secondary of	series-tuned
T2 to carrier freq.	primary
R1, R2 = 1,000 ohms	

Fig. 5(C). Series type balanced modulator

C1 = 0.003 $\mu\text{F}$	T1 = Plate to grid audio
R1 = 1,000 ohm carrier	transformer
balancing pot.	T2 = 1F transf. tuned to
	carrier freq.

Fig. 5(D). The Ring Modulator

R1 = 250 ohms	T2 = Tuned to carrier
T1 = Plate to 500 ohm	frequency.
audio trans-	
former	

When using diodes minimum distortion is obtained when the RF carrier voltage is at least 5 to 10 times that of the peak audio voltage. It is suggested that several volts of RF and a fraction of a volt of AF be used in the average operating circuit. The forward resistances of the diodes may be measured with an ohmmeter, to assure as close a match as possible.

A balanced modulator of particular interest which does not use push-pull circuitry is that in the Collins KWS-1 SSB transmitter. This circuit, given in Fig. 6, is very similar to one of the popular product de-

modulator circuits, also developed by Collins for use in their SSB receivers. The rather complex tuned plate section is required due to the high ratio of VFO input voltage to SSB signal voltage. The purpose of the tuned plate circuit is to reject a strong undesired frequency component in the mixer output, which results from the high-level VFO signal. The principle involved is called "selective feedback rejection."

The tuned plate circuit consists of C4, C5 and L1, with C4 and L1 tuned to resonance at the desired output frequency in the 3 to 4 mc range. Condensers C1, C2 and C3 form a capacitive voltage divider, with the values of C2 and C3 chosen to determine the amount of feedback for the undesired VFO component. The variable condenser, C1, is adjusted to null out the particular frequency to be rejected. Heterodyne action in the valve and selective feedback rejection in the tuned plate circuit produce excellent selective bandpass and stability characteristics for the 3 to 4 mc range.

This circuit may also be used for mixing an audio signal with that of an RF carrier. The audio would be fed to pin No. 7 in place of the indicated 250 kc SSB signal, and with proper adjustments, the output would consist of a double-sideband suppressed-carrier signal.

For a complete discussion on the various forms of balanced modulators the reader is referred to the following amateur publications: *Single Sideband for the Radio Amateur*,\* published by ARRL; and the two *CQ Magazine* publications: *Single Sideband Techniques*, by Brown and the *New Sideband Handbook*,\* by Stoner.

\* Obtainable from Publications Dept., *Short Wave Magazine*, Ltd.

**HF Crystal Filter Circuits**

By using a high-frequency crystal filter for sideband selection in an SSB receiver or transmitter, one or more frequency conversions may be eliminated. Elimination of the additional mixing stages offers the advantage of circuit simplification and improved performance, as previously discussed. A well designed and properly aligned HF filter will provide the

selectivity and stability required in SSB equipment. It is for these reasons that the HF filter has become so popular among the Sideband group and is destined to become a "standard" in SSB generating systems.

A mobile single-sideband transceiver, designed around a high-frequency surplus-crystal filter, was described in *QST* for June 1959. The author, W3TLN, makes good use of surplus FT-243 HF crystals in the filter circuit, in a similar manner to that described in "SSB Topics" for April 1959. While the complete transceiver by W3TLN is of interest to those contemplating the design and construction of such a unit, the discussion following will be limited to the subject at hand HF filter applications and associated circuitry.

The diagram shown in Fig. 7 indicates one of the possible ways to use the HF filter in an SSB generator. While 8.55 mc surplus crystals are used in this filter, W3TLN points out that the same results can be anticipated with crystals in the 5 to 8.5 mc range.

A conventional Pierce oscillator circuit is used for the 8553 kc carrier crystal. The condenser in parallel with this crystal is used to lower the frequency for proper placement on the filter slope. The balanced modulator is similar to the one used by Collins in their KWS-1 and KWM-1. The author suggests that other modulator circuits could be used if preferred.

The filter input is terminated and isolated from the non-linear impedances of the balanced modulator by a resistive isolating pad. The filter output is terminated in a resistor of 510 ohms, which was determined to give the flattest passband with the crystals used. The crystal filter is of the back-to-back

**Table of Values**

Fig. 6. Collins balanced modulator circuit

C1, C4 = 8-50 $\mu\mu\text{F}$ midget variable	C7, C8 = .001 $\mu\text{F}$
C2 = 270 $\mu\mu\text{F}$ mica or ceramic	L1 - Tuned to 80 m. with C4 and C5
C3 = 430 $\mu\mu\text{F}$ mica or ceramic	R1 = 47,000 ohms
C5 = 20 $\mu\mu\text{F}$ mica or ceramic	R2 = 47 ohms
C6 = .01 $\mu\text{F}$	R3 = 220 ohms
	R4 = 100,000 ohms
	R5 = 10,000 ohms
	RFC = 2.5 mHy RF choke

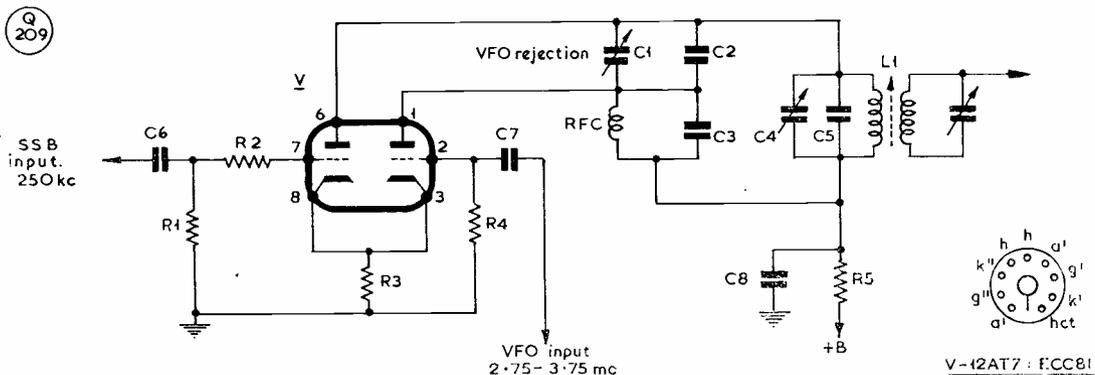


Fig. 6. An unusual balance modulator arrangement, of the type found in the Collins KWS-1 SSB transmitter. The sideband signal at 250 kc is taken from the output of a mechanical filter and mixed with the 2,750-3,750 kc VFO signal to produce output in the 80-metre band. The tank circuit C4-L1 is tuned for 80 metres. The RF voltage on pin 7 is about 0.1v. and at pin 2 it is 1.5v. The principle known as selective feedback rejection is used to "null out" the strong VFO component in the output, this being performed by C1.

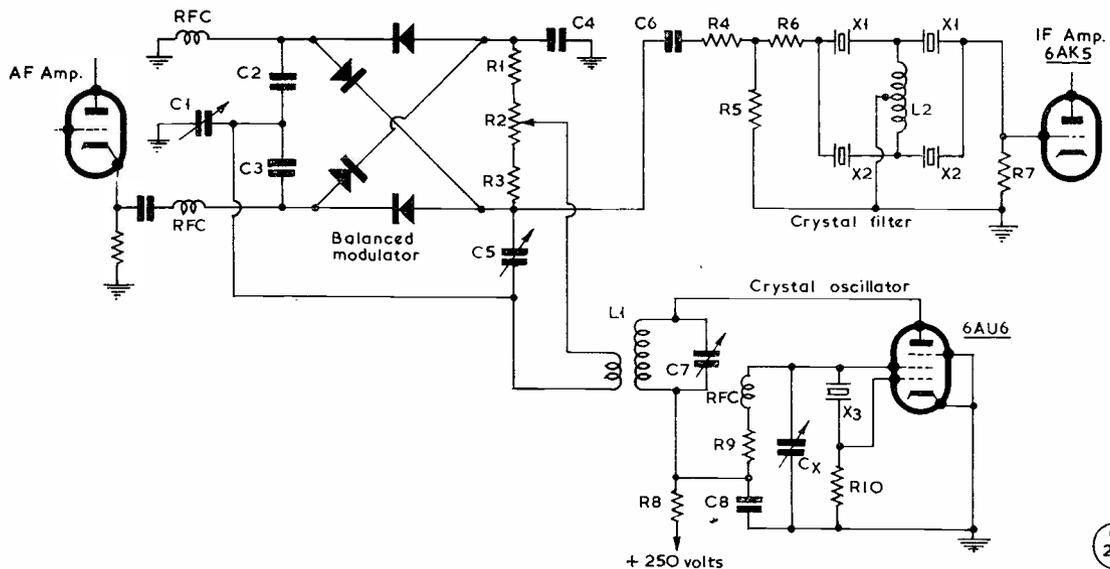


Fig. 7. Portion of an SSB generator using an HF crystal filter. In this circuit, the carrier CO is on 8553 kc.  $C_x$  is used to tune the crystal frequency lower if required; carrier suppression is by a ring-type balanced modulator, the adjustment for exact null being on  $C_1$ ,  $C_5$ ,  $R_2$ . The filter is terminated with the correct value resistors to give the flattest pass-band.

half-lattice configuration, using crystal pairs with 1.5 kc frequency separation. A bifilar winding on a toroidal ferrite core is used to couple the two filter sections together.

Further experimentation by G2MA has produced the interesting filter circuit shown in Fig. 8. Two half-lattice filters are again connected in the back-to-back circuit, with 1.9 kc separation for the two crystal pairs. This filter was measured and gave a bandwidth of 2.2 kc at the 6 dB points and had a shape factor of 2:2, which is ideal for SSB.

It will be noted that the input and output circuits are terminated in resistors and tuned circuits. The two tuned circuits are adjusted for maximum signal output and the series condensers,  $C_3$  and  $C_4$  are included to permit optimum impedance matching. G2MA points out that if the tuned circuits and the impedance matching condensers are omitted, the values of the terminating resistors,  $R_1$  and  $R_2$ , must be determined experimentally. This may vary with different crystals and different frequency spacings. A value of about 430 ohms is suggested as a starting point.

G2MA has also done some experimentation with four pairs of HF crystals in a filter. Although the exact frequency matching was quite tricky, the filter produced "skirts" which were nearly vertical! It should be noted that the performance of the 1.5 kc separation G2MA filter described in this column for June 1959 was incorrectly stated. The shape factor should have been 2:3 and *not* 60:1 as the "gremlin" indicated—that is, the bandwidth at the 60 dB down points was 2.3 times the width at the 6 dB points.

#### Impedances in Grounded-Grid Linears

Impedance matching in grounded-grid linear amplifiers seems to be a problem confronting a

#### Table of Values

Fig. 7. Using an HF crystal filter

$C_1$ , $C_5$ ,	$R_5$ = 220 ohms
$C_7$ — 3-25 $\mu\mu\text{F}$ midget	$R_6$ = 330 ohms
variable	$R_7$ = 510 ohms
$C_2$ , $C_3$ ,	$R_8$ = 1,000 ohms
$C_8$ — 0.001 $\mu\text{F}$	$R_9$ = 10,000 ohms
$C_4$ , $C_6$ = 200 $\mu\mu\text{F}$	$R_{10}$ = 350,000 ohms
$C_x$ = 3-12 $\mu\mu\text{F}$ midget	RFC = 100 $\mu\text{H}$ RF choke
variable	$X_1$ = 8550 kc, FT-243
$L_1$ = Tuned to resonate	crystal
at 8.5 mc with $C_7$	$X_2$ = 8551.5 kc, FT-243
$R_1$ , $R_3$ = 470 ohms	$X_3$ = 8553 kc, FT-243
$R_2$ = 100 ohm potentiometer	$L_2$ = 50 $\mu\text{H}$ bifilar
$R_4$ = 1,200 ohms	wound on toroidal ferrite core

number of readers. As the majority of queries concern tetrodes and pentodes connected for high- $\mu$  triode operation—that is, with all grids operating at the same DC and signal voltages—this discussion will be limited to that mode of operation.

In a grounded-grid amplifier there are the same number of impedances to be matched as in a conventional grounded-cathode amplifier. Impedance matching becomes more important in the g-g stage when considering that the input and output impedances appear in shunt to the driver stage. This is shown in Fig. 9A. These two impedances will react upon each other—that is, a variation in one will effect the other. The actual circuit with impedances indicated is shown in Fig. 9B.

The plate load impedance is computed in the normal manner, the same as for any conventional linear amplifier. The input impedance is an entirely different problem. The actual computation is quite complicated for the average amateur and requires valve data which is normally not published by the valve manufacturers.

Fortunately, a simple method for approximating

the input impedance of g-g valves connected as high- $\mu$  triodes has been described by W6GEG, in *CQ Magazine* for January, 1956. The opposite of impedance — conductance — is first computed. If the plate resistance,  $R_p$ , is much greater than the load impedance,  $Z_L$ , and the  $\mu$  of the valve remains much greater than unity, the input conductance can be shown as:

$$g_i = \frac{\mu}{R_p} = g_m$$

This represents the valve's conductance in g-g. As impedance is the reciprocal of conductance, the input impedance may be determined by dividing the  $g_m$  into 1. Valve transconductance can be obtained from manufacturers' data, which can in turn be divided into 1 to determine the input impedance in ohms.

As an example, the 813, with a transconductance of 3750, has an approximate input impedance of 267 ohms. In this case, the driver stage output circuit must provide for a proper match to 267 ohms for maximum transfer of power.

Another point to remember in determining input impedances for g-g stages is, that for valves operated in parallel, the total input impedance for the amplifier is the impedance of one valve divided by the total number of valves in parallel. Therefore, in the case of the 813 stated above, two valves in parallel would present an input impedance of 133.5 ohms to the driver.

Table 1 lists some of the valves found to perform well with both grid and screen grid grounded. The transconductance was extracted from manufacturers'



Three well-known SSB personalities — W2CFT, left; G6LX/DJ0BM, centre; and DL4WX at right. This photograph was taken at the station of DL4WX.

data sheets and input impedance was calculated from the formula:

$$Z_g = \frac{1}{g_m}$$

**News and Views**

It has recently been learned that the U.S. firm, The Brush Development Company, manufacturer of numerous piezo-electric crystal devices, is developing a mechanical filter utilizing piezo-electric material. The design frequency of the first filters will be in the IF range. The early indications are that the price will be about \$7 (U.S.).

Also, an electronic firm in Japan is reported to be ready to start production on a mechanical filter. While no details are available at the time of writing, it can be safely assumed that the price will be reasonable!

One of the new SSB transmitter/exciter units manufactured in the States is using sub-assemblies prefabricated in Japan.

**In Conclusion**

When you receive this issue of *SHORT WAVE MAGAZINE*, your conductor will be on holiday in the States. It is hoped that many of the manufacturers of sideband equipment can be visited and through "SSB Topics" descriptions of U.S. activities and current developments in the field of sideband presented.

Many thanks to our readers for their contributions and helpful suggestions. Don't forget to send your reports on activities, experiments and sideband circuitry, as well as photographs of yourself and station, to this feature.

(Over)

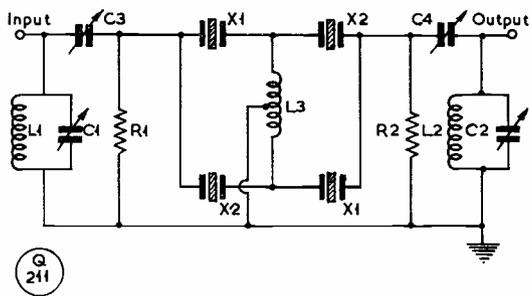


Fig. 8. HF crystal filter circuit suggested by G2MA. Two half-lattice filters are connected back-to-back, with correct impedance matching. The frequency separation of the crystals is 1.9 kc (X1, 8,600 kc; X2, 8601.9 kc). The filters are coupled by a 25-turn bifilar coil L3, using a Mullard FX-1299 ferrite toroid core. The inductance is not critical. The tuned circuits are resonant at the filter frequency, and C3, C4 are 3-30  $\mu\mu\text{F}$  miniatures for impedance matching. R1, R2 are 1,000 ohms each, non-inductive.

Table 1

Valve Type	Transconductance (gm)	Input Impedance (ohms)
6AG7	11,000	90
6V6	3,750	266
6L6	5,200	192
802	2,250	444
837	3,400	294
6146	7,000	143
4E27	2,800	357
4E27A	2,150	466
4-125A	2,450	408
813	3,750	267
803	4,000	250
4-250A	4,000	250
1625	6,000	167
EL-34	11,000	90
EL-38	11,000	90
4X150A	12,000	80

"SSB Topics" will appear again in the December issue, for which all correspondence should be received by October 23. Address "SSB Topics," c/o Editor, SHORT WAVE MAGAZINE, 55 Victoria Street, London, S.W.1, or direct to your conductor at Mauerkircher Strasse 160, Munich 27, Germany.

Vy 73 de Jim, DJ0BX.

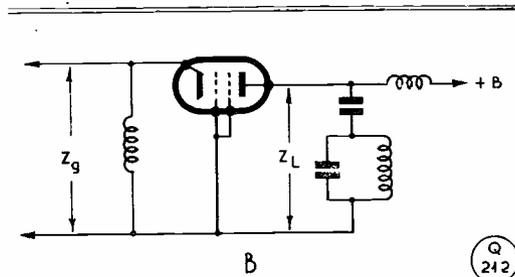
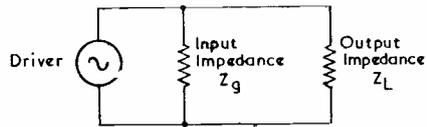


Fig. 9 (A). Input and output impedances of a grounded grid linear amplifier appear in shunt to the driver. Any change in one has a reaction on the other; this can demand high drive. Fig. 9 (B) shows the circuit for a grounded-grid, grounded-screen amplifier. Many pentodes or tetrodes may be used in this configuration with good results; in the case of a pentode with separate suppressor, this should be tied to the other two grids.

**MARCONI TROPOSPHERIC SCATTER LINK FOR WEST INDIES**

Cables & Wireless Ltd. have placed an order with Marconi's Wireless Telegraph Co. Ltd. for a quadruple diversity UHF tropospheric scatter link between the West Indies islands of Trinidad and Barbados. Duplicated VHF multi-channel links to carry the signals between the tropospheric scatter terminals and the operating centres are also to be installed. The Trinidad scatter site will be established at a point along the Blanchisseuse Road, some ten miles from the Cable & Wireless station at Port-of-Spain. In Barbados the scatter station will be at Mount Misery with a two-way multi-channel VHF link connection to the Cable & Wireless radio receiving station at Carrington.

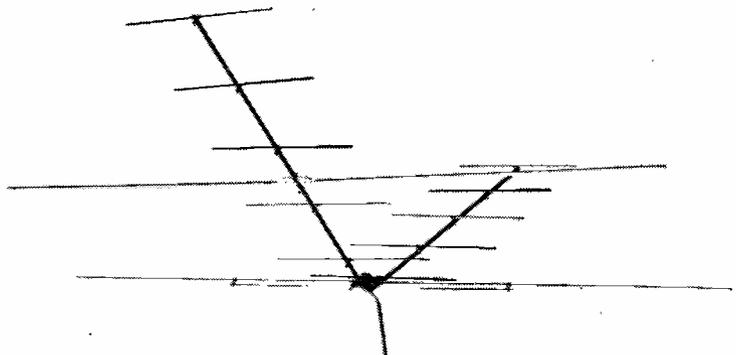
The system will carry six telephone speech channels initially, one of which will be used for telegraphy, embodying three 100-baud FM/VF channels. One FM/VF channel will be in two-channel (50 baud) time-division multiplex. Automatic error correction is to be provided by the incorporation of the new Marconi Autoplex equipment.

Each of the tropospheric scatter sites will have two Marconi Type HS315 1 kW UHF transmitters with associated drive equipments, Type HD313. Each transmitter feeds into a 30ft. dish aerial to give an effective radiated power of some 4 megawatts in

the direction of maximum intensity. Operation is in the band 680-970 mc. with a frequency spacing between transmitters of 4 mc. Since the system is quadruple diversity, two transmitters operate at each terminal, with their dishes set up about 100ft. apart. The path distance is about 210 miles.

**TAKING CARE AT UHF**

In a further comment on the hazards of exposure to UHF radiation, G2TA (Bushey, Herts.) says that it has now been found that there is danger to the eyes at frequencies between 1,000 and 3,000 mc if the gear is capable of producing a field of the order of 0.1 watt per sq. cm. In other words, don't peer down a waveguide with the transmitter on.



The Labgear type C.30 aerial assembly is a special three-channel model designed to cater for one Band I and one Band III transmission originating from one direction, and an additional Band III service from a completely different direction.

ANYONE at all interested will know that the period since our last appearance produced VHF conditions up to the best yet experienced in terms of EDX potential, though the openings were not as sustained as some known in the past.

In particular, for "the first time in living memory," a spell of good conditions actually coincided with the International VHF Contest of Sept. 5/6, making that event really worth while, in that *international* contacts were possible—in previous years, this Contest has invariably fallen during a period of flat conditions, with no EDX available to the generality of U.K. stations. As it was this year, to be in the running at all well over 100 contacts would have had to be made; totals of more than 150 have already been reported. Because conditions were so good, with high activity, it is not possible to pick out the big individual scores, but it was obvious that many of the Continentals were doing well. An interesting feature of this opening was that the glass was not abnormally high, though it had been steady for the whole of the preceding week. What happened on the Saturday evening, 5th, was that it turned into a cool evening after a warm day, this condition being widespread over Northern Europe. How fortunate we were that there was a contest on, and how interesting that must have been for the majority of operators, unaccustomed to a contest under real EDX conditions.

The next big break was a week later, when the evening of Saturday, 12th, produced a solid jam of S9 signals from all over Northern Europe, from end to end of the band. The QRM resulted in a happy chaos and, if there was any "interference with Service communications," it is to be hoped that the authorities will realise that it was a once-in-a-way occurrence, due to propagation conditions and not careless operating. However, during those openings there must have been many instances of unexpected inter-Service QRM in the VHF regions, not in any way due to amateur activity; in any event,

# VHF BANDS

A. J. DEVON

## More Good EDX Openings—

## Excellent Conditions for VHF Contest, Sept. 5/6—

## Large Movements in the Tables—

## Notes, News & Station Reports—

the Service channels are normally pretty quiet at week-ends.

The weather state for the September 12 opening was that the glass had been steady all the week, starting to climb on the morning of the 12th and, once again, the evening was cool after a generally warm day.

Practically all the reports this month mention EDX contacts, and some very good QSO's are recorded, even in the case of poorly-located stations (some with indoor beams only). While this sort of thing cannot be expected in the ordinary way, it proves once again that when conditions are right, very satisfying results can be obtained with simple gear—but it remains true that this happy state cannot be expected very often!

## The Tabular Matter

Naturally, there have been big claims for the Tables, some 40 movements having been taken into those shown this time. In particular, there have been numerous changes in Countries, which now reflects the very creditable performances of many U.K. operators over the years—this is an all-time table and, like All-Time Counties,

we are well aware that not a few of the calls shown are no longer even active on VHF. But the point is that these tables constitute a *record of achievement*, which is why all call-signs are kept standing. In the All-Time, there are instances of people who, having abandoned VHF for a period of years, are now back again and able to take up the quest for counties where they left off.

We also received a number of very useful calls heard/worked lists; though there is no room for them this time, they have been very helpful to your A.J.D. as background information, and are valued accordingly. We will resume the publication of calls heard and worked as soon as things calm down, when they will be more useful and interesting to the general reader. So please do continue sending them in.

In the "Firsts" list, not shown this month, it is worth mentioning that E12W now holds no less than nine first-contacts for Eire; he has been consistently active on VHF over the years and his operating record, from a location which is one of the most difficult geographically, is a great credit to his ability and enthusiasm. And, some might say, his stamina, too!

And, finally, on the subject of the

## TWO METRES

### COUNTIES WORKED SINCE SEPTEMBER 1, 1959

Starting Figure, 14

From Home QTH Only

Worked	Station
35	G3HBW
34	G3JWQ
24	G3KPT
19	G2CIW, G3HWR
18	G3ICO
14	G3AYC, G3DLU, G3IOE, G5ML

*This Annual Counties Worked Table opened on September 1st, 1959, and will run till August 31st, 1960. All operators who work 14 or more Counties on Two Metres are eligible for entry in the Table. The first claim should be a list of counties with the stations worked for them. The list can be added to as additional counties accrue.*

tabular matter, the new Annual Counties has got off to a very good start. The table for the year ended Aug. 31, 1959, is not shown again, due to space considerations, but here are some of the final scores claimed: G5MA, 59; G3HBW, 48; G3JWQ, 42; G8VZ, 39; G3MAX, 32; G3KQF, 30; GW3ATM, 28; and GW3MFY, 25. With the entries given last time, this makes a total of 18 stations listed for the year. G5MA again being the high scorer—he makes a habit of coming out top of Annual Counties; well done, Bob!

### VHFCC Elections

Of particular interest this month is the claim from J. R. Elms, VK6BE, Kalamunda, W. Aust., who gains VHFCC Certificate No. 247. Covering 50 mc and 144 mc, his cards show 36 VK's worked in all districts on six metres, three ZL's also on 50 mc, and three VK6's on two metres; the balance are JA's on six metres, good contacts JA/VK having been possible on that band during their recent openings. In the main, the gear used in those parts is much as it is in Europe, the reliance being on openings rather than on high power.

Other VHFCC Certificates awarded are to C. R. Plant, G5CP, Wingerworth, Derbys., No. 248; to R. Stanford, G3MNR, London, S.W.2, No. 249, who shows 99 G's and one card from PE1PL; and to E. Neal, G8GP, London, S.E.4, No. 250, who has cards from nine countries.

### Notes, News and Gleanings

G3CCH (Scunthorpe) had two contacts with GM3BOC/A in the very rare county of Sutherland, on Sept. 7th and 10th, putting him up to 76C in the All-Time; he also worked two LA's during the Contest. G3JWQ (Ripley) reports 32 new stations worked since his last report, making his total 461. G3KQF (Derby) says he is not active for the time being, as he is rebuilding for SSB.

Well-known old timer G5ML (Leamington Spa) now has a 4/4/4 at 60 ft. and, with a new PA running 60 watts, Freddy worked G1GXP and GM3EGW for new

ones. Also with a new aerial is G8DR (London, N.W.2), who has just put up a slot-fed 8/8 J-Beam, which has already brought him a first contact with GM, using only 15w. from a poor location; G8DR says he now hopes to work the DX "which hitherto has ignored me."

G3HBW (Bushey Heath) reports "conditions good for some time with a few brilliant patches"—which were the week-ends already mentioned—and during the Contest he accounted for 87 stations, of which 32 were EU's; Arnold also notes that though SM6ANR was a strong signal on two metres on the 12th, he could not be heard at all on 70 centimetres. Up in Sheffield, on the 12th, G3DLU found the whole band "packed full with DJ/DL, F, ON and PA stations," of which he worked 12, all with S9+ both ways. How does the word get round, he wonders, because it seemed that every G was on!

From that hole of his in South Gosforth, Northumb., G3IOE was very pleased to get GM3BOC/A, Suth., and GW2HIY for Anglesey, the first GW ever heard in seven years on two metres! However, he gets good signals from the GM's (when they come on) and some of the Lancs. stations, and has been working GM2FHH in Aberdeen. G3IOE has built that G6TA A.2521 RF pre-amp. and is very pleased with the results—it has an NF of 2.2 dB only.

Bob has been out and about again with G5MA/P, using Bulbarrow Hill, N. Dorset, which, he says, is a grand site 900 ft. a.s.l.; quite a large number of stations were worked, including G3ABH who, one of the active two-metre men in the early days, has started up again from Corfe, Dorset. G5MA has also had a visit from SM6BTT, recently in the U.K. G3HAZ (Northfield, B'ham) is over the hill from G2CIW, and both report themselves active. G3HAZ remarks that he has never heard so many DJ/DL, ON and PA stations on two metres as during Sept. 12/13 "filling the band up to 145.9 mc and all S5-S9," with a mention of SP6CT/P (who was on again and

## SEVENTY CENTIMETRES

### ALL-TIME COUNTIES WORKED

Starting Figure, 4

Worked	Station
32	G2XV
27	G3HBW, G3JWQ, G3KEQ, G5YY
26.	G6NF, GW2ADZ
23	G3BKQ, G6NB
20	G3HAZ
19	G2CIW
18	G3IOO
16	G3LHA, G3MED
15	G4RO
14	G2DDD, G2HDZ, G3FAN
13	G3MPS
12	G2CIW*, G5BD
10	G2OI, G3AYC, G3IRW
9	G3KPT, G5DS
7	G2HDY, G3JHM, G3LTF
6	G3JMA, G3KHA, G3WW
5	G3FUL, G3IRA, G3IUD, G5ML
4	G3JGY

*On working four Counties or more on the 70-Centimetre band, a list showing stations and counties should be sent in for this Table, and thereafter new counties worked notified as they accrue*

\* New QTH

has worked some more G's from the same site as last year). G3HAZ had a good 70-cm phone QSO with PA0WAR and has now accounted for six countries on Seventycems—he thinks he might just get the edge on G3KEQ if the SM's broke through to the Midlands on 430 mc. The same might go for G2CIW, who is also on Seventycems, 435.45 mc, and very anxious for more activity on that band; Jack wonders if some of "the old exponents" have given up 70 cm altogether.

G3AYC is the BBC Club station, active again on VHF under the guidance and inspiration of G3COJ, and operated from the 7th floor of the Langham Hotel (which is BBC property). A new QRO PA is under construction for two metres, and G3AYC is now fully operational on

Seventycems: Freq. 434.7 mc, QQVO3-20A PA with 25w., aerial 7/7 slot-fed, and Rx an A.2521 RF stage into a crystal mixer. Results on 70 cm have been, says G3COJ, "fair with F and PA worked, but activity disappointingly low, the Northern and Midlands stations normally associated with 70 cm always seeming to be on two metres." F3LP and F8MX were strong 430 mc signals on Sept. 6th and 7th, when PA/WAR was worked for the first time.

Even for GW3MFY (Bridgend, Glam.) Sept. 12/13 brought in some EDX, with DL3FM worked; this compensated for that metres opening during June 14/15, which did not touch the GW's. For G3ICO (Yeovil) the Contest week-end gave contacts with F3LP and G3MED, and on the 12th he was able to work two out of the ten or so PA's heard; also heard then were DJ3HX, DL3FM and ON4ZK.

From Portskewett on the Mon. side of the Severn Estuary, GW3ATM has been on two metres since October last, running 80w. phone and CW to an 829B, with a 4/4 at 37 ft., and a G2IQ converter into a CR-100. Previously of Huddersfield, GW3ATM found that most stations in Monmouthshire have adopted the GW prefix—though the only other two-metre operator in Mon. is G4GR, some miles to the west of GW3ATM! This apparent anomaly is due to the fact that the G.P.O., not wishing to become involved in the age-old controversy as to whether Monmouthshire is in England or Wales, have skated round the difficulty by leaving the prefix a matter of choice to the operators concerned!

G3HWR (London, N.W.3) is now using a rotatable Cubical Quad, which should be a very effective arrangement for two metres—at any rate, six countries have been worked and GDX like GW3ATM, GW5BI and GW8UH heard, also GC2FZC. The transmitter runs 90/120w. phone/CW to a QQVO6-40, and the Rx has an A.2521 RF pre-amp., with 24-26 mc tuned on a CR-100, the converter being crystal controlled. So far, 173 stations have been worked.

The EDX also broke through for G8VZ (Princes Risboro'), ON, OZ, PA and SM having been raised in what for him is the most difficult direction. Jack still runs just the 12w. to a very nice 6-elc stack, which certainly puts out a most penetrating signal in the northerly direction, and now has a new converter with an ECC84 in cascode and a tunable oscillator. He hopes to be much more active and in the meantime is maintaining his regular skeds with G3JWQ (800+ contacts) and G3KHA (400+). Up in Manchester, G3MAX moves well in the Tables and reports PA/YZ and PE1PL worked during the Contest. G3KPT (West Bromwich) had the surprise of his life when, starting up on 70 cm at about 11.30 on Sept. 6, he got F8MX back to a short call, with a report of RS-58; G3KPT says he only radiates about 1-watt of RF on 434.69 mc, and F8MX was a good RS-59 with him. At the time, there were only two other stations on—G2CIW locally and G3IRA in Swindon. During the 11/12th, G3KPT was /A from Birmingham Show and, putting out a CQ on two metres, worked four ON's in a row, followed by two G's in London who had never heard a Warwickshire station before! That's how it goes on VHF—when the bands open, all sorts of extraordinary things happen.

G3BDQ (St. Leonards, Sx.) reports some interesting QSO's during the September openings: The Contest w/e brought him 33 contacts, most of them over 100 miles, including GW3KMT/P for a new county; on Sept. 9 he worked F3YX/M on the Ballon d'Alsace, not far from the HB9 border; Sept. 12 saw contacts with a shower of ON/PA stations, DL1LB, and SM6ANR for a nice piece of 670-mile DX. G3BDQ now has a slot-fed 6/6 at 55 ft. and in the clear, while the ON4BZ-converter has been much improved by the addition of an RF pre-amp. consisting of a pair of 6AM4's in cascode with ¼-wave coax line o/p; the PA is a QQVO6-40A at 75w., which gives more RF into the aerial than the old p/p 3C24's did at 100w.

G3LTF is now at Darbury.

Essex, and shows a fine bag of EDX worked and heard, starting on Sept. 3 with ON's and PA's; then, over the Contest w/e he had 82 contacts, including four F's, eight ON's and 27 PA's, also LA8RB and LA9T, with LA3AA heard. The nearer EU's were still "loud and clear" on Sept. 7/8. G2XV (Cambridge) also got the two LA's, 8RB and 9T, on Sunday, 6th, and is now at 15C in the Countries table.

With EI2W in Dublin, conditions were extremely good for the Contest week-end, F3LP being a consistent S9 signal during the whole of the Sunday afternoon. The range coverage from EI2W was 350-400 miles, and in addition to distant G's like G2ADZ in N. Devon, G3FAN in the I.o.W. and G5DW in Somerset, Harry worked two GM's, making a total of 35 contacts for the session.

### Seventycem Activity

Or the lack of it! Through the

### TWO METRES

#### COUNTRIES WORKED

Starting Figure, 8

- |    |   |
|----|---|
| 18 | G5YV (DL, EI, F, G, GC, GD, GI, GM, GW, HB, LA, LX, OK, ON, OZ, PA, SM, SP)                                       |
| 17 | ON4BZ, (DL, EI, F, G, GC, GI, GM, GW, HB, LA, LX, ON, OZ, PA, SM, SP, 954)  |
| 17 | G6NB (DL, EI, F, G, GC, GD, GI, GM, GW, HB, LA, LX, ON, PA, SM, OZ, SP)   |
| 16 | G3CCH, G3GHO, G3HBB, G5MA   |
| 15 | G2XV, G3FZL, G4MW, G6XM   |
| 14 | G2FJR, G2HDZ, G3AYC, G3FAN, G3HAZ, G3IOO, G3JWQ, G3KEQ, G3WS, G5BD, G6LI, G8OU                                    |
| 13 | G3BLP, G3DMU, G3DVK, G3GPT, G5DS, G6XX, GM3EGW, PA0FB   |
| 12 | EI2W, F8MX, G2HIF, G3GFD, G3GHI, G3XW, G6RH, G8VZ   |
| 11 | G2AJ, G2CZS, G3ABA, G3JZN, G3KUH, G3LHA, G4RO, G4SA, G5ML, G5UD   |
| 10 | G2AHP, G2CIW, G2FQP, G2HOP, G3BDQ, G3BK, G3BNC, G3DLU, G3EHY, G3GSE, G3GSO, G3KQF, G3MED, G5MR, G8IC, GW5MQ       |
| 9  | G2DVD, G2FCL, G3DKF, G3FLJ, G3FUR, G3IUD, G3KPT, G8DR, G8GP, GC3EBK, GM3DIQ                                       |
| 8  | G2DDD, G2XC, G3AEP, G3AGS, G3BOC, G3EKK, G3GBO, G3HCU, G3HWJ, G3JAM, G3KHA, G3MPS, G3VM, G5BM, G5BY, G8SB, GC2FZC |

## TWO METRES

## ALL-TIME COUNTIES WORKED LIST

Starting Figure, 14

From Fixed QTH Only

Worked	Station
78	G5YV (787)
76	G3CCH
74	E12W
73	G6NB
70	G5MA, G6XM
68	G3BW, G3GHO
66	G3HBW, G3IUD(302), G3KEQ, G5BD
64	G3BLP
63	G2FJR (542)
62	G3FAN (760)
61	GM3EGW (232)
60	G2OI (402), G3DMU
59	G3EHY, G4SA
58	G3IOO, G8OU
57	G8SB, G3HAZ (535)
56	G3WW (770), G5DS (654)
55	G2HDZ (495), G2HIF, G5BM, GW5MQ
54	G8VZ
53	G2AJ (519), G3JWQ (461), G3LHA (387), G4CI
52	G2NH, G3FZL, G6RH, G6XX, GW2ADZ
51	G5ML
50	G3ABA, G3GSE (518)
48	G3FIH, G6TA (487)
47	G2CIW (282)*, G3DKF, G5WP
46	G4HT (476), G5BY, G6YU
45	G2AHP (647), G2DVD (362), G2XC, G3BJQ, G3GFD, G5JU
44	G3BK, G3DVK (282), G8DA
43	G2DDD, G2FCL (322), G3BA, G3COJ, G3DLU*, G3HWJ, G3KHA (262), G3KU/H, G3WS, G4RO, G5DF
42	G2HOP, G3BNC, G3IER, G6CI (220)
41	G2CZS (282), G2FQF, G3DO, G3KPT*
40	G2CIW (105)*, G3CGQ, G5MR (366), G8KL
39	G2IO, G3GBO (434), G3LTF, G3VM, G8IL (325)
38	G3APY, G3CKQ, G3HTY, G3KQF, G8VN (190)

pattern of the reports for this month runs, on the part of the Seventycem operators, a strong plea for more support for that band. Whenever quoted, we give

Worked	Station
37	G3FNW, G2FZU (180), G3DLU, G3MAX, GC3EBK (260)
36	G2DCI (155), G3CXD, G3DLU*, G3IT, G6CB (312), G8IP
35	G3FYY (235), G3GSO (266), G3HCU (224)
34	G3AEP, G3AYC, G8IC, GM3DIQ
33	G3FUR, G3HHY (125), G8DR (287)
32	G3HIL, G8QY, G8VR, GC2FZC
31	G3HXO, G3KPT (180), G5RP
30	G2AHY, G3FRY, G3GOP (208), G3GVF (129), G3IRA, G3KEF (110), G5NF, GW8UH
29	G3AGS, G3AKU, G3FIJ (194), G3IOE
28	G3ICQ, G3ITF, G8DL, GM3BDA, GW3ATM
27	G3CVO (231), G3DAH, G3ISA (160), G3LTF/A, G6GR, G3GQB, GW3GWA
26	G2BRR, G3CFR (125), G3MED, G3SM (211), G3YH, G4LX, G4MR (189)
25	G3JHM, G3JMA, G3JXN (220), G3MPS, G5SK, G6PJ
24	G3FD, G3FEX (226), G3FXG, G3FXR
23	G3CWW (260), G3HSD, G4JJ/A, G5PY, GW3MFY
22	G2DRA, G3AGR (135), G3ASG (150), G3BPM, G3HWR, G5AM, G8NM
21	G2AOL (110), G3DVQ, G3IWI, G6XY
20	G3EYV
19	G2HDR, G3GCX, G5LQ (176)
18	G3DBP, G3JGY, GC2CNC
17	G3EGG
16	G3FRE, G3MLS
15	G3IWA
14	G2DHV, G3CYY

Note: Figures in brackets after call are number of different stations worked on Two Metres. Starting figure for this classification, 100 stations worked. QSL cards are not required to verify for entry into this Table. On working 14C or more, a list showing stations and counties should be sent, and thereafter added to as more counties accrue.

\* New QTH

70 cm frequencies and, of course, the usual thing is for 430 mc to be attempted by arrangement on two metres when conditions seem favourable. But this is not really enough—what the 70-cm boys want is to be able to hear people calling CQ as they tune across the band! This means that everyone must call at every opportunity, not just sit listening and leaving it to the other chap to do the calling.

As we all know, things are quiet enough on two metres (let alone Seventycems) when conditions are flat and, while one possible solution would be the institution of regular 70-cm activity periods on the lines of those we initiated years ago for two metres—these will not necessarily be successful if conditions are poor. There is also the factor of sharp beam directivity on 430 mc to consider.

In the interests of all concerned, your A.J.D. will be only too happy to plug the theme of "more activity on 430 mc," but the real problem is how to organise it. We will be glad to publish here 70 cm frequency lists and to fix activity periods if people want them. We would even lay on a contest—but that would be an almost certain guarantee of poor conditions! So, has anyone any ideas or suggestions to put forward?

Further to that note last month about the doings of G3JHM (Worthing) on 3 centimetres, he reports that the range has since been increased to 16 miles, with signals S7, slightly QSB, held for a period of half-an-hour. A two-way test is the next move.

## Conclusion —

And so we come to the end of another offering of "VHF Bands," with the hope that all the happenings have been adequately covered. This is really only possible if we have a full flush of reports, so your A.J.D. hopes to hear from you again for next month, for which the closing date is **October 21 latest**, with everything VHF addressed to: A. J. Devon, "VHF Bands," *Short Wave Magazine*, 55 Victoria Street, London, S.W.1. Till November 6, then . . . and don't forget G3HBW's meteor shower test on October 9 (see p.264 last month for details). 73.

# H-BOMB EXPLOSION EFFECTS ON RADIO COMMUNICATION

OBSERVATIONS MADE IN  
CENTRAL PACIFIC AREA  
DURING AMERICAN  
NUCLEAR TESTS

S. G. Kingan (ZK1AA)

*(We acknowledge the February 1959 issue of the New Zealand "Break-In" as the source of this article)*

**J**UST after midnight on August 1, 1958, the Americans exploded "a nuclear weapon" carried by a rocket to a great altitude—possibly as high as 80 miles—above Johnston Island in the Central Pacific.

The effects were terrifying in their magnitude, so much so that even prominent scientists could not at first believe they were produced by a mere man-made explosion. However, even the first reports of the various phenomena following the explosion ruled out any known possible natural causes, and the coincidence with the announced bomb explosion time left little doubt but that it was the cause.

Most spectacular was the greatest tropical auroral display in the history of the world. From Fiji, Samoa, Rarotonga, Manihiki and Penrhyn came reports of a brilliantly-lit sky. From Hawaii came reports of the sighting of the explosion itself; Hawaii is 760 miles from Johnston Island, while the other islands mentioned are all between 2,000 and 3,000 miles from Johnston. It appears from these reports that the entire sky for a 3,000-mile radius from the explosion glowed. And this glowing persisted for half an hour.

## Radio Effects

Spectacular as this great auroral display was, it was still very much exceeded by the effect on Pacific radio communications.

At the time of the explosion there were two effects. First, a complete fade-out of all normal communication frequencies, disrupting many commercial, aircraft and broadcasting services. This blackout was as complete as any ever produced by sunspot explosions—the only other cause of such fade-outs (and never possible during the hours of darkness).

Secondly, the Ionosphere Observatory at Rarotonga recorded a very high ionisation density in the F2-layer of the ionosphere. The actual value was beyond the range of the equipment and was probably the highest ionisation density ever recorded.

Following the explosion, three other phenomena occurred:

First, there was excessive absorption of medium

frequency signals throughout the Pacific for a week following the explosion. (To the ordinary listener this meant a complete cessation of night-time MF broadcast band reception for an entire week.)

After five nights, Hawaiian, New Zealand and Fiji stations were coming in and a few weak South Americans. But the powerful North American stations, such as KNX on 1070 kc, which are most listened to in the central Pacific, were quite undetectable even on the best of communications receivers with beat oscillators switched on.

Secondly, phenomenal HF communication became possible. Signals on 30 mc and higher were heard over considerable distances, even at night time. Thirdly, low-frequency signals were heard at long distances during the hours of daylight.

## A Second Explosion

The effects of the second high-altitude explosion, which took place in the same area 10 days later, were also observed by the writer.

On this occasion, following complaints from the Hawaiian public and from airline companies, the Americans gave prior warning of the time of the scheduled explosion. Hawaiian broadcasting stations were standing-by ready to give an eye-witness description of what might be seen.

The writer listened to one Hawaiian station on the night concerned. For two hours it and an American station on the same medium-wave frequency that was interfering with it came in well. The Hawaiian then announced the scheduled time of the explosion as midnight, Cook Island time.

At about one minute to twelve the writer went outside to see if anything would be visible, but saw nothing. Returning quickly at 0003, four minutes later, he found that the broadcast band was almost dead. No sign of Hawaiian and American stations, although by 0015, twelve minutes later, North American stations were reappearing. The Hawaiian area reported a half-hour radio fade-out only.

In Hawaii, eye-witnesses did not see the explosion, only a reflected flash from the sky and later a grey cloud mushrooming up above the horizon.

It therefore appears that the second explosion was at a much lower altitude. (An American prediction beforehand said it would only be visible within a 450-mile radius.) This would correspond to an altitude of about 25 miles to the top of the visible section of the blast. On the other hand, for the cloud to be seen at all above the Hawaiian horizon it would have to be over 70 miles high. It was apparently higher than this, and therefore must have extended into the E-layer of the ionosphere.

Although there was little effect from this lower explosion on the F2-layer of the ionosphere, and only a short-lived fade-out at the time, the long-term effects on radio reception in the Pacific were actually greater than those that followed the earlier blast.

At five days after the blast the MW broadcast band was still a complete blackout.

The minimum frequency of recorded vertical reflections rose to about 8 mc at the sun's zenith, and this resulted in disruption of normal daytime

HF circuits in the central Pacific.

Phenomenal daytime reception occurred in Rarotonga, signals from New Zealand on the 500 kc shipping frequency and at the other end of the spectrum, the 62 mc television signals from Hawaii, having been received. ZK1BS had two satisfactory two-way contacts with Hawaii on the six-metre, 50 mc, amateur band—the first such contacts ever made between Rarotonga and Hawaii; these were at about 10.30 p.m. Rarotonga time, or 11 p.m. Hawaiian time, over a *path of complete darkness*. The same amateur had received signals on 50 mc from Japan in the evening after the first explosion.

Previous H-bomb blasts have been enormous affairs, but have all taken place at relatively low altitudes. The big British test near Malden Island in July of 1957 was reported to have been at a height of six miles, but, although high, this is still well within the troposphere. Nevertheless, the cloud produced by the explosion must, from reported eye-witness accounts, have reached heights in excess of 50 miles. This cloud dispersed slowly while drifting eastwards across the Pacific and was tracked at least as far as South America, where it was located about a week later.

Any effects on radio communication at this time were not severe enough to attract attention.

In the case of an explosion taking place near the earth's surface, most ionising radiations originating from it will never reach the ionosphere. The lower levels of the atmosphere will completely absorb all this radiation. Certainly, a high degree of ionisation will occur in a limited region of dense atmosphere which is not normally ionised to any extent, but here recombination of ions will be almost instantaneous when the ionising rays cease. A negligible amount of radiation will penetrate to the ionosphere, just as only very little ultra-violet radiation from the sun reaches the earth's surface.

But when an explosion takes place within the lower regions of the *ionosphere itself*, as apparently did the August, 1958, explosion, there is nothing to prevent the nuclear radiation from having a maximum effect on the ionosphere.

The more penetrating rays will concentrate their effects on the F2-layer, and as this is the least dense part of the ionosphere, recombination of the ions will not take place suddenly when radiation stops, but will be a delayed process.

The region immediately below the E-layer, or the D-layer of the ionosphere, absorbs other radiation from the explosion and becomes highly ionised, just as it normally does in the daytime, due to the sun's radiation. Only, in this case, the ionisation is much more intense, just as occurs during daylight when a sunspot erupts and causes a radio fade-out. *The fade-out caused by excessive D-layer ionisation has the same characteristics, whether caused by an eruption of a sunspot or nuclear radiation from a high-level bomb blast.* In either case, there is a complete HF radio blackout, but recombination and recovery of signals follows quickly when the responsible radiation ceases.

In between the D- and F-layers is the E-layer, and it was probably within this that the radiation from the first high-altitude explosion was most intense. The second bomb, exploding below rather than above the D-layer, did not cause the same glow nor the effect on the F-layer of great ionisation density, because its radiation was all absorbed in the D-layer and below, causing at the time merely a short-lived fade-out.

The immediate effects of the bomb blast can be summarised as having produced high F2 ionisation density, a night-time glow in the E-layer and a radio fade-out caused by an unusually high D-layer ionisation. All these effects ceased after the radiation stopped, only the recombination of the F2-layer being delayed.

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#### CORRECTION — CITY AND GUILDS QTH

On p.267 of our September issue, under the item "Courses for the R.A.E.," the address of the City and Guilds of London Institute was given incorrectly—it should have been 76 Portland Place, London, W.1. We are assured, however, that all mail is in fact being forwarded from the old address we gave.

#### DATA ON SURPLUS ITEMS

We are informed that in the case of certain ex-R.A.F. equipment, it may be possible to purchase the appropriate manual by quoting the official A.M. reference number and markings, and writing to: The Air Ministry, Room O.S. 2(d), Whitehall Gardens, London, S.W.1, asking whether the publication is available, and its price. To save time and correspondence, give the correct details—it is no use whatever trying to describe what is in the box, or what it looks like. What is wanted are the references on the A.M. name-plate which will usually be found on the front panel. And until the Air Ministry get your money, you won't get the book!

#### MASER FREQUENCY STANDARD FOR AUSTRALIA

A clock which will not gain or lose more than one second in 25 years is to be installed in the Australian Post Office Research Laboratories at Melbourne. The clock, known as an ammonia maser, has been constructed at the Ministry of Supply Signals Research and Development Establishment, Christchurch, Hants. It is accurate to within one ten thousandth of a second per day and will be the first of its kind in the Southern Hemisphere. One job for which the maser will be used is the measurement of the rate at which pulses sent out by a radio transmitter near Rugby are received in Melbourne, some 15,000 miles away. Although the transmitting rate is constant the pulses are not received at a constant rate, due to variations in the ionosphere. The maser will be used to measure these variations, providing more information about the ionosphere.

An ammonia maser relies on the natural vibration of ammonia gas molecules, which produce electric pulses at the rate of 24 thousand million a second—or 24,000 mc.

## Notes on **SELECTED BOOKS**

### For the Radio Amateur and The SWL

As we are constantly being asked for a summary of the contents of our more fast-selling books, the notes following are intended to help those who may be wanting manuals on particular aspects of Amateur Radio design, practice or construction—and it says much for the rapid development of the art and the wide field now covered by the amateur interest that there is scope for so many handbooks on specialised branches of the subject.

All the books mentioned here are well established, technically sound, essentially practical and, in most cases, are by authors who are themselves active radio amateurs with a professional knowledge of their subjects. And if this looks like a contradiction in terms, the meaning is that nowadays many qualified radio and electronic engineers hold amateur transmitting licences as well.

The prices given are post free, home or overseas surface mail, direct from us, and normally from stock. Orders, with remittance, to: Publications Department, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1, England. Overseas *airmail* postage rates can be quoted on application.

**Mobile Handbook:** One of the two standard treatments, the eight chapter headings are Ignition Systems, Mobile Power Supplies, Mobile Receivers (including several conversions of well-known surplus items), Noise Suppression, Mobile Transmitters (with some all-band designs), Mobile SSB, Mobile Antennæ, and Mobile Test Equipment. All in 240 pages, price 24s.

**VHF Handbook:** This is a particularly informative treatment of what to many people is one of the specialised fields of amateur activity. Useful introductory chapters on VHF propagation modes lead to a general discussion on VHF circuitry and choice of components, followed by one chapter on aerial design and a separate one on VHF antenna construction, in which numerous types are discussed in detail. The Receiver and Transmitter sections deal with both simple and advanced converter designs, and cover all standard arrangements. Chapter XII is devoted to VHF test gear. This book is very well illustrated with charts, tables, diagrams and photographs and has an adequate index. 210 pages, price 24s.

**Better Short Wave Reception:** Though intended primarily for the SWL who wants to make the most of his receiving equipment, it is of equal interest to the transmitting amateur who possesses a good communications receiver, as one large chapter is devoted to the important subject of Receiver Alignment. The constructional items include a crystal calibrator, an HF pre-selector for more front-end gain, and a Q-Multiplier for better selectivity. The chapter on Aerials discusses, in addition to long-wire and

vertical installations, types such as the ground-plane and the folded dipole. The last chapter is devoted to Reception Techniques, and includes useful advice on tuning for DX, reporting amateur stations, QSL'ing and similar problems of interest to the SWL. Eight chapters, 140 pages, indexed, price 24s.

**World Radio Handbook:** For many years now this has been a steady seller, because it is the only publication of its kind that covers, in the fullest possible detail, the short and medium-wave broadcast stations of the world, with their frequencies, transmitting schedules, identification signals and QSL addresses. This information is contained under country headings, with additional tables giving world time for all countries, allocation of call signs (much used by short-wave broadcasting stations) band allocations, standard frequency transmissions, TV stations and frequencies, and a full listing of all broadcasters by frequency, wavelength, call sign and location.

*World Radio Handbook* is to the BC station listener what the *Call Book* is to the transmitting amateur. Its companion publication is *How to Listen to the World* which, as the title suggests, is a guide for the SWL who wants to make full use of his receiver on the broadcasting wavebands. Neither publication deals in any way with Amateur Radio transmission or reception.

*World Radio Handbook*, guide to the world's broadcasters, 1959 Edn., 186 pages, price 15s. 3d. *How to Listen to the World*, manual for beginners and SWL's interested in broadcast reception, 70 pages, price 7s.

**Radio Handbook:** Many years ago, before the war, a well-known manual for advanced amateurs and radio engineers was the "Jones Radio Handbook"—this dealt with the technicalities in a much more practical manner than the standard text books, and covered the amateur side in considerable detail. The present *Radio Handbook*, now in its 15th edition, is a direct descendant of the original "Jones," but is far larger and wider in scope and, of course, right up-to-date in its treatment. As a standard text book written in easy language, it leads from the fundamentals (including transistors) to the design and construction of a great range of apparatus of every description—including receivers, transmitters, speech gear and modulators, rotary beams, test gear, power supplies, and high and low power amateur band equipment for all applications. It has diagrams or photographic illustrations on nearly every page. In addition, there are chapters on the Oscilloscope, Electronic Computers (digital, binary and analog types), Hi-Fi, Sideband design and technique, TVI/BCI control and suppression, mobile equipment construction and installation—and a very complete treatment of the

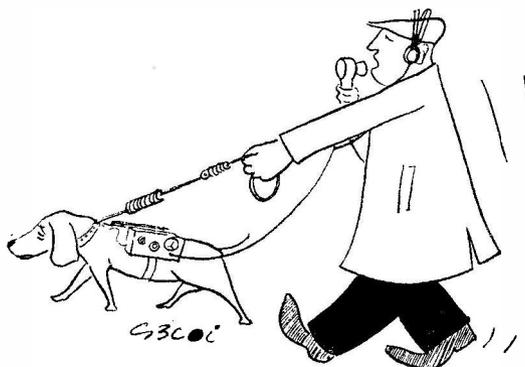
problem of radiating the signal once the RF has been generated. The book can be regarded as a reliable and comprehensive guide to the whole subject of Amateur Radio and is of particular value to the advanced amateur, who already has a station on the air and wishes to be *au fait* with modern ideas and techniques. *Radio Handbook*, latest (15th) Edn., 800 pages, profusely illustrated, fully indexed, in durable binding, price 60s.

**Ham's Interpreter:** The ingenuity of OH2SQ has resulted in a booklet which, in seven languages, deals with the straightforward problem of conducting a QSO with an amateur of another nationality, who has only a rudimentary knowledge of your language—while you may have even less of his. By having standard radio jargon and normal QSO procedure translated into all of these seven languages—English, French, Spanish, Italian, German, Swedish and Finnish—the average operator should be able to conduct a QSO with confidence and reasonable intelligibility. Obviously, to acquire good pronunciation requires practice and not being “afraid to make a fool of oneself.” The point is that *Ham's Interpreter* shows how this can be attained, to make even rubber-stamp contacts more interesting and enjoyable, apart from the fact that it is a courtesy to the other man at least to attempt to use his language. *Ham's Interpreter*, in seven languages, 38 pages, 7s.

**Novice & Technician Handbook:** This book is intended primarily for the (American) beginner starting on the air as a licensed amateur. Therefore, the first chapter is on the general theme of obtaining a licence in the U.S. However, all the rest of the book is equally applicable to the beginner in the U.K. (or, indeed, anywhere else in the world) as it covers the simpler receiver and transmitter designs in detail. The RX section includes a pre-selector, four-band converter unit, some conversions for the familiar “Command Receiver” series, a VHF receiver and—one of the most useful items—an aerial coupling unit suitable for any receiver tuning the amateur bands. The transmitter sections are equally “straight,” dealing with the construction of rigs of from 15 to 60 watts rating for various bands, as well as a neat two-metre job using a 5763 in the PA. While the parts lists (very detailed) are American, in fact there is nothing of significance that cannot be obtained on the British market. Power supply units and aerial systems are, of course, also covered. This book will give any beginner plenty of practical ideas for his own station. *Novice and Technician Handbook*, 150 pages, well illustrated, indexed, price 23s. 6d.

**DX Zone Map:** This, of course, is not a book, but it is an indispensable adjunct to anyone, transmitter or SWL, with any interest at all in DX. The present issue is an up-to-date revise of our first very successful Zone Map, which went into four separate printings, thousands being sold. The new edition has

likewise been selling steadily since its appearance at the last Amateur Radio Exhibition. It is 25½ inches deep by 34½ inches wide overall, on heavy cartridge paper, suitable for framing or wall mounting. Specially drawn for us and printed in five colours, it is to a great-circle projection centred on London—the world is, in effect, “opened out flat” with respect to the U.K. Distances, in miles or kilometres, and magnetic bearings, for beam alignment, accurate within the scale of the Map, can be laid off from the U.K. for any part of the world. The 40 areas of the Zone system are clearly shown, with the principal prefixes in each zone under marginal headings in large type. An hourly time-scale based on GMT enables local time to be worked out for any part of the world. The latitude/longitude divisions are such that any point can be plotted with sufficient accuracy for practical purposes. The Map gives an enormous number of unusual place names, as well as the “exotic islands” and such-like places of particular interest in the amateur DX world. The *DX Zone Map*, which is a very fine piece of printing and already an ornament in a large number of DX shacks, only costs 9s. 3d., and goes out in a special cardboard postal tube to prevent damage in transit.



“ . . . Yes, OM, I did say I was portable/mobile . . . ”

#### ADVANCED STUDY COURSES

The Department of Electrical Engineering and Applied Physics of the South-East London Technical College offers a number of evening study or lecture sessions, as well as full-time courses, on various telecommunications subjects. These include “An Introduction to Nuclear Physics,” “Economics for Communication Engineers,” and a six-month full-time course “Industrial Electronics.” Application for details of these and other courses should be made immediately to: Head of the Dept. of Electrical Engineering, South-East London Technical College, Lewisham Way, London, S.E.4.

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# NEW QTH's

This space is available for the publication of the addresses of all holders of new U.K. call signs, as issued, or changes of address of transmitters already licensed. All addresses published here are reprinted in the quarterly issue 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.

**E12AG**, J. R. Murphy, 235 Marian Park, Drogheda, Co. Louth.

**G3LTN/A**, R. Marriott, A.M. W/T Station, R.A.F. Weyhill, nr. Andover, Hants.

**G3NET**, L. Morley-Taylor, 91 Lower Bristol Road, Weston-super-Mare, Somerset.

**G3NKL**, R. M. Jones, 64 Lexton Drive, Churchtown, Southport, Lancs.

**G3NLS**, H. W. Craine, 19 Moss Side, Knotty Ash, Liverpool, 14. (Tel.: Huyton 3275.)

**GM3NMA**, W. T. Mains, 35 Craigend Drive West, Milngavie, nr. Glasgow.

**G3NMG**, E. E. Kench, 1 Templar Drive, Kingsthorpe, Northampton.

**G3NMJ**, G. C. C. Knapp, 5 Almonry Fields, Battle, Sussex.

**G3NMR**, M. Margolis, 95 Collinwood Gardens, Ilford, Essex.

**G3NMV**, W. Gough, 20 The Grove, Palmers Green, London, N.13.

**G3NMX**, D. Wills, 35 Kingsfield Avenue, North Harrow, Middlesex. (Tel.: HAR 1565.)

**GW3NNB**, R. J. Evans, Rhianfa, Nevin, Pwllheli, Caerns.

**G3NNF**, A. M. Mills, Kelsey. The White Road, East Hendred, nr. Wantage, Berks. (Tel.: East Hendred 346.)

**G3NNV**, P. A. Swanson. 19 Dovecot Place, Liverpool, 14, Lancs.

**G3NNX**, H. Chappell, 67 Thornhill Gardens, West Hartlepool, Co. Durham.

**G3NOQ**, A. G. P. Boswell, 23 Percy Gardens, Tynemouth, Northumberland.

**G3NPA**, G. W. Anderson. 96 Nork Way, Banstead, Surrey.

**G3NPB**, D. W. Blackford, Kinfair, Broughton, Malton, Yorkshire.

**G3NPF**, A. C. Wadsworth, 2 Edith Road, Prittlewell, Southend-on-Sea, Essex. (Tel.: Southend-on-Sea 64241.)

**G3NPG**, E. Godwin, 147 Houghton Road, Woodchurch, Birkenhead, Cheshire.

**G3NPS**, A. Bovington, 27 Kent Road, Gravesend, Kent.

## CHANGE OF ADDRESS

**G2BOZ**, J. E. Bazley, Three Willows, Beech Elm, Rushock, Droitwich, Worcs. (Tel.: Cutnall Green 297.)

**G2CDB**, R. A. Pittock, Calder Cottage, Littleborough, Lancs. (Tel.: Littleborough 88043.)

**G2DJA**, J. H. Palmer, 237 Sedlescombe Road North, St. Leonards-on-Sea, Sussex.

**G3ATH**, H. Pain, c/o Officers' Mess, R.A.F. Station, Bishops Court, Downpatrick, Co. Down.

**G3AUU**, A. J. Hill, Trull Green, Trull, Taunton, Somerset.

**G3BJN**, T. L. Johnson. 101 Beech Road, Harrogate, Yorkshire. (Tel.: Harrogate 82231.)

**G3DCF**, G. Cox, 44 Bowerdean Street, London, S.W.6.

**G3DKS**, C. K. Street, 6 Greenbrook Avenue, Hadley Wood, Middlesex. (Tel.: Barnet 4934.)

**G3HHZ**, W. S. Smith, 1 Windmill Road, Kemble, Cirencester, Glos. (Tel.: Kemble 269.)

**G3HRC**, R. C. B. Cutts, Aquilla Amateur Radio Club, L.25 Section E.I.D., Aquilla, Golf Road, Bromley, Kent.

**G3HVP**, F. E. Goddard, 19 Parsonage Road, Chalfont St. Giles, Bucks.

**G3JKE**, K. V. Franklin, 75 Highams Hill, Gossops Green, Crawley, Sussex.

**G3JOL**, V. W. Cole, Silver Plough, Pitton, nr. Salisbury, Wilts.

**G3JTF**, F. W. Blake, 207 Hydeau Way, Stevenage, Herts.

**G3JU**, S. G. Abbott, c/o 3 Dundonald Road, Ramsgate, Kent.

**G3JYF**, B. Bellringer, 27 Trefusis Road, Redruth, Cornwall.

**G3JYG**, J. Kirby, 26 Broom Close, Hatfield, Herts.

**G3KLV**, G. Vine, 82 Northampton Road, Brixworth, Northants.

**G3KMS**, D. H. Swain, 16 Orme Crescent, Tytherington, Macclesfield, Cheshire.

**G3KNU**, P. Jackson, 7 Ferriby Road, Riddings Estate, Ashby, Scunthorpe, Lincs.

**G3KQK**, T. A. Dugdale, Amptill Park House, Amptill, Beds.

**G3KRY**, G. R. Byles, The Pottery, Mafeking, High Street, Lyminge, Kent.

**G3KXA**, R. A. Swain, 145 Mill Lane, Bentley-Heath, Solihull, Warks.

**G3LBX**, Rev. J. L. R. Crawley, Long Houghton Vicarage, Alnwick, Northumberland. (Tel.: Long Houghton 264.)

**G3LEI**, D. E. Mills, 16 Whitehill Lane, Gravesend, Kent.

**G3LQJ**, R. V. Cox, Wayside, Kelling Road, Holt, Norfolk. (Tel.: Holt 3234.)

**G3LWS**, E. H. Ross, War Office W/T Station, Moulton, Richmond, Yorkshire. (Correspondence only.)

**G3MHD**, A. E. Williams, Holly Gables, North Road, South Park, Reigate, Surrey.

**G3MUF**, J. Owens, 62 Hillside Crescent, Cheshunt, Herts.

**G3NBO**, P. G. Watson, 81 Bramble Road, Hatfield, Herts.

## CORRECTION

**G3FWZ**, D. Vaughan, Wildwood, Chobham Road, Camberley, Surrey.

**G3NNO**, M. T. George-Powell, 28 Gledhow Avenue, Roundhay, Leeds, 8, Yorkshire.

*Short Wave Magazine has a world-wide circulation*

# THE MONTH WITH THE CLUBS

By "Club Secretary"

(Deadline for November Issue : October 16)

IN a nearby column you will find the rules for this year's "MCC"—the fourteenth of the series of Top Band Club Transmitting Contests, a series inaugurated in 1946.

The rules are little changed from last year, but two important alterations *have* been made. First, at the request of Clubs in the northern parts of England, the hours have been made later, and the duration is now 1700-2000 GMT on each of the four days. This change, by cutting out an hour of near-daylight and adding one of darkness, should make GDY contacts easier, particularly for the more northerly stations.

Secondly, instead of exchanging the formula "QRA . . . Club," the normal contest procedure of exchanging six-figure groups now applies. Each Club has been allotted its own identification number, which, prefixed by "C" (for Club) makes, with the RST report, the familiar six-character group.

Clubs whose names do not appear in the list of numbers (compiled from all Clubs taking part in MCC for the past three years) are asked to write in at once for a number to be allocated to them, if they wish to enter. We shall not be able to print all the extra numbers in the November issue, but as many as possible will be included. (In practice it is thought that not many Clubs outside the list are likely to apply for them—but if you are one of those who have never entered MCC, and would like to do so, just write and collect your number—see foot of col. on p.329.)

**Chester** met on September 15 to hear GW3HEU's impressions of the Radio Exhibition. On the 22nd there was a talk on Soldering Methods. October 6 is the Club Net Night.

**Clifton** are holding their Club Social on October 16. Recent events of interest have been a Grand Junk Sale on August 28, the AGM on September 11, and the Low Power Field Day on September 20. The clubroom is now being re-decorated by the members, and is open most Sunday mornings and Wednesday evenings, in addition to the normal meetings on Fridays at 7.45 p.m.

**Halifax** held their AGM and elected G3NBI chairman, and G3MDW secretary/treasurer. They have decided to hold their AGM in May for future years. **Leeds** will now be meeting every Wednesday (7.45 p.m.) at the Swarthmore Educational Centre, 4 Woodhouse Square, Leeds 3. Their season's programme includes lectures, demonstrations, film shows, junk sales and visits to places of interest. New members, who will be welcome, are asked to contact the hon. sec.—see panel for new QTH.

**Liverpool** forward their *News Sheet*, from which we gather that activity is a little low until their winter programme starts in October with a new committee. Apparently they have a large contingent of SWL's who passed their R.A.E. this year, so activity on the air will also increase.

**Mitcham** met for a Mullard Film Lecture on September 25; October 9 is scheduled for a talk on Aerials by G4LS, and November 6 for a photographic lecture by Mr. K. Frankcom. A new club transmitter is now being planned.

**Newbury** meet on October 30 for a lecture by Racial Engineering, Ltd., and on November 27 for a Film Show. **Purley** have a junk sale scheduled for October 16; they hope to have a club Tx before the end of the year, and are even thinking along the lines of amateur TV.

**R.A.I.B.C.** forward their news letter, *Radial*, which does an excellent job in the way of keeping members in touch with one another. Many amateurs who enjoy full health are giving worth-while support to this Club, but there are many more opportunities for a helping hand. Details from the secretary.

**Surrey** (Croydon) held a junk sale on September 8, but we have no news of future meetings. Their Christmas Party will be held on either December 11 or 18—details later. **Aberdeen** meet on October 2 for a talk on the Club Transmitter by GM3FKS; on the 9th for a junk sale, GM3ALZ conducting; on the 16th for an RAEN discussion; and on the 23rd for a discussion and demonstration of Talking Books for the Blind. October 30 is the date of the Club's AGM. GM3BSQ, the club Tx, is on the air, all bands, and contacts will be welcomed.

**Crystal Palace**, at their September meeting, heard a talk by G3IIR and G3BCM on TVI and BCI. On October 10 G2FKZ will be talking on Hints and Tips for the Beginner. A visit was paid to the BBC station at Tatsfield during September. The October programme for **Derby** is as follows: 7th, junk sale; 14th and 28th, Open Evenings (in the sub-basement rooms); 21st, Demonstration of Stereophonic Equipments. Meetings are at Room No. 4, 119 Green Lane, Derby, and begin at 7.30 p.m.

## THE FOURTEENTH MCC

Clubs who wish to enter, and have not had a number allotted them in the list on p.329, should apply immediately so that the number can be notified in the November issue.

**Dorking** will be meeting regularly during the winter, on the second and fourth Tuesdays at the Star and Garter Hotel. On October 27 there will be a talk by G5BT on Amateur Radio in America—8 p.m. October 13 is an informal evening—same time and place.

**North Kent** forward their *Newsletter* No. 26, an interesting feature of which is news from "Absent Friends"—members who have left the Club and the district. Four members passed the R.A.E. and are awaiting their new calls. Forthcoming meetings: October 8, Operating Practice; 22nd, the IGY and the Radio Amateur (G3FZL). Both at the Congregational Hall, Chapel Road, Bexleyheath, at 8 p.m.

**Preston** have succeeded in arranging a course of instruction for the R.A.E. at the Harris Institute, Technical College, Corporation Street. The course will cover theory only, and classes will be from 7.15 to 9.15 p.m. on Thursdays. Enquiries and enrolment should be made at the College.

**2204 Club** (Chesham), now finding its feet after 18 months of hard work and study, recently celebrated the arrival of one full licence (G3LNX) and one GPO Morse certificate. Members are now in the middle of an intensive R.A.E. course. The Club call is G3MDG, active on most bands at week-ends.

**Gravesend** recently operated G3GRS/A from Scout Headquarters at Hopehill, Meopham, when a day out was organised for a group of children from Tunbridge Wells. Three members were successful in the recent R.A.E., two of them being the son and daughter of G3FST, who did the coaching! Meetings are on Thursdays, 8 p.m., at The Old Sun, Crete Hall Road, Northfleet.

**Reading** is still attracting new members and good attendances. At a recent meeting G3DXJ gave a talk and demonstration on SSB; at the September meeting G5TP was due to discuss and demonstrate the mobile equipment he has been building. On October 31 G3DXJ will be back again with SSB from the transmitting angle.

**Southend** return to these columns after a long absence. They have been having lectures by well-known firms, and several visits, both social and technical. Morse and theory classes have accounted for several new calls in the district. The new season opens on October 2 with a talk and demonstration on Stereo; work will also begin on the club Tx—an all-band Table-Top rig. Meetings are on alternate Fridays, 8 p.m., starting on October 2.

**Southgate, Finchley & District** will meet at Arnos School, Wilmer Way, N.14, on October 15 at 7.30 p.m. GB3SRA was operating recently at the Friern Barnet and Wood Green summer shows, and despite poor conditions some good DX was worked.



When the Conway Valley Amateur Radio Society supported the Llandudno Model Engineering Exhibition at the end of August, they had GB3GW on the air. The stations worked totalled 67 for the period of the show.

**Cornish** held a field day at Redruth on September 6, attended by members from all over the county. Both mobile and portable operation were organised, and the social side was also a great success. Even a "rescue" of a member's car which had broken down was duly conducted with radio contact between the breakdown gang and the headquarters!

**Exeter** meet on the second Thursday of the month, and recently held their AGM. Next meeting is on October 8, when there will be a Quiz evening. During the winter it is hoped to run an R.A.E. course, and a club call-sign is also projected. **Hull** meet on October 13 to hear about Improving Communications Receivers; on the 27th the subject will be ZC1 and 19 Sets, and on November 10, TVI Problems.

**Spenn Valley** have an Open Meeting on October 14. On the 18th they are visiting O. B. Listers—a spinning mill in which many electronic devices are used. On November 11 a BBC engineer from Holme Moss will be talking about the Z-match and the coupling of transmitters to aerials.

**Stockport** are in full swing, and recent lectures have covered Mobile Equipment, Transistor Circuitry, and Gadgets in general. R.A.E. classes will be run during the winter. October 7 is booked for a hot pot supper and social evening. This, and the following meeting on the 21st, will be at The Blossoms Hotel, Buxton Road, at 8 p.m.

**Wanstead & Woodford** meet on Wednesdays, 8 p.m., at Wanstead House. The AGM will be held on October 7; all members are requested to attend, and all visitors will be welcome. The club's Top Band Tx is on the air, signing G3BRX, and a 50-watt all-band rig is also on the way.

New to these pages, and welcome, is the **Conway Valley Amateur Radio Club**, which meets monthly at

the Y.M.C.A., Llandudo Junction—more membership is wanted, transmitter or SWL. from around the Colwyn Bay and Llandudno areas (see panel for QTH).

The **Enfield** group continue to produce their interesting *Lea Valley Reflector*, from which we find that their next meeting after publication will be on October 22, at the George Spicer School, Southbury Road, where they are holding an exhibition.

### MCC—FOURTEENTH ANNUAL TOP BAND CLUB TRANSMITTING CONTEST RULES

- Duration:** Saturday, November 14; Sunday, November 15; Saturday, November 21; Sunday, November 22. On each of these days between the hours of 1700 and 2000 GMT (twelve operating hours in all).
- Frequency and Power:** All contacts will be made in the 1800-2000 kc band only, using CW, with a power not exceeding 10 watts to the final stage. All reasonable precautions will be taken to avoid interference with other services using the band.
- Call Signs:** Where a Club has its own transmitting licence and call-sign, that call-sign is to be used. Clubs without their own call may use a member's station, provided that this is nominated as their official entry by the Club Committee.
- Calling:** Clubs will call "CQ MCC" and will sign off at the end of each contact with "AR MCC VA."
- Scoring:** Other Club stations may be worked once on each day of the Contest and will count for *three points each time*. Non-Club stations may be worked once only, during the whole period of the Contest, and will count for *one point* only. Inter-Club contacts will be considered complete after an exchange of six-character groups comprising the RST, the letter "C" (for Club) and the Club's own identification number, as shown in the list opposite. (Thus Bury, receiving Rugby at 579, would send 579 C06; Rugby, receiving Bury at the same strength, would reply with 579 C40.) The use of the word "Club" and the exchange of QRA, as in former years, is no longer required.
- Non-Club Contacts:** Contacts with non-Club stations, counting for one point, will be considered complete with the logging of RST and the other station's QTH. The QTH of the Club (not the identification number) should be sent in these cases.
- Logs:** Contest logs are to be set out as follows: Quarto or foolscap sheets should be ruled into seven columns, headed as follows—Col. 1, *Date and Time*. Col. 2, *Call-sign of station worked*. Col. 3, *Out-going six-figure group*. Col. 4, *Incoming six-figure group*. Col. 5, *RST out-going, to non-Club station*.

#### NAMES AND ADDRESSES OF CLUB SECRETARIES REPORTING IN THIS ISSUE

ABERDEEN: W. K. Heggie, GM3NHW, 90 Leslie Terrace, Aberdeen.  
 CHESTER: H. Morris, G3ATZ, 24 Kingsley Road, Boughton Heath, Chester.  
 CLIFTON: C. H. Bullivant, G3DIC, 25 St. Fillans Road, London, S.E.6.  
 CONWAY: J. Howard, 40 Rhuddlan Avenue, Llandudno, North Wales.  
 CORNISH: G. Hubber, 9 Cardew Terrace, Redruth.  
 CRYSTAL PALACE: G. M. C. Stone, G3FZL, 10 Liphook Crescent, London, S.E.23.  
 DERBY: F. C. Ward, G2CVV, 5 Uplands Avenue, Littleover, Derby.  
 DORKING: J. Greenwell, G3AEZ, Wigmore Lodge, Beare Green, Dorking.  
 ENFIELD: V. Croucher, G3AFY, 15 Nelson Road, Tottenham, London, N.15.  
 EXETER: F. A. Vogel, G3LTH, 11 Longfield, Starcross, near Exeter.  
 GRAVESEND: D. Andrews, G3MXJ, 42 The Fairway, Gravesend.  
 HALIFAX: A. Robinson, G3MDW, 7 Upper Brockholes, Ogden, Halifax.  
 HULL: G. G. Wray, G3MVO, 93 Wolfreton Lane, Willerby, Hull.  
 LEEDS: D. Dinsdale, 8 Quarry Mount Street, Leeds 6.  
 LIVERPOOL: H. James, G3MCN, 448 East Prescott Road, Liverpool 14.  
 MITCHAM: D. Johnston, G3NFA, 23 Woodland Way, Mitcham.  
 NEWBURY: J. A. Gale, G3LLK, Wild Hedges, Crookham Common, near Newbury.  
 NORTH KENT: D. W. Wooderson, G3HKX, 39 Woolwich Road, Bexleyheath.  
 PRESTON: G. Lancefield, G3DWQ, 35 Brixton Road, Frenchwood, Preston.  
 PURLEY: E. R. Honeywood, G3GKF, 105 Whytecliffe Road, Purley.  
 R.A.I.B.C.: W. Harris, 25 Playford Lane, Rushmere, Ipswich.  
 READING: R. G. Nash, G3EJA, 9 Holybrook Road, Reading.  
 SOUTHEND: Mrs. P. M. C. Collop, 53 Beedell Avenue, Westcliff-on-Sea.  
 SPEN VALLEY: N. Pride, 100 Raikes Lane, Birstall, near Leeds.  
 SOUTHGATE: A. G. Edwards, G3MBL, 244 Ballards Lane, North Finchley, London, N.12.  
 STOCKPORT: G. R. Phillips, G3FYE, 7 Germans Buildings, Buxton Road, Stockport.  
 SURREY (CROYDON): S. A. Morley, G3FWR, 22 Old Farleigh Road, Selsdon, South Croydon.  
 WANSTEAD AND WOODFORD: N. B. Hough, 24 Raymond Avenue, South Woodford, London, E.18.  
 2204 CLUB: 2204 Experimental Radio Club, Chesham, c/o Capt. C. G. Stephenson, 21 Lynton Road, Vale Rise, Chesham, Bucks.

Col. 6, *RST incoming, from non-Club station*. Col. 7, *Points claimed for contact*, (3 or 1). Col. 7 must be totalled at the bottom of each page and the running totals brought forward.

The last page of the log should contain the following summary: Club contacts (number) at 3 points each:—*total figure*. Non-Club contacts (number) at 1 point each:—*total figure*. *Grand Total*.

Comments on experiences during the Contest, equipment used, number of operators employed, and general impressions are invited, and should be added at the end of the log.

- Any Club station receiving reports consistently worse than T9 will be liable to disqualification.
- Logs, addressed to "Club Secretary," *Short Wave Magazine*, 55 Victoria Street, London, S.W.1. must be posted to reach us by **Wednesday, December 2, 1959**. The Editor's decision on the results will be final, and will be published in the January, 1960 issue of *Short Wave Magazine*.

### IDENTIFICATION NUMBERS FOR CLUBS IN "MCC"

C.01 Acton, Brentford & Chiswick	C.30 Northern Polytechnic
C.02 Bailleul	C.31 Nottingham
C.03 Barnet	C.32 Overstone
C.04 Barnsley	C.33 Plymouth
C.05 Bradford Grammar School	C.34 Port Talbot
C.06 Bury	C.35 Preston
C.07 Catterick	C.36 RAF Kinloss
C.08 Cheltenham	C.37 RAF Watton
C.09 Chester	C.38 Ravensbourne
C.10 Clifton	C.39 Ringwood
C.11 Compton Bassett	C.40 Rugby
C.12 Coventry	C.41 Salisbury
C.13 Crystal Palace	C.42 Scunthorpe
C.14 Derby	C.43 Sheffield
C.15 Dowty	C.44 Slade
C.16 East Kent	C.45 Southampton University
C.17 Edgware	C.46 Southport
C.18 Grafton	C.47 South Shields
C.19 Gravesend	C.48 Stevenage
C.20 Grimsby	C.49 Stoke-on-Trent
C.21 Harlow	C.50 Stourbridge
C.22 Harrow	C.51 Stroud
C.23 Hastings	C.52 Surrey
C.24 Leeds University	C.53 Sutton & Cheam
C.25 Leicester	C.54 Thanet
C.26 Liverpool	C.55 Torbay
C.27 Medway	C.56 Walsall
C.28 Mitcham	C.57 Wellingborough
C.29 North Kent	C.58 West Lincs.
	C.59 Wirral
	C.60 Wrexham

*Note:* This list includes all the Clubs participating in "MCC" for the last three years. Other Clubs desiring to enter for this year's event should write in for a serial number, enclosing a stamped addressed envelope, before October 16 for publication next month. Letters should be addressed "MCC," *Short Wave Magazine*, 55 Victoria Street, London, S.W.1.

### AWARD FOR PETER ODELL, G3MUM

The triumph of G3MUM over his infirmity—he is a spastic with only some slight foot movement left to him—was mentioned on p.237 of the July 1958 issue of *SHORT WAVE MAGAZINE*, with a photograph of his station on p.585 of our January 1959 issue. We now hear that he has been made the first recipient of the Mullard Award and Plaque, to be awarded annually to the radio amateur who has set an example by his courage and fortitude. The presentation, accompanied by the gift of a transistor receiver, was made at Redcar, Yorks., on August 29. His mother, Mrs. Odell, also received a present, a typewriter, which was subscribed for by a number of G3MUM's amateur friends. This was, appropriately, in appreciation not only of her great help in getting G3MUM through his licence examinations (for which Mrs. Odell learnt Morse herself so as to be able to teach it to Peter), but also in dealing with the large

correspondence G3MUM receives. He is a member of the Radio Amateur Invalid and Bedfast Club—the title is self-explanatory, the members are more numerous than might be supposed, and readers who may have books and periodicals for disposal, or unwanted gear in usable condition, might do more than they know to help someone by getting in touch with: W. Harris, hon. secretary, R.A.I.B.C., 25 Playford Lane, Rushmere, Ipswich, Suffolk.

### AMATEUR RADIO EXHIBITION

Make a date to be in London during November 25-28 to visit the Radio Hobbies Exhibition, in the Royal Horticultural Hall, Vincent Square, London, S.W.1 (near Victoria Station). There will once again be a fine display of interest to every radio amateur. The products of all the well-known names in the world of Amateur Radio will be featured on some 30 stands, most of which were booked a month ago.

### MORE R.A.E. COURSES

Further to the notice on p.267 of the September issue of *SHORT WAVE MAGAZINE*, the following courses have been notified:

**Birmingham:** Organised by the City Education Dept. at St. Thomas' School, Holloway Head, for Monday and Wednesday evenings, 7.0-9.30 p.m. Enrolment at the school. The Midland Amateur Radio Society also gives Morse instruction at the Red Cross Hq., Highfield Road, Edgbaston, every Thursday evening. Details of these courses can be obtained from: M. A. Brett, G3HBE, 55 Chestnut Drive, Erdington, Birmingham, 24.

**Bognor Regis:** At the Bognor Regis Technical Institute, Southway, on Monday and Friday evenings, 7.0-9.0 p.m. Classes in Theory and Morse for the R.A.E. The lecturer is E. J. Pearcey, G2JU, who will accept enrolments at the Institute.

**Croydon** (London): At the Technical College, Fairfield, Croydon, on Friday evenings. Application should be made immediately, as classes may already have started.

### CARDS IN THE BOX

QSL cards are held for the following operators, whose addresses are not known to us and do not appear in any published lists. Please send a large, stamped self-addressed envelope, with name and callsign, to: *BCM/QSL, London, W.C.1* (which is a full and sufficient address) and the cards will be forwarded on the next U.K. clearance. If publication of the callsign/address is wanted, in "New QTH's" and the *Radio Amateur Call Book*, that should be mentioned when sending in for the cards.

G2ADL, 2CQG, 2DTB, 2DUG, 2HRD, 3APW, 3BAD, 3BZ, 3CDQ, 3CZJ, 3GFJ, 3GJ, 3GNB, 3HOT, 3JPF, 3LFJ, 3MN, 3MWL, 3NCN, 3NCU, 3NED, 3NEO, 3NFP, 3NFW, 3NFZ, 3NGU, 3NHA, 3NIT, 3NJH, 3NJI, 3NJR, 3NKC, 3NKR, 3NLG/A, 3NNW, 3NOT, 3NVV, 3NXQ, 8DB, G13KV, GM3BCO.

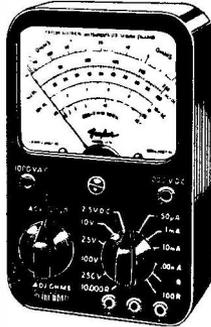
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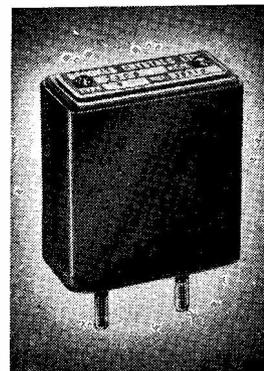
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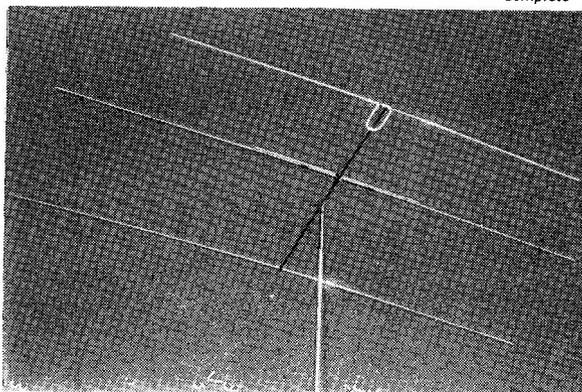
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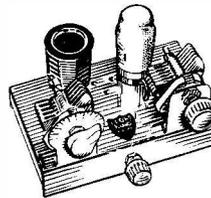
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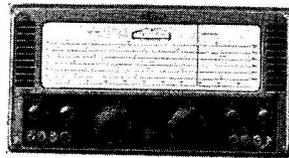


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**EXCHANGE** latest Minimitter "Mercury" and LPF for mint receiver; AR88, 680X, etc., or sell £85 cash. Adjustments if necessary. — Box No. 2161, Short Wave Magazine, 55 Victoria Street, London, S.W.1.

**SALE:** 1475 Rx, externally good, electrically excellent; P/Pack to suit, metered and fused; grey hammer cabinet; Hunts R/C Bridge.—G3JYV, 67 Fleming Mead, Mitcham, Surrey.

**SALE:** Gelo VFO 4/101, valves, dial, escutcheon, £5. Power unit, Type 392, IP 240v. AC, OP 750v. DC at 100 mA, fully smoothed, £2. Mod. Trans. UM2, as new, little used, £3. Parmeko Table-top mains transfr., 30/-. All carriage extra (o.n.o.)—Grace, 44 Cedar Avenue, Ripley, Derbys.

**FOR SALE:** Panda Cup Tx with chrome handles, Panda TVI Filter, Labgear Tx/Rx Relay; £48 the lot or offers?—Box No. 2162, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

**AMERICAN Panoramic Adaptor BC-1031A**, £20. American Reiner 5in. Model 556 laboratory 'scope, incorporating X, Y, and Z axis amplifiers and calibration meter, manual and circuit, £45. Cossor Model 1430 DC Pre-amplifier, manual, as new, £10. Cossor Double-beam 'scope 339A, with manual, beautiful condition, £20. Mullard general-purpose 'scope, Type E800, £20; another with long persistence tube, immaculate, £20. Bridge Ohmmeter by Record, £12 10s. Evershed & Vignoles direct-reading resistance box, £3 10s. Furzehill LF Oscillator, Type G425. 1-4 c.p.s. to 30 kc, with manual, £25. Two Grundig Stenorette dictating machines with accessories, one in portable case, both as new, £55 the pair. Inspection and offers for bulk purchase of the above.—Box No. 2163, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

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SMALL ADVERTISEMENTS, READERS—*continued*

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**ALL-BAND G5RV** 50-watt Tx; excellent keying and note and stabilized relay-controlled power pack. Prefer buyer collects. £20 10s.—Faulkner, Grange Hostel, Farnborough Hants.

**BC 221T** Frequency Meter for sale, A1 condition, complete in transit case, £45. Buyer collects.—R. A. Klein, 6 Briardale Gardens, London, N.W.3.

**5763** and small transmitting valves wanted. State quantity and price.—Box No. 2165, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

**MINIMITTER MR37** Receiver, mint condition, few hours' use only, £40. Class-D Wavemeter, modified for 6v. AC, £6 10s.—Box No. 2166, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

**B2** Tx, all coils, Rx bandsread 80/40/20, home-built heavy-duty PSU, £9. 14-watt mod/amp with output transformers and PSU, £5. RL85 VHF Rx, 28-84 mc, £3. Nearest offers; free delivery London or near.—G3DSV, 66 Chestnut Avenue, West Wickham, Kent.

**TIGER "TR200"** (Aug., 1958), mint condition, absolutely TVI-proof guaranteed; urgent sale; first offer £120 secures; Yorkshire district; reason, ordered Tiger TR300.—Box No. 2167, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

**TAYLOR** Model 160A output meter, £10.—GW3ESJ, 130 Garth Owen, Newtown, Montgomeryshire.

**FOR SALE:** Eddystone 840A, £50; used 3 hours only; going mobile.—Box No. 2168, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

**RADIO AMATEUR**, with his own flat and outside shack, wishes to share same with man with same interest with own Tx/Rx, S.W. London area.—Apply Box No. 2169, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

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**EDDYSTONE 888A**, S-meter, speaker, in matching grey; Brown's phones; Minibeam 34ft. rotating mast; all in new condition; cost £135, sell £85.—(Ruislip 2032.)

**FOR SALE:** Amateur QRT, complete station, Tx complete with modulator, power units, Wilcox-Gay VFO, BC-348, DB-20 pre-selector, R208, converters for BC-348, R1155 with p/p. several other power packs; many spare valves for above equipment, all new, plus the usual bits; all in working order. First £30 cash; buyer collects.—(Phone Pinner 3447, evenings.)

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**AR88D**, £45; Class-D Wavemeter, £7; Mini-mitter Converter, £9; Radiocraft pre-selector, £4. Buyer collects lot, £60 (Scotland).—Box No. 2171, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

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**68OX**, £70; **SX24**, £19; Grundig **TK12**, £45; all as new, with original handbooks; **AR88** wavechange switch, new, 10/-.—Andrews, 8 Forest Grove, York (Tel. 22343.)

**QST's**, bound volumes, 1939-1946 inclusive, £10; Marconi Comparison Bridge **TF202C**, £10; Panoramic Adaptor **BC-1031A**, £20; Receiver, 15-valve, FM, 4-channel, 27/38 mc, xtal calibrator, **BC-923A**, no power unit, £7; **APR4 TN16** converter, 38/93 mc, £5. Two 7½in. fans, 12v. DC 1-6a, £1 each; **TCC** Visconol condensers, 0.5 µF 3 kV, 0.1 µF 4 kV, 8/- each. Three-element 20-metre beam (adjustable elements) with 14ft. x 1ft. 6in. x 6in. steel lattice boom (commercial), buyer collects, £4. Two high-speed polarised Creed relays, Type 27, with bases, first offer. Pair **DA41's** (TZ40's), unused, 30/-. Offers?—Ellett, Ashleigh, Cardington Road, Bedford (5567).

**WANTED**: **G4ZU** Minibeam, Minimitter, or similar telescopic mast, beam rotator and indicator.—Details and price any above to Wright, 27 Haverstock Court, St. Pauls Cray, Kent. (Foo 4266.)

**STC** Tx unit, 5AH, complete with home-built PSU; **R1155/RF24** c/w h/b PSU, 6V6 o/p; Modulator **S7F** (ex-T1131), h/v PSU, 610v. and 300v. h/b.—Details (send s.a.e.) to **G3LUV**, 17 Low Escomb, Bishop Auckland, Co. Durham.

**BACK ISSUES**: **QST**, **CQ**, *Short Wave Magazine*, 3/- each, post paid. Eddystone 750, £41.—Box No. 2173, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

**AR88D RECEIVER**, complete in cabinet, PVC wiring and new valves throughout, 500 kc marker xtal, and instruction book; delivered 60 miles; £45. **SX-28** in working order, £30. **BC-342**, complete with 230v. AC power supply, £12 10s.—Wright, 72 Hartington Road, London, S.W.8. (WIM 3318 biz. hrs.)

**SALE**: Eddystone 888A, £85; Panda **PR120V**, £50; Minimitter 10/15 Minibeam, £10; Minimitter Q-Multiplier, £4; Hammarlund **HQ120X**, £40. Buyers collect, N.W. London.—Box No. 2145, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

**COMPLETE** Working Station, £25: **HRO**, 9 coils, **CPU**; Tx, 20-40-80-160 metres, modulator, **PU**, **ATU**, **LP Filter**; buyer collects.—Sherlock, 8 Tudor Road, Canvey Island, Essex.

**FOR SALE**, **AR88** spares: genuine S-meter, £3; set of 4 switches, £2; selectivity switch, 12/-; all brand-new, boxed. 110v. **HRO** power pack, unused, 45/-. Postage extra.—A. J. Reynolds, 149 Waller Road, New Cross, London, S.E.14. (Telephone after 7 p.m., New Cross 1443.)

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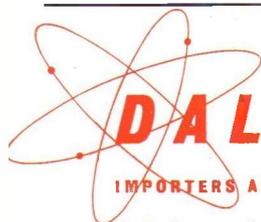
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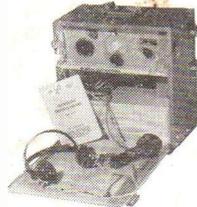
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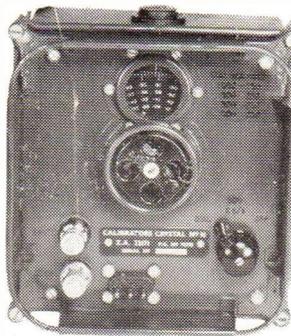
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