

# The SHORT WAVE Magazine

VOL. XXII

APRIL, 1964

NUMBER 2

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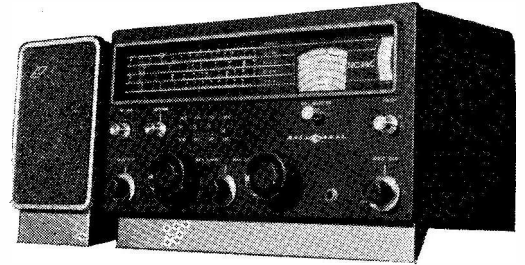
1 HEATH STREET, DARTFORD, KENT Cables: KAYDUBLEW, Dartford Phone: DARTFORD 25574



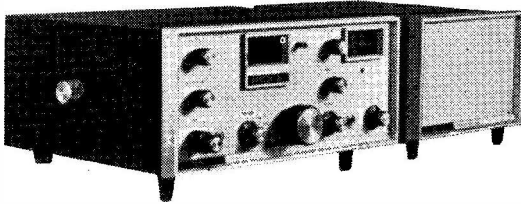
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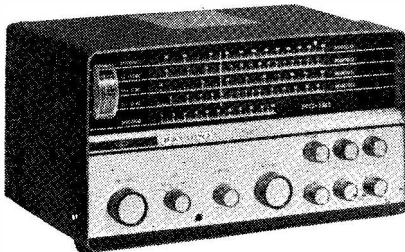
# National RANGE



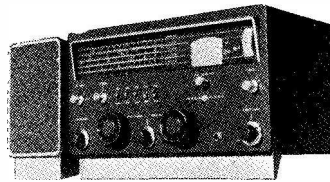
**NXC 3** — Tri-Band SSB transceiver. Complete coverage of the 80, 40 and 20 metre phone and CW bands. **Only £148.8.4, matching AC speaker console £46.7.1**

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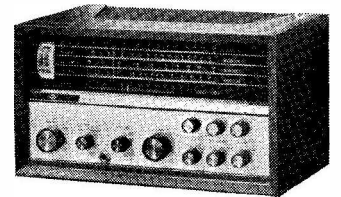
**NC 121** — Designed for the more advanced enthusiast, features edge-reading signal strength meter, noise-limiter, variable BFO, audio and RF gain controls, exclusive Tuner Output for use as a short wave tuner with Hi-Fi equipment and peaking Q-multiplier for optimum selectivity. **Price £53.6.11**



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may be connected in parallel, providing that a resistor of between one-tenth and one ohm is connected in series with each diode. The lower values should be used only when the output current is such that excessive voltage drop occurs across the resistors. The purpose behind the inclusion of these resistors is to even out the forward current, which would otherwise be larger in one diode than the other, since their forward voltage drops would almost certainly be different.

**HV Power Pack**

We move now to high-voltage, high-current power supplies. Under these conditions, the usual *pi*-filter, also known as a capacitor-input filter, is replaced by a choke-input filter, which has several advantages in this type of application. The maximum diode current is always about equal to the load current (the choke acting as a current stabiliser), whereas, using a capacity filter, the peak diode current may be several times the continuous load current. Ripple is reduced, and regulation is improved. The choke system has, however, two disadvantages. The first is that the choke must have a high inductance while passing a large DC current; thus an iron-cored choke with an appreciable air gap is usually preferred. The other disadvantage is that the output voltage is lower than that for the capacitor filter by a factor of  $2/\pi$ .

For instance, suppose that the input is 250 volts; the output with a capacitor filter will be about this figure. If a choke-input system is used, the output voltage will only be about 160 volts. This does mean that a higher voltage transformer is required, and probably the diodes will need to be of a higher p.i.v., but for high-voltage, high-current applications, the advantages of the choke-input filter far outweigh these criticisms.

We shall consider the design of a 650-volt, 500 mA, power supply for a transmitter, bearing in mind the requirements outlined previously with respect to overload and transient protection. It is hoped that the principles described will enable the reader to

modify the design to his own requirements. The circuit is shown in Fig. 7, and the principles of operation will now be analysed.

It will be seen that, provided the fan motor (which is suppressed as previously outlined) is switched on, AC may be applied to the transformer primary via S2. This ensures a steady flow of coolant to the PA, or whatever, before the application of HT. (This refinement may, of course, be omitted if desired.) A neon N1 indicates that the fan is on. C2 and R2 are the transient protection components mentioned before. T1 is a 1000-0-1000 volt transformer, which with a choke-input filter will give the required output voltage of 650v. The usual heater windings are provided. The transformer has an electrostatic screen, which should be earthed.

Four diodes are used in a series full-wave arrangement. Series connection of diodes may be carried as far as is required, and three or more units of a lower p.i.v. in series could be used instead of the two shown in each arm (*see* Table of Values). Note, however, that the resistor and capacitor across each diode are *essential*. These components even out the production spreads in back-resistance and junc-

**Table of Values**

Fig. 7. PSU for High Power Transmitter

C1 = .02 $\mu$ F, 1000v.	D1, D2,
C2 = .05 $\mu$ F, 1000v.	D3, D4 = 1N1130 (Texas)
C3 = 32 $\mu$ F, 450v. elect.	S15BR2 (WH),
C4, C5,	OA211
C6, C7 = .01 $\mu$ F, 2kV	D5 = OA211, (Mullard)
C8 = 16 $\mu$ F, 1000v.	S1 = SPST, toggle
R1, R3 = 47,000 ohms	S2 = DPST, toggle
R2 = 6,800 ohms	S3 = HV toggle, 2-
R4, R5,	break in series
R6, R7 = 330,000 ohms	M = Fan motor (for
R8 = 100,000 ohms, 5w.	QRO PA)
R9 = 820,000 ohms	T1 = 1000-0-1000v. 500
R10 = 56 ohms	mA, C-core
RL = High impedance	N1, N2,
relay with two	N3 = 90v. neon bulbs
"make" con-	F1 = 150 mA
tacts, RA1, RA2	F2 = 500 mA
Ch = <i>see text</i>	

Note: All resistors  $\frac{1}{2}$ -watt, except R8.

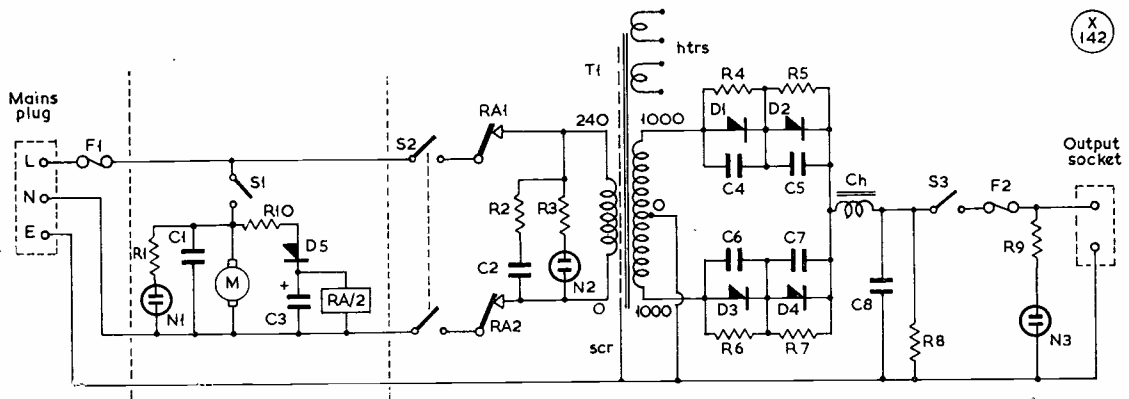


Fig. 7. Circuit design for a transmitter HT power pack, giving 650v. at 500 mA and incorporating suitable suppression where a blower motor is involved for forced-air cooling of the PA; this part of the circuit is between the dotted lines. The design considerations are discussed in the text and all values are given in the table. There are a number of silicon diodes suitable for a power pack of this sort. On no account should R8 be omitted, as it bleeds the pack when the mains are switched off.

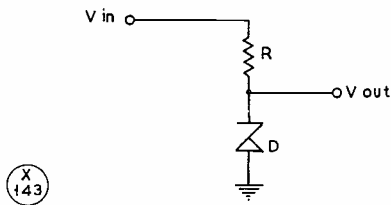


Fig. 8. The principle of the zener diode as a voltage stabiliser is discussed in the article.

tion capacitance, and ensure that the reverse voltage drop across each diode is the same under both steady-state and transient conditions. R4 to R7 should have a value, in ohms, of 220 times the p.i.v. of one diode in volts. Since these diodes have a p.i.v. of 1500v., R4 to R7 are chosen as 330K. C4 to C7 are .01  $\mu$ F paper capacitors, with a working voltage greater than the p.i.v. of each diode. It will be seen that no series resistors for initial current limiting are included; this protection is not needed in choke-input filter systems, since the choke itself prevents a high initial current flowing through the diodes.

The choke Ch. must have an inductance of not less than (R load) Henry, where (R load) is in kilohms. In this PSU the minimum value of load resistance we can apply to the output terminals will draw 500 mA from 650 volts, which corresponds to a resistance of 1300 ohms. Hence an inductance of 1.5 Hy will stop the current through the choke ever falling to zero even under all possible load currents. This component must carry the full load current of half-an-amp. without saturating, and thus will probably need to be of the air-gapped type.

C8 is a block paper condenser to provide further smoothing, and this must have a working voltage of at least 750v. R8 acts as a bleeder, and a further neon tube N3 indicates when the load is on. Experienced readers will not need to be reminded that the shock which could be received from the terminals of this condenser C8 could easily be fatal, and the usual safety precautions must be taken. It should not be possible to energise the mains trans-

former when the unit is out of its case, and if output terminals are provided these should be in the form of a fully-shrouded, finger-proof, chassis-mounting socket of approved design and voltage rating.

For some of the diodes, heat sinks are recommended by the manufacturers. In this case, the devices should be bolted in direct contact with the heat sink, and the whole assembly then insulated from its surroundings. Mica washers and bushes are not really to be trusted at these voltages.

**Stabilising**

No discussion of power supply technique would be complete without some reference to stabilisation. Provided their limitations in this respect are understood, semiconductors may be used to make very good voltage stabilising circuits. High-voltage packs are still best left to valves, but transistors will, if correctly used, fulfil the difficult requirement of providing a low-impedance voltage source from which high currents can be drawn.

Rather as a preamble, let us consider the use of zener diodes as voltage stabilisers. Zeners are available from 3.3v. to more than 150v., in logarithmic steps. Currents of more than an amp. can be taken from some types. Further, diodes may simply be connected in series. This enables voltages above the range of single diodes to be regulated, and the correct choice of positive and negative voltage/temperature coefficients makes the stack virtually independent of temperature. Zener diodes are used

**Table of Values**

Fig. 9. Stabilised PSU circuit

C1 = 2/500 $\mu$ F, 50v.	D1 = OAZ244 (Mullard)
C2 = 100 $\mu$ F, 25v.	TR1 = OC16 (Mullard)
R1 = 4,700 ohms	TR2 = OC77, OC81,
R2 = 1,000 ohms	OC84 (Mullard)
R3 = 150 ohms	TR3 = OC42, OC44,
R4 = 1000-ohm w/ wound, o/p volt- age control	OC45, OC71 (Mullard)
R5 = 330 ohms	V = 0-20v. meter, m/c
F = 150 mA	A = 0-250 mA meter, m/c

Note: All resistors rated  $\frac{1}{2}$ -watt.

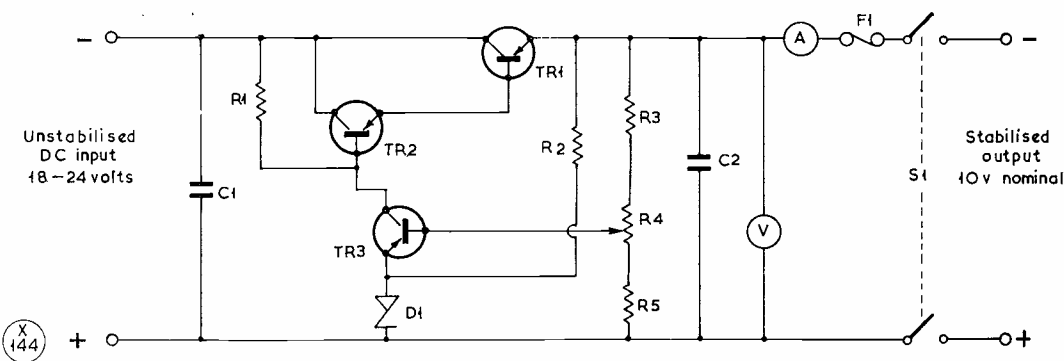


Fig. 9. Simple circuit for a stabilised power supply, using a zener diode at D1. The circuit will hold to a nominal voltage output, set by R4, over quite a wide range of DC input. Meters as shown should be incorporated in the construction, and the pack should be correctly fused.

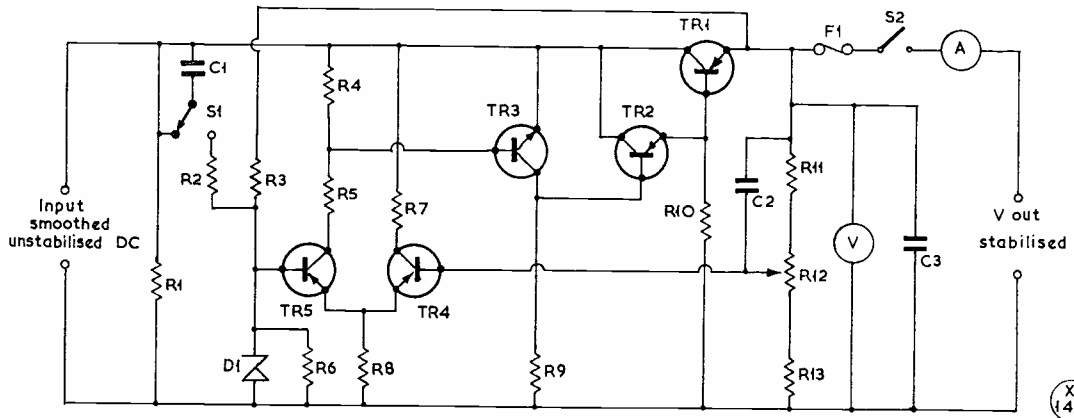


Fig. 10. A stabilised power supply, with overload protection, and designed for either of three possible output voltages — 6v. negative from 14-20v. input; -10v. from 24-30v.; and -20v. from 30-40v. DC input. Table III shows the resistor values to use for either of these three ranges, and the design allows for load currents up to 2 amps. R12 sets the output voltage and, as in Fig. 9, an ammeter and voltmeter should be provided.

mainly as stabilisers for supply lines to oscillators, BFO's and such, and as reference elements in stabilised power supplies. Referring to Fig. 8, we assume that we have decided on our requirements for  $V_{out}$ . We then choose a diode which has the correct zener voltage, and which can more than supply the maximum load current. It is essential that at least one milliamp should always flow in the zener, otherwise its constant-voltage characteristic will be impaired. Since  $V_{in}$  is fixed by other considerations (it may be the only power supply we possess!) R must be chosen so that the difference between  $V_{in}$  and  $V_{out}$  across it corresponds to a current equal to the load current plus the zener sustaining current. For instance, if we require a 9-volt stabilised supply, and a nominal 24-volt rail is available, we choose a diode such as the Mullard OAZ247, which has a zener voltage of 9.1v., and a maximum current of 25 mA. Then  $R = 680$  ohms is a suitable safe value, and the maximum load current is 20 mA, allowing 2 mA for the zener sustaining current. At the other end of the scale, the Mullard OAZ227 has the same zener voltage, but a maximum dissipation of 7 watts, giving a maximum zener current of about 750 mA. In this case R can be 62 ohms, and the load current over 700 mA.

However, for higher currents, and better stabilisation—or if the output voltage is required to be variable—a true stabilised power supply is required. Two such circuits are given. Fig. 9 shows a simple low-current supply with fairly good regulation, whilst at Fig. 10 is a more complex circuit with very low output impedance, which is protected against overloads, and can deliver up to two amps.

Note that in both cases reference diodes are chosen with zener voltages between 5 and 7 volts. This is the optimum range for the lowest temperature coefficient. No attempt will be made here to describe the full theory of stabilised supplies, as this can be most complex. Suffice it to say that the output voltage is compared with a standard reference, and

Table of Values

Fig. 10. Stabilised PSU with overload protection

- C1, C3 = 100  $\mu$ F, 25v.
- C2 = 25  $\mu$ F, 25v.
- S1 = Push-button, re-set
- S2 = SPST, toggle
- F = 2 amp.
- A = 0-2A meter
- V = Voltmeter, m/c
- D1 = OAZ202
- TR1 = OC28, OC29, OC35, or OC36 (Mullard)
- TR2 = OC16 (Mullard)
- TR3 = 2N388 (or any similar n.p.n. type)
- TR4, TR5 = OC77, OC81, OC844 (Mullard)

Table III

Resistor values for circuit Fig. 10

$V_{out}$	-6 volts	-10 volts	-20 volts
R1	160	180	270
R2	560	1200	1800
R3	160	360	1500
R4	100	100	100
R5	1000	1800	4700
R6	1500	3000	6200
R7	1500	3000	6200
R8	750	1500	1800
R9	1200	1800	3900
R10	3600	5600	10,000
R11	560	750	1800
R12	1000	1000	2000
R13	560	750	1800
$V_{in}$	14-20v.	24-30v.	30-40v.

NOTE: Values R1-R13 given in ohms. Select range for output voltage required.

any difference causes the current through the series transistor (TR1 in both cases) to vary in such a way as to tend to restore the output voltage to its original value.

The main advantageous features which the circuit of Fig. 10 has are: The increased current-rating of the series transistor, allowing more output current; the improved stabilisation due to a more sensitive error-detecting amplifier; and the overload protecting facility.

This latter is a great asset when experimental work is being carried out, since an accidental short might otherwise damage the series transistor before the fuse has had time to blow. If this type of power pack is shorted, the voltage drops to almost zero, and a low current flows in the output. The circuit is reset (after removal of the short!) by the push-button S1.

Three versions of Fig. 10 values are given for three different output voltages—see Table III—and

readers may interpolate for intermediate values of their own choice. The potentiometer R12 connected across the output gives a variation of about 15%.

The whole unit, with the exception of TR1 and TR2, can be built on a piece of *Veroboard*, and since the two power transistors have a common collector, these may be bolted direct to a heat sink of about 50 sq. in. of blackened aluminium.

This does not quite embrace all the possibilities of semiconductor applications in 50 c/s AC power supplies. A further article in this series, dealing with miscellaneous uses of semiconductors, will include the description of a teleprinter motor DC supply. Several types of printer in common use have DC motors requiring a stable source of one to two hundred volts at a fairly high current. A circuit will be given of a stabilised, variable-voltage supply, which will run the motor constantly at the correct speed. It uses two inexpensive silicon controlled rectifiers, and a minimum of other components.

### THE MOBILE RALLY CALENDAR

The dates fixed for Mobile Rally events, as notified to us since the appearance of the note on p.35 of the March issue, are now as follows (the *Wethersfield* event for *May 24* having been scrubbed):

**April 5:** Bedford Mobile Rally at Texas Instruments factory. It is understood that the usual arrangements have been made, but no details have been given.

**April 19:** The annual Mobile Rally event at Trentham Gardens, the show-place near Stoke-on-Trent, Staffs., which is organised jointly by the Midland Amateur Radio Society and the Stoke-on-Trent Amateur Radio Society. There will be a wide range of attractions, radio and non-radio, and, as in previous years, this is certain to be a well-attended event. There will be talk-in for all mobileers, with out-station support by G3COY on 1960 kc, ready to hand visiting /M's over to the local Trentham Gardens station.

**May 3:** Organised by the Medway Group, at the works of British Uralite Ltd., Higham, Nr. Rochester, Kent, with talk-in by G2FJA/A (Top Band) and G3OHP/A (two metres). The *venue* is a rural area, with picnic facilities, and if the weather should be inclement, there will be ample covered accommodation.

**May 10:** Mobile Rally organised by the Thanet Radio Society, at the Viking Ship, Pegwell Bay, Ramsgate, with G3DOE/P coping with the talk-in on 160m., and G3BAC/P available for two-metre mobileers.

**June 14:** The Hunstanton Mobile Rally, at the QTH of G3JEC, 9 Lavender House, Seagate Road, with talk-in by G3ANM on 1980 kc and G3RED on 145.2 mc. This is an all-day affair, with amateur TV as one of the attractions, and there will be a charge of 2s. 6d. for admission and parking.

**June 21:** Mobile Picnic, South Shields, Co. Durham.

**July 5:** Mobile Rally, R.A.F. Amateur Radio Society, Weston-super-Mare.

*also*, Mobile Rally, South Shields, Co. Durham (organised by the local Amateur Radio Society).  
*also*, Northern Mobile Rally, at Harewood House, near Leeds.

**August 9:** Mobile Rally at the Royal Naval College, Dartmouth, Devon, arranged by the local Amateur Radio groups. *Full details later.*

**August 30:** The U.B.A. (Belgian) Rally, near Namur, in the Ardennes. *Full details later.*

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

From the foregoing, the Sunday of July 5 looks like being the Busy Day—however, these three centres are well dispersed geographically, and there should not be too much clashing. Organisers of other Rally events are asked to let us have dates and details as soon as possible—we can publicise only those events notified direct to us for appearance in this column.

### IT WOULD HELP US —

If readers would note that we cannot, in the ordinary way, deal with technical queries on the telephone, nor with the sort of enquiry that starts "Can you tell me if you have ever published a circuit of the Bloggs Transceiver." Practically every query, even the simplest one, involves a certain amount of research—which is difficult when there is someone hanging on the phone. In any event, our office staff are always extremely busy and, as we are anxious to be as helpful as possible, it would be appreciated if all such queries could be made by post, with an s.a.e. They can then be given proper attention.

## MARINE RADIO EQUIPMENT

FOR THE YACHTSMAN  
AND THE AMATEUR —  
COVERING 1.6-4.0 MC RANGE

*This is one of our periodical general-interest articles —which seek to keep readers informed of what is happening in fields of radio communication and activity outside Amateur Radio. Visiting this year's Boat Show, it was found that there are several firms offering equipment of interest not only to the yachtsman but also to the radio amateur—the former because it enables him to fit his craft with a full range of radio aids, and the latter because (the main*

**S**INCE radio apparatus for small craft must be light, compact, robust, efficient and economical of power, many of the transceivers available for boat fitting are no larger or heavier than the gear carried in his car by the average /M operator—and all shown or discussed here are designed to work direct from a 12v. DC line (car battery), with transistorised PSU's.

The power range of the transmitter assemblies is in the 10-65 watt category, the latter power rating being unusual and classified as QRO in this context. The Tx frequency range is approximately 1.6-4.0 mc, and receivers—while of course covering this band—also give tuning over the medium and long-wave broadcast bands.

### Frequencies and Procedures

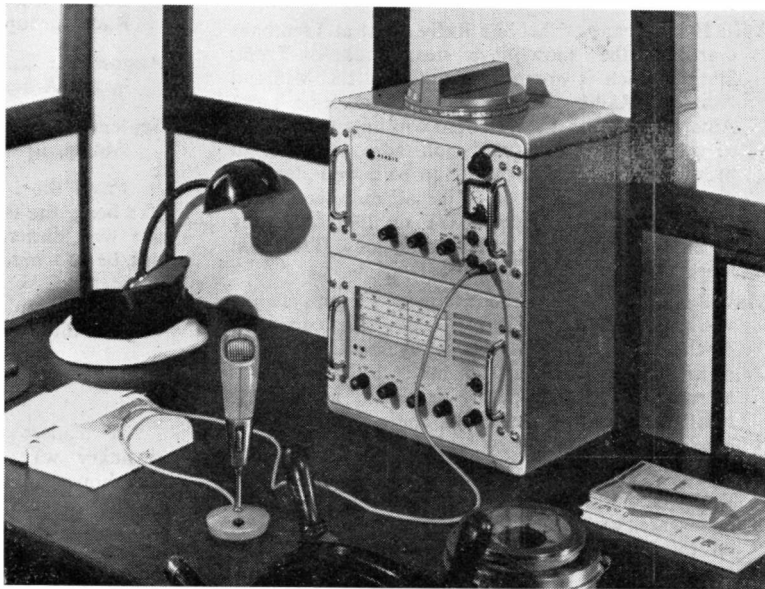
For yachtsmen in small craft around our coasts, full radiotelephone coverage is given by a number of Coast Stations provided and operated by the G.P.O. The main frequency area is in the 2.0-2.5 mc region for communication, and there are D/F aids available which are designed to use the long-wave radio beacon system (the "navigation wave-band") in the 180-420 kc range.

Since small craft work with G.P.O. Coast Stations (GNI Niton, GNF North Foreland, GLD Lands End, and the rest) apparatus as fitted to private craft must be licensed and conform to an approved specification. The operator, who is nearly always the owner of the yacht, must himself be licensed—the Restricted Certificate of Proficiency in Radiotelephony, as it is called, is issued after a simple oral and practical test in procedure and operating, carried out by arrangement with the local radio inspector and on the equipment as fitted in the yacht. A log has to be kept,

*frequency area being in the region of our LF bands) this same equipment could be of direct interest to the mobile or portable operator using Top Band and Eighty.—Editor.*

the ship station must be available for inspection by the G.P.O., and the cost of the licence is £2 annually—all much as we know it in Amateur Radio, except that the operating certificate is for phone-only and is very much easier to get! There are also rules about how the ship station may be used (no unnecessary conversation, transmission of music, etc.) and messages to destinations ashore must be passed only through a Coast station—and have to be paid for. As in the case of an AT station, a yacht installation is allotted a ship call sign in the 4-letter marine sequence for the U.K.

All operation is on spot frequencies (no swishing about with VFO's), crystal controlled, the Coast Stations each having two main working frequencies, e.g. GNI Niton (I.o.W.) uses either 1834 or 2628 kc. Small craft are grouped on four main frequencies, on which regular watch is maintained by the Coast Stations, the channelling arrangement in respect of station locations geographically being such as to keep interference to the minimum possible—for instance, to call either Stonehaven (N.E. Scotland), Humber (N.E. England), Niton (Isle of Wight), Ilfracombe (Bristol Channel) or Portpatrick (S.W. Scotland), the calling frequency used by the yacht would be Ch.6, 2534 kc, the Coast Station coming back on its own appropriate main frequency. Hence, all such operation is cross-frequency. *[cont'd. p106]*



The well-known firm of Pye, Cambridge, offer a wide range of equipment — MF and VHF/FM — for the marine market, this being their "Hamble" transistorised radiotelephone, incorporating the D/F facility. The coverage is 1.6-3.8 mc on the Tx, with two RF power output settings, 20-35 watts and less than 10 watts; on a 24v. DC line, the loading is 7 amps. on high power with full modulation. The receiver tunes 150-400 kc, 535-1605 kc and 1.52-3.8 mc. A separate D/F loop and null-meter are available for use with the Rx.

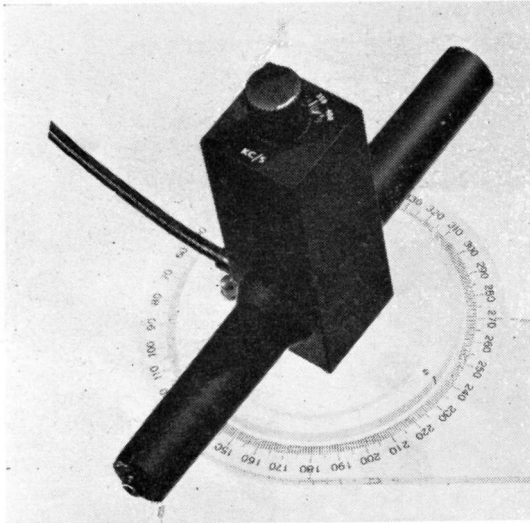


The "Corvette" transceiver (radiotelephone) is a design by Coastal Radio, Ltd. for yachts and small commercial vessels operating in coastal waters. It covers the 1.6-4.0 mc band, with continuous tuning on the Rx side and six CC spot frequencies in the same range on the transmitter. The receiver also gives the MW/LW broadcast bands and coverage of the LF beacon system. For 35 watts input, the Tx puts about 12 watts RF, fully modulated, into almost any sort of aerial. Transistor circuits are extensively used for battery economy and for a DC line voltage of 12v., the maximum load is 7.5 amps.; with a 24v. DC supply, as found on many small craft, the loading is only 4.5 amps. The size overall is approximately 14½ ins. wide by 8½ ins. high by 11½ ins. deep. The "Corvette" would be very suitable for use as a transceiver on the amateur LF bands — say, in a caravan, into a loaded-whip aerial.



The "Shannon" radio telephone, by the same makers as the BEME Loop, tunes 185-420 kc, 550-1630 kc and 1.6-4.0 mc on the receiver side which, like the modulator, is all-transistor. Valves are only used in the CO-PA Tx, which gives eight CC channels in the 1.6-3.7 mc band, with RF output up to 20w. nominal. With a 12v. DC line, the total current load is about 8 amps., the power pack being a transistorised DC/DC converter. The "Shannon" is completely self-contained, may be mounted in any position, and the cabinet is salt-water resistant.





The neat D/F unit to work with the "Sailor 16T" marine receiver. It is a ferrite-rod aerial with a tuned circuit covering the beacon range 275-425 kc (the navigation waveband) and is mounted to rotate on a compass rose having a long ruler arm. This can be set up on the chart, and bearings laid off to get a fix.

There are also three frequencies—2241, 2246 and 2301 kc—allocated for inter-ship working. The distress frequency for all small craft is 2182 kc and, of course, continuous watch is also kept by the Coast Stations on this channel.

It will be seen that for full coverage of all channels likely to be required, the yacht Tx might need up to eight crystals for these various spot frequencies.

#### Design of Equipment

Within the limitations of the electrical and radio specification laid down by the G.P.O., no great variations in design are possible. Most transmitters are CO-PA, using valves, and modulators are either valve or transistor, or a transistor-valve combination, with speech into a carbon microphone and an audio filter to restrict the speech frequency range to that required for communication purposes. Though an arrangement of this sort is quite capable of giving very tolerable phone quality, often it does not because of bad operator technique—yachtsmen are only very rarely radio men and, having no idea how their equipment works, naturally do not always make the best of it.

Receivers are almost invariably fully transistorised and are thus light, economical and capable of a very good performance. In some designs, receiver and transmitter are in the same housing, making a very compact transceiver type of installation, but in every instance the Rx side is, of course, free tuning within its frequency coverage, which might be in either three or four switched bands.

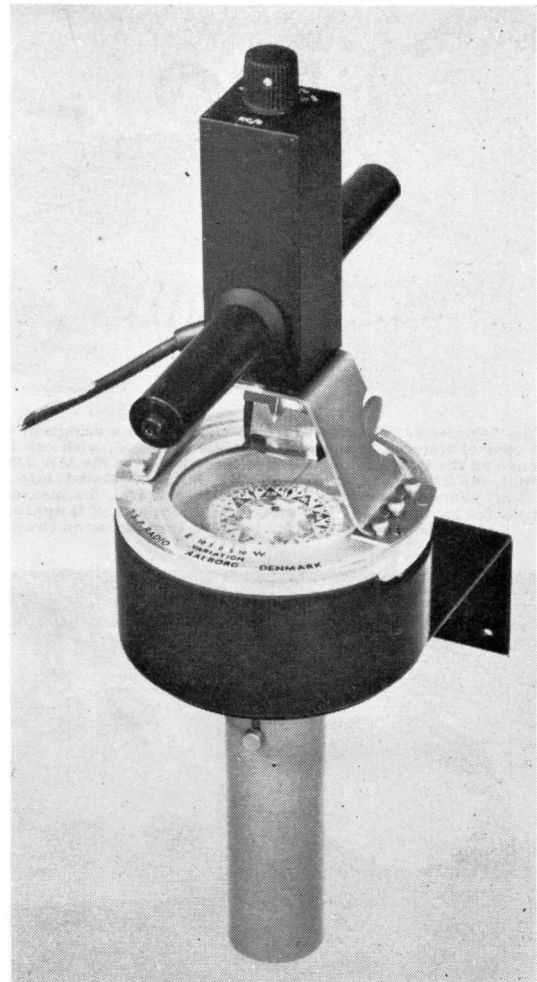
Finish and durability are good in all designs, proofing against seawater and salt-air corrosion being a particular point. Operation of all equipment is made as simple and as direct as possible, and transmitter tuning is almost always one-knob with visual indication for the resonance condition on the frequency selected.

Taking all the equipments seen and examined by your correspondent at the Boat Show, the choice before a prospective buyer covers either an integrated Tx/Rx as a single unit; a separate transmitter and receiver; either bulk-head mounting, or table-top with suitable fixings; a receiver either with or without D/F facilities; and operation from a DC-line supply of either 12v., 24v. or 32v.

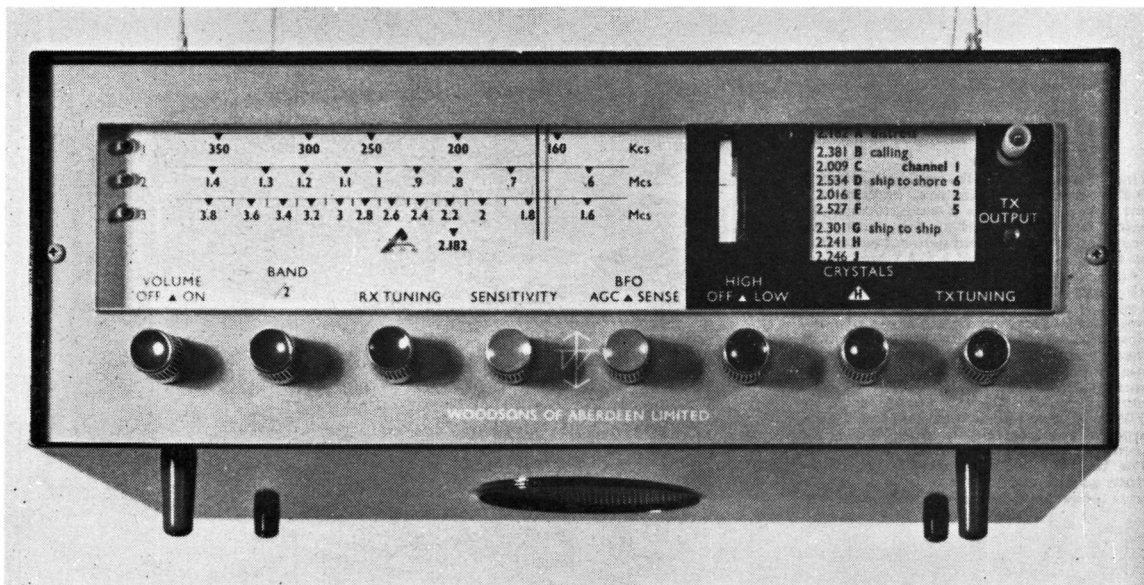
#### Radiating System

Most transmitters will load into whatever sort of aerial can be provided on the vessel. In yachts in the 10-ton category, where the owner is a sailor rather than a motorist, it is a good deal more difficult than might be supposed to find a run for the aerial which will always be clear of booms and sheets. In fact, this is a problem in a sailing craft of almost any size. The back-

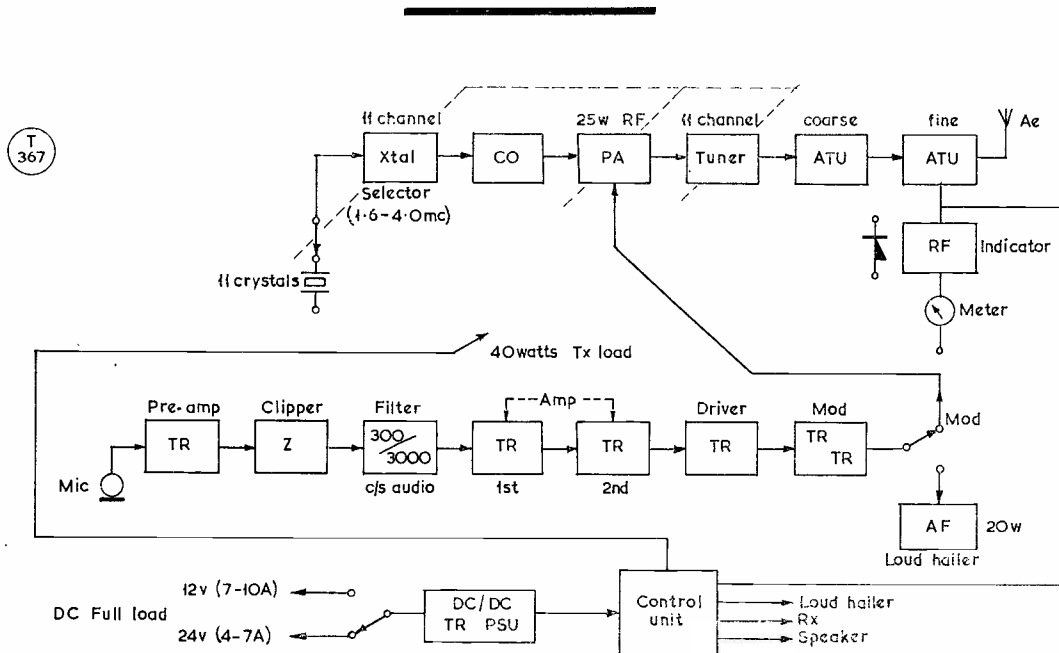
*[cont'd. p.109]*



The "Sailor Navigator" can also be mounted on a hand bearing illuminated compass, for direct readings from beacon stations, with correction for variation and local electrical or magnetic deviation. The compass is dead-beat in action and will give readings to within one degree.



The Type TR20 R/T transmitter-receiver for small craft, by Woodsons of Aberdeen. The Rx side covers the LW/MW bands, as well as 1.6-3.8 mc, and the Tx frequency is selected by switched crystals. For all small craft in coastal waters, the distress frequency is 2182 kc, on which shore stations maintain continuous watch; notice that this frequency is clearly marked on the Rx dial, and is also set up as one of Tx channels. The Woodson Type TR20 has two power-output settings, and the transmitter output tuning indication is by glow-tube rather than by meter.



Block diagram of the "Sailor 26D" marine transmitter for the 1.6-4.0 mc band, for which eleven crystal-controlled spot frequencies are provided, with a modulated RF output into the aerial of 15-25 watts. This design is by the Danish firm of S.P. Radio, and they feature a rather more refined speech circuit than in some British equipments. Complete change-over is effected by a press-to-talk switch on the microphone. For those skippers who like to bawl orders at the crew, or exchange badinage with other craft, a loud-hailer is provided; this takes the full 20w. of audio from the modulator, into a suitable speaker separately mounted on deck. The matching receiver for this interesting Tx design is the "Sailor 16T"—see p.109.

The "Pilot Pal" is a three-band portable D/F receiver, for use in small craft, which not only functions as a navigational aid using the LF beacon system, but also provides broadcast and general reception on the 550-1600 kc and 1.5-4.5 mc bands. Being a transistor design with a tuned RF stage, it gives plenty of gain and has a very good performance. It is light and compact — 8ins. on the longest dimension and weighing only 2 lbs. — and is easily portable. The "Pilot Pal" is also one of the cheapest D/F receivers of its kind available and, in the Amateur Radio context, would be just about ideal for D/F field day operations on Top Band, especially as it has a null-meter for accurate bearing indication or homing. The bearing scale gives 180° to left or right and is equivalent to a 10-in. compass rose without need to rotate the entire set.



The American firm of Raytheon have produced a new navigational aid for yachtsmen in the shape of a Loran receiver working on the LF "C" chain. In small craft, the range is about 1,000 miles and the accuracy of the system (which is now open to all users) is such that fixes can be obtained as close as one foot per mile of distance, i.e., the position given would be within 100ft. at 100 miles — and few navigators would want it closer than that! The Raytheon Loran CA-400 will give results of this sort under any conditions and without sextant, stellar observation or any calculation being necessary, as the instrument is direct reading.

An interesting assembly for marine work is shown at right. The "Sailor" transmitter Type 26D (above) and Rx Type 16T (below) are designed as matching equipments for bulk-head mounting. A block schematic of the transmitter is given on p.107. The 16T receiver has four tuning ranges, covering the LW beacon channels; the LW and MW BC bands; and 1.6-4.0 mc. It includes D/F facilities, with sensing, using meter indication for tuning, and incorporates a BFO.

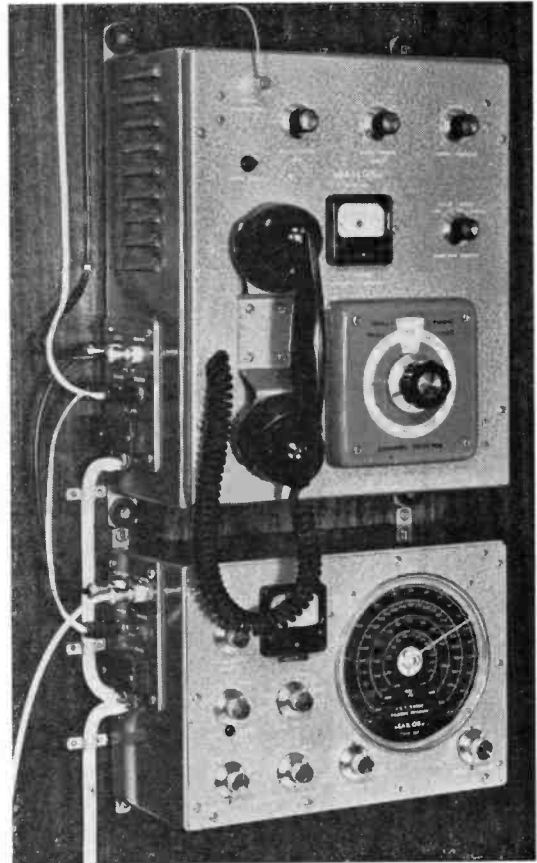
stay is frequently suggested—this is a wire which always has a clear run and is most out of the way. But as it also has to bear a considerable strain, and so must be one of the heaviest rigging lines, it is not practicable to replace it with aerial wire, however strong.

In boats having a wooden mast, one solution is to run a heavy rubber-covered wire up the mast and close to it, inside all fittings and running gear. But even this is not very easy and as many modern yachts have metal masts, may not even be practicable. What it comes to is that the vessel has to be carefully surveyed for the best aerial positioning, and almost each case is an individual one.

Where motor-cruiser type craft are concerned—or when sailing is of secondary interest (it being remembered that practically every yacht, of whatever size, almost, these days has an engine for motoring, and hence an electrical power supply)—the aerial problem is easily solved. Motor yachts usually have a short, stub mast, from which the aerial can be run in some convenient way. But the method most used is a whip-type aerial, mounted on the deck-house, with base loading, and tuned as we do in the /M context.

#### Direction Finding

There are two ways in which the beacon navigational system, or medium-wave BC stations, can be used for position finding. One is by a loop mounted to rotate and used in conjunction with a compass ring, and feeding



One of the more essential navigational aids for the yachtsman and for small-craft navigation generally is a D/F device. Elaborate shore-based radio beacon systems are provided for anyone to use and, with a suitable receiver, safe and accurate navigation is possible all round our coasts and in Northern European waters generally. This is the BEME Loop, which gives D/F facilities in the 180-420 kc beacon range, as well as MW/BC reception on 600-1650 kc and coverage of the 1.6-4.0 mc band. It is fully transistorised, with an excellent receiver specification, and only weighs 8 lbs. complete with dry-cell batteries and compass.



Coastal Radio, Ltd. offer a 65-watt transceiver called the "Curllew," for simplex operation from either a 12v. or 24v. DC supply. The receiver tunes 170-425 kc, 600-1600 kc, and 1.6-4.0 mc, with an optional D/F facility; the S-meter as fitted functions also as a null-indicator when using the Consol position-finding system. A BFO for CW reception and a headphone jack are provided. The Tx coverage is 1.6-4.0 mc in six CC channels, the valve line being N78-QV06-20 in the CO-PA, and N78-2/QV06-20 in the speech amp.-modulator, using a good-quality carbon microphone. The PSU is a DC/DC converter with 2/CT308 power switching transistors. The total load on a 12v. DC supply is about 12 amps.

into the receiver. The other is by a hand-held ferrite-rod type of instrument, which can be tuned to the beacon frequencies, and also working against a compass rose. This may either be a self-contained D/F unit, complete with its own receiver, or it can be coupled into the main receiver.

Other navigating systems include the Consol—which can be used simply with a receiver having a BFO, the position being calculated from a coding sequence heard on the Consol transmitters—and Loran, which is not much used by private owners because of its relative complexity and the more elaborate receiving equipment required. Apart from that, as the name implies it is intended for long-range working, its advantage being

that it gives much greater accuracy at ranges of several hundred miles than the MF beacon system.

This article can only attempt to outline the fascinating possibilities of combining the running of a yacht with an interest in marine radio communication equipment of the sort now available to the private owner. While these notes have been largely inspired by that interest, it is of more importance in the Amateur Radio context that much of the equipment now offered to the yachtsman is also very suitable for operation on our LF bands.

Finally, words of advice—if a yacht owner with good technical knowledge of communication radio is an unusual combination, a radio amateur who really understands what is required in the way of radio, and naviga-

tional aids, in small craft is equally rare! Hence, if you are asked, as somebody who knows quite a lot about *radio*, for your advice on what sort of gear your sailing friend should install, it is better not to try to give him any advice at all than to get him involved with some-

thing unsuitable. And the fact is that, though there is a large potential market for the sort of equipment discussed and illustrated here, its growth is slower than it should be because many yacht owners do not really know what they want, or where to go for sound advice.

## Miscellany

### INCIDENTAL INFORMATION—IDEAS AND SUGGESTIONS OF TOPICAL INTEREST

"Television! It has been said that this brought to an end the family musical evening and intelligent conversation; but, true or no, it certainly sounded the death-knell of the T.1154 and the large, heavy six-foot open rack transmitter. This was probably a blessing in disguise, for the table-topper was born, which, apart from being sometimes lethal to family and visitors, was now sometimes permitted a place in the living-room. . . ." (Editorial, "GM Magazine")

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A new electronic component on the scene is the Tandel (thermo-autostatic non-linear dielectric element). It is a non-linear capacitor, the capacity of which varies with the applied voltage, and it is suggested that the tandel may replace the varactor in certain applications. (Varactors are expensive and sensitive to overloads.) Briefly, the tandel is a crystal of a ferro-electric substance which has the property of keeping its own temperature steady; other ferro-electrics lose their properties above a certain temperature. Research is going on in Czechoslovakia, and it is thought that this new component will have wide applications in modulators, frequency-multipliers, and instruments designed for measuring very small currents. The frequency limit, it is thought, is about 1000 mc. (New Scientist)

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Within a few years, it is said, most American university students will carry automated pocket teaching machines and two-way radios, hooked up to a central library. If this sort of thing is commonplace in "a few years," how long will it be before every man, woman and child in the world has his own personal frequency for communication? (A cynic says that this is already happening, and you only have to listen on 7 or 14 mc to prove it.)

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The 1964 Award for Supreme Non-Concern about DX goes to an 80-metre phone operator who was heard to say: "Oh, you worked a VK on Twenty this morning. That sounds pretty good; where is it—South Africa or somewhere, isn't it?"

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Which leads on to the theme of the Single-Band Man, who sticks to his small piece of territory and knows nothing of what goes on in the great world outside. There are more of them than one would

imagine; some on Top Band, some on Eighty and some, it seems, on Twenty. Although they miss a lot of the interest and fun that might be theirs, at least they can live the simple life. One aerial (probably a dipole); a single-band home-built transmitter; no worries about whether they are using the best band for the time of day. And, of course, a certain kind of expertise and specialised knowledge about the narrow frequency-area of their choice. But it would be interesting to know how many of them there really are; also how many six-banders, five-banders and so on. Truly they come in all shapes and sizes . . .

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One of the IQSY projects is concerned with "whistlers"—the particular type of QRN observed on Very Low Frequencies. A co-operative effort in Antarctica, it is said, involves the use of a *long wire*—one hundred miles long. Although the connection between this and the short waves, with which we normally deal, may seem a little tenuous, it is quite possible that some energetic amateur type will be on the spot to try it out on DX! That should finally kill off the fable about using a 67-foot long wire.

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"One thing that I cannot understand about SSB is why, after suppressing their carrier and one side-band, they also have to suppress their call signs."

(G3NKE, in "The Cornish Link")

— • • • —

"The film was 'Doctor No.' Opening scene, Jamaica. Camera zooms into a room where a charming girl is operating, with plausible procedure, a transmitter and receiver which turn out to be a K.W. Vanguard and Eddystone S.750 . . . Next shot is of Hq. receiving site back in England, about a score of Racal RA-17's. Back in Jamaica the girl is having QRM trouble and is re-tuning. Close-up reveals that she is turning the *PA control on the transmitter!* Happy to report that at this moment she is shot . . ."

(G3KYH, in "Radial," RAIBO)

#### A. J. DEVON—"VHF BANDS"

It is much regretted that because of heavy pressure on space as well as A.J.D.'s indisposition, it has not been possible to include "VHF Bands" this month. He hopes to be back in full fettle for May.

# NEW QTH's

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

- DL2AH**, J. T. Worrall (*ex-5B4JW*), Gds. Bde. Gp., 204 Signal Sqdn., B.F.P.O. 44.
- DL2AO**, A. Osborne, G.R.S.S., Tec. Wing, R.A.F. Laarbruch, B.F.P.O. 43.
- G3CB**, A. E. Orme, 65 Gardendale Avenue, Clifton Estate, Nottingham. (*Re-issue*).
- GM3HGA**, J. McCall, 1 Pinewood Place, Aberdeen. (*Tel. Aberdeen 33838*). (*Re-issue*).
- G3QP**, J. Brindle, 406-A The Spa, Melksham, Wilts. (*Re-issue*).
- G3RKD**, W. C. Booth (*ex-DL2BH*), The Parachute Sqdn., R.A.C., Bhurtpore Barracks, Tidworth, Hants.
- G3RP**, R. M. Denham, 186 Church Lane, Manchester, 9. (*Re-issue*).
- G3SLI**, A. C. Osborne (DL2AO), 12 Pembury Road, Tonbridge, Kent.
- G3SRC**, Surrey Radio Contact Club, c/o S. A. Morley, 22 Old Farleigh Road, Selsdon, South Croydon, Surrey. (*Tel. Sanderstead 3258*).
- G3SRI**, I. D. Bruce, 437 Helmsore Road, Helmsore, Rossendale, Lancs. (*Tel. Rossendale 2041*).
- G3SRL**, G. Loxley, 7 Portland Terrace, Watchet, Somerset.
- G3SUE**, A. E. Geeves, 26 Glebe Road, Hertford, Herts.
- G3SUK**, H. N. D. Mahony, Hollybush Farm, Rattlesden, Nr. Bury St. Edmunds, Suffolk. (*Tel. Rattlesden 352*).
- G3SUV**, D. E. Ashby, Insteps Farm, White Colne, Colchester, Essex.
- GM3SUZ**, D. McLean, 38 Netherthird Road, Cumnock, Ayrshire.
- G3SVF**, J. W. Mitchell (*ex-4S7WM*), c/o Sgts' Mess, R.A.F. Station, Newton, Nottingham.
- G3SVG**, V. R. Gough, c/o Sgts' Mess, R.A.F. Station, Newton, Nottingham.
- G3SVL**, C. Duckling, 95 Boxmoor Road, Collier Row, Romford, Essex.
- G3SVN**, J. Fowler, 14 Debdale Road, Barrowby, Grantham, Lincs.
- GW3SVY**, D. Scourfield, Anchor Villa, Penybont, Carmarthen.
- G3SWN**, R. Webster, 38 Fernwood Avenue, Thornton-Cleveleys, Lancs.
- G3SWP**, W. Boothman, 5 Millwood Road, Balby, Doncaster, Yorkshire.
- G3SWT**, A. C. Morris, 148 Twyford Road, West Harrow, Middlesex.
- G3SWV**, A. P. Tompkins, 37 Oak Avenue, Shirley, Croydon, Surrey. (*Tel. Spring Park 1579*).
- G3SWZ**, P. J. Davies, 25 Pembroke Road, Walthamstow, London, E.17.
- G3SXX**, B. J. Doel, Brooklands, Marconi Residence, London Road, Chelmsford, Essex. (*Tel. Chelmsford 51539*).
- G3SXR**, A. S. M. Read, Ready-money Cove, Fowey, Cornwall. (*Tel. Fowey 2112*).
- G3SXY**, E. J. Davis, 72 Northview, Westbury Park, Bristol, 6.
- G3SYC**, B. K. Booth, 49 Park Avenue, Normanton, Yorkshire.
- G8MG**, P. G. James, Windrush, Frances Avenue, Maidenhead, Berks. (*Tel. Maidenhead 27254*).
- G3COL**, H. Collins, 148 Greenway Road, Runcorn, Cheshire.
- G3EWP**, A. B. James, 26 The Greenway, Dairyfields, Trentham, Stoke-on-Trent, Staffs.
- GM3FIZ**, D. M. Sangster, 22 Raith Crescent, Kirkcaldy, Fife.
- G3FMI**, E. T. Wilson, Ashville, Old Hall Park, Guilden Sutton, Chester.
- G3GGI**, A. A. Laurence (*ex-MB9BJ*), 7 The Glen, Enfield, Middlesex.
- G3HIF**, A. Reid, 205 Mortimer Road, South Shields, Co. Durham. (*Tel. South Shields 60774*).
- G3IJU**, E. Briggs (*Overseas*, El Adem, Libya).
- G3JAY**, A. C. Richards, 41 Northwich Road, Knutsford, Cheshire.
- G3JFF**, M. J. Matthews, 32 Briar Close, Cowplain, Hants.
- G3KZW**, R. B. Ratcliffe, 43 Beacon Road, Billinge, Wigan, Lancs.
- G3NNS**, H. Johnson, Ledsham, 48 Abbotsford Gardens, Woodford Green, Essex. (*Tel. BUCKhurst 0306*).
- G3PAU**, B. J. Bestwick, Crimond, Lings Lane, Keyworth, Notts.
- G3PKA**, E. C. Harris, (*ex-VS9AKH*), c/o Officers' Mess, R.A.F. Station, Brampton, Hants.
- G3PTU**, D. J. Long, 16 Low Poppleton Lane, Acomb, York.
- G3RYY**, N. Penketh, rear flat, 72 Bryn Street, Ashton-in-Makerfield, Wigan, Lancs.
- GW3SLA**, J. Sugden, 7 David Street, Coldbrook, Cadoxton, Barry, Glam.
- G3SRX**, N. E. Down, 23 Lady Bay Road, West Bridgford, Nottingham. (*Tel. Nottingham 83106*).
- G5NN**, J. H. D. Ridley, M.B.E., Fir Tree Cottage, Singleborough, Bletchley, Bucks.

## CHANGE OF ADDRESS

- E1ST**, I. A. Lyon-Bowie, 42 Seafield Road, Blackrock, Co. Dublin.
- G2DBF**, J. F. Squires, M.B.E., 18 Wakefield Avenue, Northbourne, Bournemouth, Hants. (*Tel. Northbourne 3453*). (*Re-issue*).
- G3AYK**, T. Murgatroyd, 42 Derwent Avenue, Garforth, Leeds.
- G3BII**, A. R. Clark, 19 Lakes Lane, Beaconsfield, Bucks.

Regular readers of "Short Wave Magazine" are in touch with all the latest trends, developments and ideas in Amateur Radio

# THE OTHER MAN'S STATION

**G2HMK**

THIS is the *indoor* station of G2HMK, at 99 Brinkburn Drive, Darlington, Co. Durham, owned and operated by Thomas G. Brown, who started with an AA ("artificial aerial") licence in pre-war days. He is one of the comparatively few U.K.

amateurs, represented by about 700 or so entries in the current G listings, who, having held the AA permit (issued by-request prior to 1939) were automatically granted a full licence in 1946, without having to go through any "examination sieve." The active callsigns in this particular category fall in the present sequence G2AAM-G2HPF.

Getting back to G2HMK, the picture here shows a K.W. "Viceroy" Sideband transmitter on the top shelf, with a K.W. Linear Amplifier beside the speaker in the centre. At the lower, operating, position are the CDR beam rotator control, the K.W.-77 receiver, crystal microphone, RF output monitor and LPF unit. This equipment is installed in an alcove in the dining-room, which is very comfortable for operating during the bleak days of winter.

G2HMK also has a No. 2 station, outside in a wooden shack. This is an entirely independent



installation, and likewise is for SSB working only. It consists of an AR88D receiver and the transmitter is a home-constructed G5BJ-type crystal filter exciter into a 6AG7 buffer driving a TT21 linear running about 50 watts; this in turn pushes an 813 linear PA to full p.e.p. on 20 and 80 metres. The aerials used, for either station, are an 80-metre dipole and a Mosley TA-33JR. beam.

Main interests at G2HMK are ragchew QSO's on 80 metres, DX on the 20-metre band, and the acquisition of QSL cards. A good deal of constructional and experimental work is done in the No. 2 shack, in the comforting knowledge that whatever may be happening out there, the indoor station with its standard equipment is always instantly available to go on the air, for a bang-round on Eighty or Twenty. And there are many who would be glad to have such enviable facilities for their own indulgence in Amateur Radio.

Always mention "Short Wave Magazine" when writing to Advertisers — It helps you, helps them and helps us



# THE MONTH WITH THE CLUBS

By "Club Secretary"

(Deadline for May Issue: April 10)

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

ONCE again, the volume of correspondence from the Clubs is so great that there is no space for the usual preamble. We must apologise to those scribes whose voluminous remarks may have been cut down to a mere sentence, but space is limited, and we have tried to give all the important news. And so, straight into this month's Club reports—numbering 74 in all!

## CLUB ACTIVITIES

An interesting talk at **Ainsdale** was by G3OIR on an electronic clock mechanism, driven by a 64 kc crystal. Future meetings, April 5 (SSB Night) and 29th (general discussion, mostly aeriels and portables). QTH: 77 Clifton Road, Southport, at 8 p.m.

**East Worcestershire**, on April 8, will cater for the SWL's who are taking the May R.A.E. with a Questions-and-Answers session—be at the Old People's Centre, Redditch. **East Kent** have formed a Junior Section under G3RWB, who recently gave a talk on Transistor Transmitters for Top Band; G3LTY, the club station, now boasts an aerial 300 feet long and 60 feet high (!) and will be on 160 metres every Tuesday, 1930-2130.

Meeting at their new headquarters at Perdiswell Park, **Worcester** will be holding their Constructional Contest at the end of April; every Saturday, 7.30 p.m., for normal meetings. "Communications in the R.N.R." is the subject of the talk at **Burnham-on-Sea** (by Lt. Cdr. H. T. Lloyd) on April 14, at the Crown Hotel.

**Wirral** will have a Junk Sale on April 15, an Extra Meeting to discuss Field Day on the 22nd, and a Film Show by G3ERB on May 6—all at Harding House, Park Road West, Birkenhead. At **Cambridge** they held the biggest Junk Sale in their history on March 6, and the AGM was on March 20; the Club Dinner is on April 3, and a talk by G3PTB on the 10th.

**Sutton Coldfield** hold a contest with South Birmingham on April 5; on the 9th, a talk on Single-Transistor Converters for D/F (all members are building one) and on the 23rd, the finalising and testing of these receivers.

At their recent AGM, **Blackpool** elected Mr. F. W. Pontin as president, G3OPT chairman, G3OCX secretary with Mr. B. Yates as treasurer; the committee consists of G5ND, G3PNQ and SWL P. Sinclair.

The newly-formed club at **Leyton** meets in the Leyton Senior Evening Institute every Tuesday at 7.30 p.m. for a lecture, Morse practice and a cup of tea; new members will be cordially welcomed.

During March, **Reading** visited the 63rd Signal Regiment (T.A.) to see some of their radio equipment, and also went to the School of Electronic Engineering at Arborfield (R.E.M.E.). Their April meeting, on the 25th, will be devoted entirely to the SWL, and on May 30 they will be having a Surplus Sale—both meetings at the Palmer Hall, West Street, 7.30 p.m.

**Acton, Brentford & Chiswick** will be carrying out Comparison Tests on Receivers at their next meeting (April 14, 7.30 p.m., at the A.E.U. Club, 66 High Road, Chiswick). **Barnet** will be hearing from G3BPT on Port Communications on April 28—the Red Lion Hotel, High Barnet.

Meetings are held every Thursday at **Scarborough**, and continue to be well supported. On April 9, G3PEJ will talk on the HRO Receiver; on the 16th there is a talk entitled "Light," by G5VO; April 23, Field Day Plans; and April 30, Visits to Local Stations.

**South Yorkshire** notify us of a change of secretary—see panel for QTH. Their meeting-place is the Lord Nelson Hotel, Cleveland Street, Doncaster, and they plan a series of lectures using the club's own transmitter and receiver for demonstrations. Visits to places of interest have been arranged, and they hope to be in a position to project sound films later in the year. The Annual Dinner, in February, was very successful, with 30 members and wives present.

Fortnightly meetings continue for **Flintshire**, always preceded at 7.30 p.m. by Morse practice, with the main meeting at 8 p.m. On April 14 the subject is "Standardisation in Amateur Radio"; and on April 28 there will be a demonstration of Amateur TV by GW3JGA/T and GW3PCZ/T.

**Melton Mowbray** meet on April 23, but not at their headquarters, as it is the occasion for a visit to the station of G4MK, at 20 Iris Avenue, Birstall. The May meeting, on the 21st, will be a talk on 70 cm. Work, by G2FNW, who is well known on VHF.

**A.E.R.E. (Harwell)** meet in their Social Club on the third Tuesday of the month. They report considerable on-the-air activity, both HF and VHF, and their keenness on portable events is reflected in their decision, after being let down by sundry P-E generators, to purchase a 300-watt job for the club's own use. Quote from QAV: "There is a strong tendency for most of the club's affairs to be left to the hard-working core without whom practically nothing would have been achieved in the past . . ."

Does this ring a bell with other clubs ?

Arrangements for April at **Chester** are as follows : April 7, "Net Night" with operation on Top Band and Two ; 14th, Talk on The HRO, by G3JAZ ; 21st, Construction Contest Judging, by G3CSG ; 28th, Getting Going on Two, by G3EWZ.

A printed programme covering their syllabus right up to the end of the year has been circulated to members by **Midland**. Their meetings, normally on the third Tuesday, start at 7.45 p.m. in the Affiliated Societies Room at the Midland Institute, Paradise Street, Birmingham 1. April 21—Hints for Amateur Workshop Practice, by G6SN and G3KPT ; May 26 —lecture on Lasers and Masers, by speakers from Birmingham University.

### Anniversary

The **R.A.I.B.C.** (Radio Amateur Invalid and Bedfast Club) celebrated its tenth birthday with the February issue of *Radial*. During those ten years the Club, unobtrusively and with tact, has done most excellent work in helping handicapped amateurs, and we wish them every success in the next ten years. As they say, by 1974 they have every hope of celebrating something even more satisfactory. Incidentally, the interest of *all* amateurs in this Club is welcomed ; financial help, the donation of unwanted small parts, valves, and so on, and gifts of periodicals and technical literature will always be most gratefully received. The prime mover and organiser of **R.A.I.B.C.** affairs is Mrs. Frances Woolley, G3LWY (*QTHR*).

**Radio Club of Scotland** announce a link-up with the West of Scotland Tape Recording Society. The benefits of this "merger" have already been felt, since common club premises may now be shared ; a club station is now a possibility ; the library, blackboard and cine-screen are now permanent fixtures.

### Contest

The Newsletter *QSP*, withdrawn from publication by **South Birmingham**, has now been reinstated in a much improved form. In April they will hold their annual Inter-Club Top Band Contest with the Sutton Coldfield club, with two two-hour sessions (1000-1200 and 1800-2000) on April 5. On April 14 their monthly meeting will be at the Friends Institute, when G3JAO will give a talk on "Closed-circuit TV." In March the club joined forces with the Bournville group in a visit to the BBC short-wave station at Daventry.

A drop in membership is reported by **Uxbridge**, who hope to be able to compensate for this by attracting new members ; licensed amateurs, in particular, will be very welcome. Next meeting is on April 20, when there will be a lecture on Aeronautical Communications and Control-Tower Procedure, as well as a competition for SWL's. On May 4 there is to be a talk on Field Day Techniques.

**Civil Service** will have an informal meeting at the Science Museum on April 20, with a tape-recorded lecture on Transmitter Design and TVI, by G3BTM ; on May 4 the talk is by G2AOX and the subject Satellite Tracking and Prediction for Amateurs, on which he is an acknowledged expert.

There was a record attendance of 51 (including

six visitors) at the **Cornish** meeting last month. The club also reports a growth of membership. For the coming season they plan several outdoor events, including a Mobile Rally in late June, and they have a well-organised Contest Committee to look after these things. A recent talk was on Radio Astronomy, by G6LV, and the Club Dinner is on April 22 (Radio Gastronomy).

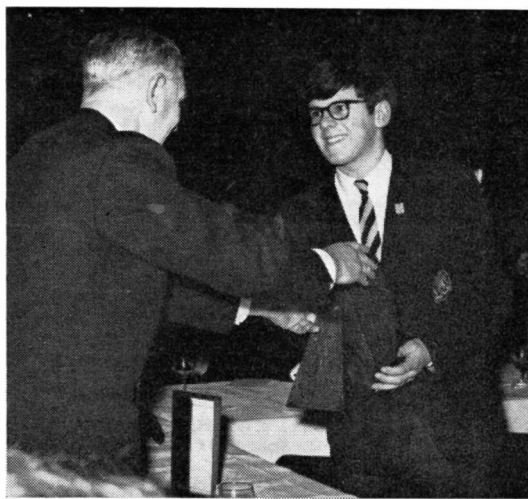
The two April meetings at **Southgate** (Atlasta Lodge, Tottenham Road, N.13) will comprise a talk by Acos Ltd. on the 9th and an open meeting on the 23rd. At the latter event there will be slow Morse, operation of the club station and possibly a technical demonstration ; but the main feature will be "an opportunity to talk freely about any topic that puzzles one"—in other words, a good natter about Amateur Radio.

A full month for **Spenn Valley** includes a visit to Leeds and Bradford Airport on the 9th ; a visit to Leeds Radio Club on the 15th ; a talk on Telstar on the 16th ; the Annual Dinner (Batley Park Cafe) on the 25th ; and a talk on the TW range by Tom Withers, G3HGE, himself on the 30th.

**Stockport** meets on alternate Wednesdays, 8 p.m. at The Blossoms Hotel, where new members and visitors from other clubs will always be welcome. On April 22 they will have a lecture on First Aid, with regard to electric shock, possible Field Day injuries and so on. As they say, "not quite radio, but very important." One of their oldest members is presenting a cup for a "home-built" competition which, it is hoped, will bring forth some really good equipment.

Meeting at The Wheatsheaf on April 14, **Dorking** will be discussing Operating Technique ; at the same place, a fortnight later, Planning for Field Day is the subject.

**Northern Heights** have their AGM on April 15,



At the recent annual dinner of the Derby & District Amateur Radio Society SWL P. Haddock was presented with the trophy for the best piece of home-constructed gear—in his case, a 13-valve receiver.

and a discussion on Medium-Wave DX'ing (Mr. D. Howell) on the 29th—both meetings at the Sportsman Inn, Ogden, Halifax, at 7.30 p.m.

**W.A.M.R.A.C.** remind members of two important events—their Second Activity Weekend, May 22-24, and their Third Wamfest, May 30. **W.A.M.R.A.C.** Net times and frequencies remain as stated in this column last month.

Shakespeare and the Quatercentenary keeps **Stratford-upon-Avon** busy, and their meetings on April 10 and 17 are described as "Preparation for Celebrations." On the 23rd their special station will go into action with the callsign **GB2WS** (no prizes for guessing the significance of this!). Their recent "Boasters' Night," when five members stood up

and talked about their own pieces of equipment, was very successful and well attended.

**R.A.F.A.R.S.** will celebrate their 25th anniversary with a Dinner and Hamfest in Weston-super-Mare on July 4, and on the following day there will be visits to the headquarters at R.A.F. Station Locking, combined with a Mobile Rally.

Meeting on Thursdays in their own clubroom at the rear of the Cottage Inn, **Stoke-on-Trent** will be discussing various subjects during May, including Optics, Industrial Electronics, Colour Photography and two local visits, one to the telephone exchange and one to Lichfield TV station. They will also be assisting **M.A.R.S.** at the Trentham Gardens Mobile Rally, April 19.

### *Names and Addresses of Club Secretaries reporting in this issue :*

**ABERDEEN:** J. McCall, GM3HGA, 1 Pinewood Place, Aberdeen.  
**ACTON, BRENTFORD & CHISWICK:** W. G. Dyer, G3GEH, 188 Gunnersbury Avenue, W.3.  
**A.E.R.E. (HARWELL):** C. Sharpe, G2HIF, Building 347B, A.E.R.E., Harwell, Berks.  
**AINSDALE:** N. Horrocks, G2CUZ, 34 Sandbrook Road, Ainsdale, Southport.  
**A.R.M.S.:** N. A. S. Fitch, G3FPK, 79 Murchison Road, London, E.10.  
**B.A.T.C.:** J. E. Tanner, G3NDT/T, c/o 4 Inwood Close, Shirley, Croydon, Surrey.  
**BARNET:** F. Green, G3GMY, 48 Borough Way, Potters Bar.  
**BLACKPOOL & FYLDE:** J. Boulter, G3OCX, 175 West Drive, Cheveleys, Blackpool.  
**BRISTOL:** E. J. Davis, G3SXY, 72 North View, Westbury Park, Bristol 6.  
**BURNHAM-ON-SEA:** D. W. Birt, G3GIW, 99 Stoddens Road, Burnham-on-Sea.  
**BURY:** J. Bennett, G3PVG, 21 Horwood Drive, Elton View, Bury.  
**CAMBRIDGE:** H. Lowe, G3PEI, 47 Hurst Park Avenue, Cambridge.  
**CHESTER:** R. Trickey, G3DRB, 31 Penzby Avenue, Chester.  
**CIVIL SERVICE:** G. Lloyd-Dalton, 2 Honister Heights, Purley, Surrey.  
**CORNISH:** W. J. Gilbert, 7 Poltair Road, Penryn.  
**CRAWLEY:** R. G. B. Vaughan, G3FRV, 9 Hawkins Road, Tilgate, Crawley.  
**CRAY VALLEY:** S. W. Coursey, G3JJC, 49 Dulverton Road, London, S.E.9.  
**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, Eastfield, Henfold Hill, Beare Green, Dorking.  
**EAST KENT:** D. Williams, G3MDO, Seletar, New House Lane, Canterbury.  
**EAST WORCS:** M. J. Nicholas, 12 Crabtree Close, Lodge Park Estate, Redditch.  
**ENFIELD:** R. Langston, 54 Poynter Road, Bush Hill Park, Enfield.  
**FLINTSHIRE:** A. Antley, Fairholme, Fairfield Avenue, Rhyl.  
**GRAFTON:** A. E. Bristow, 37 Tyndale Mansions, Upper Street, London, N.1.  
**HALIFAX:** J. Ingham, G3NBQ, Lambert House, Greetland, Halifax.  
**HARROW:** R. C. Ray, G2TA, Wintons End, Springfield, Bushey Heath, Herts.  
**I.H.C.:** J. Coote, 56 Dinsdale Avenue, Kings Estate, Wallsend, Northumberland.  
**LEYTON:** R. W. Firmin, 9 Raglan Road, London, E.17.  
**LIVERPOOL:** H. James, G3MCN, 448 East Prescott Road, Liverpool, 14.  
**LOTHIANS:** L. R. Richardson, GM3AKM, 39 Silverknowes Grove, Edinburgh 4.  
**LOUGHTON:** A. W. Sheppard, G3JBS, 11 Barfields, Loughton.  
**MANCHESTER:** D. H. Poole, 215 Greengate, Middleton Junction, Manchester.  
**MANSFIELD:** F. N. F. Bewley, G8HX, 116 Westfield Lane, Mansfield, Notts.  
**MEDWAY:** D. G. Quarrington, G3KSL, 11 Mill Close, Strood, Kent.  
**MELTON MOWBRAY:** D. W. Lilley, G3DFD, 23 Melton Road, Asfordby Hill, Melton Mowbray.

**MIDLAND:** C. J. Haycock, G3JDI, 360 Portland Road Birmingham 17.  
**MID-WARWICKSHIRE:** T. Inkester, 13 Dormer Place, Leamington Spa.  
**NORFOLK:** J. D. Simpson, G3NJK, 50 Vicarage Road, Norwich.  
**NORTHERN HEIGHTS:** A. Robinson, G3MDW, Candy Cabin Ogden, Halifax.  
**NORTH KENT:** B. J. Reynolds, G3ONR, 49 Station Road, Crayford.  
**NORWICH:** A. Halfacre (no address supplied).  
**OXFORD:** B. Green, G3PMI, 3 Barnet Street, Iffley Road, Oxford.  
**PADDINGTON:** J. E. Alban, G3JEA, 2 Warwick Crescent, London, W.2.  
**PETERBOROUGH:** D. Byrne, G3KPO, Jersey House, Eye, Peterborough.  
**PLYMOUTH:** R. Hooper, 2 Chestnut Road, Peverell, Plymouth.  
**R.A.F.A.R.S.:** R.A.F. Locking, Weston-super-Mare, Somerset.  
**R.A.I.B.C.:** Mrs. F. E. Woolley, G3LWY, 10 Sturton Road, Saxilby, Lincoln.  
**READING:** R. G. Nash, G3EJA, 9 Holybrook Road, Reading.  
**REIGATE:** F. D. Thom, G3NKT, 12 Willow Road, Redhill.  
**RODING BOYS' SOCIETY:** R. J. Phipps, 51 James Lane, London, E.11.  
**SCARBOROUGH:** P. Briscoe, G8KU, Roseacre, Irton, Scarborough.  
**SCOTLAND:** A. Barnes, GM3LTB, 7 South Park Terrace, Glasgow.  
**SHEFFIELD:** D. A. Justice, G3PYL, 314 Stannington Road, Sheffield 6.  
**SOUTH BIRMINGHAM:** A. E. Bishop Jr., 40 Cecil Road, Birmingham 29 (Acting).  
**SOUTHGATE:** K. Spicer, G3RPP, 22 Clifton Road, London, N.3.  
**SOUTH HANTS:** G. J. Meikle, G3NIM, 34 Victoria Road, Netley Abbey.  
**SOUTH LONDON MOBILE:** B. Negri, G3LXN, 17 Voltaire Road, London, S.W.4.  
**SOUTH SHIELDS:** D. Forster, G3KZZ, 41 Marlborough Street, South Shields.  
**SOUTH YORKSHIRE:** J. M. Heath, 235 Thorne Road, Wheatley Hills, Doncaster.  
**SPEN VALLEY:** N. Pride, 100 Raikes Lane, Birstall, Leeds.  
**STOCKPORT:** R. R. Diamond, G3SFN, 102 Chatsworth Road, Hazel Grove, Cheshire.  
**STOKE-ON-TRENT:** K. H. Parkes, G3EHM, 28 Grove Road, Heron Cross, Stoke-on-Trent.  
**STRAITFORD-UPON-AVON:** N. Smith, 54 Clopton Road, Stratford-upon-Avon.  
**SURREY:** S. A. Morley, G3FWR, 22 Old Farleigh Road, Selsdon, South Croydon.  
**SUTTON COLDFIELD:** K. H. Varney, G3DMV, 149 Whitehouse Common Road, Sutton Coldfield.  
**TORBAY:** Mrs. G. Western, G3NQD, 118 Salisbury Avenue, Barton, Torquay.  
**UXBRIDGE:** A. Duell, Treetops, Bakers Wood, Denham, Bucks.  
**W.A.M.R.A.C.:** Rev. A. Shepherd, G3NGF, 121 Main Street, Asfordby, Malton Mowbray.  
**WHITENESS:** D. Grigg, Whiteness Manor, Kingsgate, Broadstairs, Kent.  
**WIMBLEDON:** E. N. Hurle, G3RZN, 156 Monkleigh Road, Morden, Surrey.  
**WIRRAL:** A. Seed, G3FOO, 31 Withert Avenue, Bebington, Wirral.  
**WORCESTER:** G. W. Tibbetts, G3NUE, 108 Old Hills, Callow End, Worcester.  
**YEOVIL:** D. L. McLean, G3NOF, 9 Cedar Grove, Yeovil.

**Plymouth** are now meeting every Tuesday at Virginia House, and report a good mixed bag of events during March, and also a very successful Dinner and Social in February, which excelled last year's effort in every way. Parties from the Torbay and Kingsbridge clubs helped to swell the numbers.

The fourth Annual Dinner at **Crawley** was attended by about 50 people, and voted "the best yet." At the meeting on April 29, G3FZL and G3IIR will give a demonstration of Hi-Fi Stereo—visitors welcome. (We did not know that these two, so active on VHF and RTTY, also had this special interest in audio!)

Recent events at **Yeovil** have included a tape lecture on TVI, and a general ragchew—meetings every Wednesday, 7.30 p.m. at Park Lodge, Park Road, Yeovil.

**Peterborough**, for their March meeting, gathered in the Technical College Electronics Block and saw G3EEL and G3LOC demonstrate their home-built SSB rigs; G3HXR dealt with the special licence conditions concerning power measurement on SSB.

The Annual Dinner and Social at **Torbay** went off well, with 70 members and friends present. The various trophies were presented, with G3LHJ winning the Senior Construction Cup, Mr. P. Hunt the Junior; the SWL Cup went to Roger Western (now G3SXW), who also carried off the G3LFL Rose-Bowl; and G3LHJ won the 28 mc Cup.

**Wimbledon** held a Junk Sale in March, and their April meeting (on the 10th) will be devoted to judging a constructional contest; meetings are on the second Friday, at 28 St. George's Road, London, S.W.19.

The R.A.E. Refresher Course at **Bristol** will carry on until the actual date of the examination, and Morse classes still run; the Construction Group is busy on a two-metre converter. Their secretary is now licensed as G3SXY.

April meetings at **Paddington** will include talks by G8PL on Certificates and Awards, G3MHQ on Detection and Suppression of Spurious Emissions, a talk and film show by G3AWS, and a Junk Sale and Raffle. Every Wednesday, 7.30 p.m., in the club shack at 2 Warwick Crescent, London, W.2. The club station G3PAD is active on all the HF bands, and also on Two.

**Sheffield**, at their AGM, elected G3LWB president, G3JON "vice" and G3PYL secretary; they will be manning a station at the local Open Exhibition of Models and Handicrafts, signing GB3RCM. Next regular meeting, April 10 at the clubroom, 8 Sandbeck Place, Sheffield 11.



The boys of Whiteness Manor Radio Club had a party given them by the Top-Band amateurs of Kent and Essex and, among other activities and attractions, GB3WRC was put on the air, operated by G3REZ of Broadstairs. As a result of the efforts of G4FN, who organised the financial side of the event, the magnificent sum of nearly £38 was collected round the Kent/Essex amateur group. This effort having been such a success, with so much generous support, it is now hoped that, come the summer, it will be possible to give the boys (who are all cripples) a really good outing.

Regular Friday meetings continue at **South Shields**. Prizes were recently presented to the winners in their Transmitting and Receiving Contest, and G3SFL, who received the silver cup presented by the chairman, gave a talk on his entry—a mobile transmitter/receiver. A Mobile Picnic has been arranged for June 21, in addition to the Rally at Harewood House on July 5.

**Norfolk** have produced the second issue of their ambitious quarterly, *NARC Challenge*, from which we gather that meetings are held fortnightly, 8 p.m. on Mondays, at The Branford Stores, Norwich.

After a long absence, **Aberdeen** report that meetings are held every Friday, 7.45 p.m. at 6 Blenheim Lane. April 10, Talks by winners of the Building Competition; 17th, Practical Receiver Alignment; 24th, Work Night. **Bury** visited the Huncote power station—the first of a series of outside visits. G2HW gave a talk on Tx and Rx Testing, and club members went over to Eccles to judge that club's constructional contest.

**Norwich** report that their AGM will be held on April 18, 7.30 p.m. at the Festival House, St. Andrew's Street. **Halifax** will be hearing G2VO ("Around My Shack") on April 28, at the Beehive and Crosskeys.

**Manchester** will hold a Junk Sale on April 8; a business meeting on the 15th; and a talk by Mr. P. Futers on Radio Model Control on the 22nd. **Loughton** will be hearing G3MVV on Mobile Operation in Eire (illustrated by film) on April 10; on the 24th G3JBS will continue on the subject of Simple Test Gear. Meetings are on alternate Fridays, Loughton Hall, Debden Community Centre, Rectory Lane.

Some of the members of **Lothians** recently visited the Falkirk Club and were most impressed by the

welcome they got and the friendly atmosphere there. Lectures have covered SSB, Silicon Planar Transistors and some modern ideas on TVI Prevention.

**Mid-Warwickshire** meet on alternate Mondays, 7.30 p.m. in the Civil Defence Training School, Harrington House, Newbold Terrace, Leamington Spa. **North Kent** continue at the Congregational Church Hall, Bexleyheath, on alternate Thursdays, 8 p.m.

From **South Hants** we learn that the next Southampton Group meeting is on April 11. Four days after their normal March meeting they arranged a Beer and Skittles Party at the Rising Sun Hotel, Warsash; and in February they held a very successful Annual Dinner (43 present) at the Montagu Arms, Beaulieu. The March issue of their Newsletter, *QUA*, contains an article on Weather and Radio Propagation by Trevor Baker, the STV Met. Man.

On April 8 there will be a Technical Film Show at **Derby**; on the 15th they hold the first D-F Practice Event; on the 22nd G2CVV and G3JFD will give a talk, and April 29 is an Open Evening. **Surrey (Croydon)** report an average attendance of 50 at their meetings, with a steady flow of new members. Their AGM is on April 14 (Blacksmith's Arms, South End, Croydon) and April 26 is the date fixed for their visit to the Radio-Astronomy Observatory of Frank Hyde (near Clacton).

**Grafton** will re-open on April 10, and on the 17th begin their Spring programme with a talk and demonstration of Closed-Circuit TV. On April 24, G3JKY will cover the subject of D-F—a new one for this club. Various outdoor activities are planned for the summer.

**South London Mobile Club** report an excellent lecture on SSB, by G3JJG. They meet on alternate Saturdays, 8 p.m. at the Clapham Manor Baths. **Oxford** continue their meetings on the second and fourth Wednesdays at the Cherwell Hotel, Water Eaton Road (7.30 p.m.). Some interesting lectures have been arranged, notably by Heathkit (May 13) and Cathodeon Crystals (June 10). Rascal Electronics Ltd. are also booked for a future date.

The Annual Dinner and Dance at **Reigate** attracted 49 people and was a great success. The first programme at their new clubroom (at the George and Dragon, Cromwell Road, Redhill) will be on April 18, with a selection of films from the Electrical Development Association.

**Roding Boys' Society** have nearly finished their Top Band Transmitter, built on "Chassilets" as shown at the Radio Communications Exhibition. They now have their own call, G3SRE, all ready and waiting to be put into use. Their QTH is Wanstead House, The Green, London, E.11.

Over at **Medway**, they are working for new membership and the raising of funds for their own Hq. The committee, under the chairmanship of G3CHD, have planned a social meeting for April 11 and a Mobile Rally for May 3—it is hoped that

#### CLUB PUBLICATIONS RECEIVED

We acknowledge, with thanks, receipt of the following Club Publications:

**AERE, Harwell** (*QAV*, February); **ARMS** (*Mobile News*, February); **Cornish** (*The Cornish Link*, January-February, March); **Cray Valley** (*Newsletter*, March); **Enfield** (*Newsletter*); **IHHC** (*Newsletter*, February); **Midland** (*Newsletter*, February, March); **Plymouth** (*QUA*, March); **RAFARS** (*Newsletter*, No. 11); **RAIBC** (*Radial*, February); **Radio Club of Scotland** (*GM Magazine*, January and February); **South Birmingham** (*QSP*, March); **Stratford-upon-Avon** (*News Sheet*, January); **WAMRAC** (*Circular Letter*, No. 40); **Southgate** (*Newsletter*, March); **Norfolk** (*NARC Challenge*, Spring); **South Shields** (*Spectrum*, March); **South Hands** (*QUA*, March); **North Kent** (*Newsletter*, February); **Derby** (*Newsletter*, No. 1/64); **Reigate** (*Feedback*, February); **Surrey** (*SRCC Monthly News*, March); **Wirral** (*Newsletters*, Vol. 17, Nos. 2 and 3); **Crystal Palace** (*Newsletter*, No. 100); **BATC** (*CQ-TV*, No. 52); and **Medway** (*Newsletter*, No. 5).

after these events the first £100 required for the new headquarters will be in the kitty.

Having elected their officers for the year, **Mansfield** go forward with a membership of 42; meetings held weekly on Fridays, 7.45 p.m. at the Hope & Anchor, Union Street, these being mainly informal and social but with R.A.E. lectures and Morse instruction as required by members; and a financial position reported as good. Plans are in hand to get on the air from the Club premises.

The boys of **Whiteness Manor Radio Club** are doing well, with five entries for the May R.A.E., building and rebuilding of gear and, recently, a visit to North Foreland Radio, GNF. The club continues to have a lot of support from local amateurs, who take a practical interest in this school for crippled boys, and the summer is being looked forward to with the prospect of more outings.

**Harrow** continue with weekly meetings on Fridays, while up at **Liverpool** they get together on Tuesdays, 8.0 p.m., at the Conservative Club Rooms, Church Road—having held a very successful hamfest early in March, various lectures and discussions have been arranged to fill up April.

The **Crystal Palace** group maintain an attitude of friendly rivalry with the Clifton Club, the big event being the Quiz contest, taken in two rounds, one at each Hq., the subject being Amateur Radio in all its aspects. All sorts of activities are being planned for the next few months, and the Crystal Palace interests cover a wide range.

#### AMERICAN MAGAZINE SUBSCRIPTIONS

Readers who are interested in the American periodicals on Amateur Radio are reminded that we can accept subscriptions, or subscription renewals, at the rates given on p.66 in this issue. These are nett sterling charges for postal delivery by surface mail, direct from the American publisher.

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#### SITUATIONS

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**W**EBB'S LOG BOOK for recording signals heard and worked; 112 pages 9½ in. x 8 in. approved format, semi-stiff covers. Excellent value; 6s. 0d. post free. or callers. 5s. 4d.—Webb's Radio, 14 Soho Street, London, W.1.

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**F**OR SALE: Minimeter Amateur Bands Converter 10-80 metres, £14 o.n.o.? WANTED: R.206 or CR-150 receiver.—Atkinson, Brada, Beadnell, Cathill, Northumberland.

**S**ALE: R.107, excellent condition, £12 10s. Ex-Government PSU, 0-700 volts regulated, £25; or exchange for CR-100, AR88.—Gorrill, 4a Southgate Parade, Crawley, Sussex.

**S**ALE: CR-100 with noise limiter, needs re-lettering, £12; buyer collects.—Denham, 28 Medley Road, Greet, Birmingham, 11.

**£10** offered for HT-11 Tx/Rx. Consider any Tx/Rx covering 1.5 to 4 mc.—Cain, 18 Oakby Balks, Alnwick, Northumberland.

**W**ANTED: K.W. "Valiant" Tx (without power supply) 10-160 metres, working order.—T. Kennedy, 22 Main Street, Spittal, Berwick/Tweed.

**W**ANTED: Key type J36 or similar.—Details to G3LLZ, 51 Norman Road, Swindon, Wilts.

**S**ALE: AR88LF, silver-grey hammer finish, excellent condition, £40 o.n.o.?—M. Simpson, 21a Upper Richmond Road, Putney, London, S.W.15.

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**COLLINS 30L-1 Linear, new 1963, absolutely perfect. Hallicrafters S.36A VHF receiver 27-143 mc, v.g.c., offers?** —(Tel. Blidworth (Notts) 2138.)

**SALE:** Command 80-metre transmitter, 50s.; Command plate modulator, 50s. Transmitter/Receiver BP5 1.9-8 mc, £7; BC-348 drive, dial, gang, coilpacks, £2.—G2DPD, 3 Raymond Way, Claygate, Esher, Surrey.

**WANTED: AR88D in perfect working order. Please call or write—L. Ling, Cherrells, Mill Lane, Bethersden, Nr. Ashford, Kent.**

**FOR SALE:** Minimitter MR44/II, requires slight attention; first offer over £28 (free carriage within 100 miles).—G3PRI, 142 Belle Vue Road, Cowes, I.o.W.

**SALE:** ZC1-Rx/Tx, 12 volts, £3 each. German (Lorenz) EK-10 Rx, 3.6-25 mc. **WANTED:** Mini-mitter mobile Tx; 80m. Mobile Rx. W.H.Y.?—GM3PIP, 50 High Street, Strichen, Aberdeenshire.

**FOR SALE:** RF Amplifiers No. 2 Mark II, to increase range of wireless set No. 19 Sender, same size; dial frequency as W/S 19; self-contained rotary transformer 12-600 volts, 240 mA.—Cooper, Churchfield Road, Outwell, Wisbech, Cambs.

**EXCHANGE:** Exa 11 SLR, f 2.8 50mm. FAD Domiplan, plus cash, for Rx. Will pay carriage. Details to—Box No. 2985, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

**WANTED:** Preferably buy, manual for AR88LF receiver.—J. B. Letts, 81 Tennis Court Drive, Humberstone, Leics.

**TWO** prop-pitch motors, complete and fitted with Telsyns, £12 each. One cowl-gill motor, £4. One CDR motor with indicator, £8.—Yates, G3LB, 134 Whitcliffe Lane, Ripon, Yorks.

**WANTED:** Table top CW/AM transmitter, TCS-12, Vanguard or similar. Letters to—Bennett, 93 Horsneile Lane, Bracknell, Berks.

**30s. offered for Hallicrafters S36A manual (not S36), or can exchange S36 manual.**—J. Jackson, 25 High Street, Crail, Fife.

**R.107**, S-meter, good condition, £8. Minimitter, phone/CW mobile transmitter, £12. Minimitter mobile control box, £3; both mint.—G3LBO, 10 Glendale Avenue, Garforth, Nr. Leeds, Yorkshire.

**HRO** Table Model, nine GC coils, PSU, speaker, K.W. converter, £30.—Wilson, Orchard House, Sutton Green, Guildford. (Tel. Guildford 5783.)

**SALE:** R.208, new valves, perfect condition, £8 o.n.o.? Buyer collects.—Smith, 116 Mantogomery Street, Hove, Sussex.

**WANTED:** All-band Tx, QRO or QRP, for school club—will consider part built—prefer (and will collect in) Birmingham.—Radio Club, Sir Wilfrid Mortineau Upper School, Birmingham, 33.

**FOR SALE:** G3HSC Morse record, seven 1964 Amateur Radio handbooks including *World Radio Handbook*, *How to Listen to The World*; all brand new, 55s.—B. Popely, 49 Eden Grove, Morpeth, Northumberland.

**SALE:** HRO senior table model, coils, charts, AC and DC packs, £25.—Shadlock, Cleveland View, Ackworth, Pontefract, Yorks.

**DX-100U** for sale, very little used, £60. Delivered 100 miles.—J. Wilmott, 59 Green Lane, Eastwood, Leigh-on-Sea, Essex.

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—Write or phone 46334 to ascertain still unsold.  
G2NS, 31 Cranleigh Gardens, Southbourne,  
Bournemouth, Hants.

**W**ANTED: R.107 and manual, description of  
any modifications made, must be v.g.c. elec-  
trically.—D. P. Francis, 17 Glasgow Road, Ports-  
mouth, Hants.

**T**IGER TR-60X, 10-160m., TT21 PA, BK keying,  
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Going mobile.—G3SFS, 32 Maitland Road, Wood-  
thorpe, Nottingham. (Phone 61855.)

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—G3RDQ, 7 Chatsworth Road, Cheam, Surrey. (Tel.  
FAI 5929, evenings.)

**W**ANTED: VHF receiver 60-120 mc, or transistor  
portable. Price and particulars to—Box No.  
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London, S.W.1.

**G**3MAO going silent-key wishes to dispose of  
G Geloso G212 Tx, 160 to 10m., £46; also 160m.  
Tx/Rx with vib. PSU.—(Ring GUL 4261.) (No  
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**C**R100/2, grey hammer finish, £10, prefer buyer  
collects; also valves 12AT7, 1625, 2s.; ruggedised  
12AU7, 3s.; E180F, 4s. plus postage.—GW3ROG,  
28 Goshen Street, Rhymney, Monmouthshire.

**K.W.** Geloso converter, complete with built-in  
mains power supply, in as-new mint con-  
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with wide-band coupler and valves; both built on  
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Lamberts Castle, Marshwood, Nr. Bridport, Dorset.

**S**ALE: Geloso 209 Rx, 160-10 metres, fully band-  
spread, very good condition, £55 o.n.o.?—A.  
Calvert, 2 Littleworth Lane, Old Rossington,  
Doncaster, Yorkshire.

**F**OR SALE: Eddystone 940 receiver, 550 kc to  
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manual, little used, as new, £75. HRO-MX receiver  
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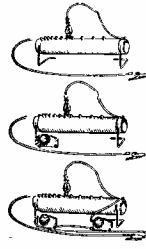
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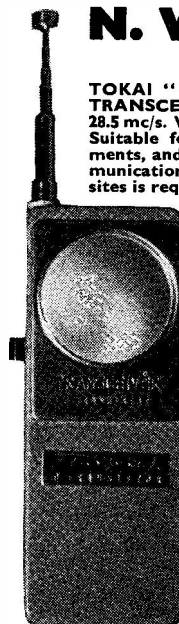
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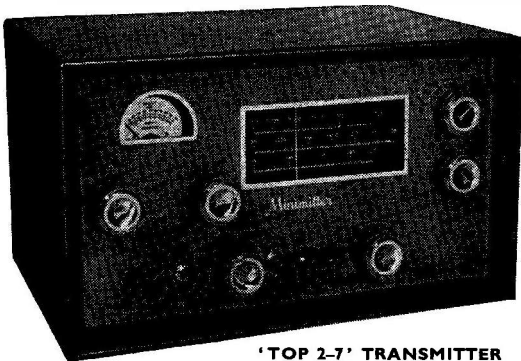
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**FOR SALE:** R.107, fitted S-meter and HRO dial, handbooks and AR88 speaker, £15. Minimitter amateur band converter (1.5 mc IF), as new, £12. Panda Explorer 150w. Tx with Minimitter low-pass filter, £45.—Green, The Cottage, Mill House Farm, Fulmer, Slough, Bucks.

**BC-312N** Receiver 1.5 to 18 mc, AC mains, speaker, working, £10. BC-348N receiver, 1.5 to 18 mc, AC mains, speaker, working, £7 10s. 30 feet 1 1/2-in. alloy tube, 27s. 6d. AC mains beam rotator, 50s.—*Phone Trevelyan 8141*; write Briscoe, 335 Eton Road, Ilford, Essex.

**FOR SALE:** G2DAF receiver, built to original design using *Electroniques* coils and transformers, every component brand-new including *Eddystone* 898 dial and Jap S-meter, full coverage of 10-metre band; silicon rectifiers used in power supply; receiver working but requires alignment. Offers, or exchange good general coverage receiver.—Box No. 2987, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

**K.W.** "Vanguard" 10 to 160 metres, mint condition, as new; new style cabinet; £45 or offers?—G3MXZ, 58 Rochester Road, Middlesbrough, Yorks.

**SALE:** Eddystone S.640 with S-meter, speaker and handbook, £25. "Vanguard" Tx 10-160m., £45; both in excellent condition, 522 2m. Tx in case with PSU and mike, TVI vetted, £10. High-capacity 6v. car battery, 50s. H.M.V. car radio, works fine but needs PSU, £3. Vibrator PSU, 6v., 10s.; 28v., 5s. Various 6v. and 12v. valves, 2s. 6d. each. 832 valves, 10s. each. All carriage extra. Various 3 cm. waveguides, loads bits-and-pieces; state requirements.—Belcher, 7 Savill Road, Lindfield, Sussex. (*Lindfield 2050*.)

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**FOR SALE:** Labgear "Topbander," plate-and-screen mod., 5 months' old, cost £29, accept £19, including carriage, going HF.—GI3SMO, 9 Coleraine Road, Portstewart, Co. Derry, N.I.

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**QST** bound volumes (2 per year) 1947-'50, loose 1951-'61; **CQ** bound '48-'51, loose '52-'54; **Bulletins** bound Vol. 12-27, loose '28-'35; **Short Wave Magazine** Vol. 4-18; offers, including postage, to—Bazley, Three Willows, Rushock, Nr. Droitwich, Worcs.

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**SALE:** S.36A 27-145 mc; S.27CA 130-210 mc; SHRO 1475 2-20 mc; Signal Corps repeater T.G.30 Terminal. Write—R. W. Hilton, 8 Hogshill Lane, Cobham, Surrey.

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**SHACK CLEARANCE:** Class-D Wavemeter with speaker, £4. 465 kc IF/AF amplifier, £2. 250/6-3v. PSU, £1. Also many components, books; cheap. Buyer collects.—K. Adhins, 72 Courtenay Avenue, Harrow, Middx.

**EXCHANGE:** ARRL Handbook, 1963 edition, good condition, for RSGB ditto.—Hart, 117 Windermere Avenue, Kirk Hallam, Ilkeston, Derbs.

**WANTED:** Minimitter telescopic mast; Mosley TA-33 Junior; CDR rotator.—Stead, 2 Cliff Road Gardens, Leeds 6. (All letters answered.)

**EXCHANGE:** German Kodak Retina II S in absolutely mint condition, indistinguishable from new; four-element 45 mm. Xenar f/2-8 lens, automatic exposure meter with coupled range-finder, etc., complete with E.R. case, cost £57—FOR mint LM-14 frequency meter and small cash adjustment, or W.H.Y.?—Osborne, G4OV, Pucks Knoll, Lamberts Castle, Marshwood, Nr. Bridport, Dorset.

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SMALL ADVERTISEMENTS, READERS—continued

**SALE:** Eddystone 670, £15. Minimitter MR-44 Rx, latest mods. by manufacturer, £28. New Perdio Portorama transistorised 8½-in. television, complete with batteries, £50. Uming Phonomatic 8 mm. projector, £25. Mohican GC-1U Mk. II, factory built, £25. All items carriage extra.—Wilson, 13 Lumley Avenue, Skegness. (Tel. 1623.)

**TIGER 200,** just overhauled by makers, £65 o.n.o.? Buyer collects.—G3TF, 38 Wrottesley Road, Tettenhall, Wolverhampton. (Phone W'ton 51441.)

**EDDYSTONE 770R VHF Receiver,** 19-165 mc, AM/FM/CW, excellent condition, £110 or offer; free delivery Midlands, S. England. Also new service manual for Collins 75A-4 receiver, 35s.—D. Walch, 9 Pembroke Street, Oxford.

**DX-100U Tx,** only 6 months' old, works assembled and modified for SSB Adaptor, crated, £68. Write—Pat Spashett, G3RX, Bungay, Suffolk. (Phone Bungay 88.)

**WANTED:** Mosley TA-33Jr. beam; state condition and price.—G3RUX, 39 Park Lane, Pinhoe, Exeter, Devon.

**BRT-400, Gonset G66B, MCR1, Minimitter mobile** transmitter, control box, power supply, ZC1 AN/PPN2, S450B, FM tuner, R.209 tuner, new transformers, valves, crystals, etc. Large s.a.e. for lists.—G3ERB QTHR.

**GENUINE Collector** requires all types of miniature or suitcase Tx/Rx—as were used by the Polish, French, Dutch Resistance—such as type A.1A Mk. II, BP5, Type 3 Mk. I, S-phone, etc. Also accessories, attachments and handbooks relating to this type of equipment. Good price paid.—M. Gee, 11 Whitehorse Lane, Stepney, London, E.1.

**CANADIAN 29 Set,** unused, £5. Mains regulator 500 VA, 30s. Transistor stab. PSU, new, £8; BC-348. Dozens other items; 200 valves, all cheap; s.a.e. list.—Holland, Birchfield, Theydon Mount, Epping, Essex.

**FOR SALE:** Marconi B.28 Communication Receiver, 60 kc-30 mc, good condition, £15 o.n.o.? Buyer collects.—P. Lacy, Worcester Road, Ledbury, Herefordshire.

**PSU** Wanted: 600v. PSU, 100-150 mA, 350v. 100 mA. Write—C. Morgan, 3 Nibloe Terrace, Penydarren, Merthyr Tydfil, Glam.

**MULTIBAND** Antenna traps, 80-10m. high efficiency, superbly finished, only 45s. pair. Silicon diodes 1000 p.i.v. at 500 mA, 9s. OC44, 45, 81, 81D, 3s. 6d. OC170, 4s. OC171, 4s. 6d. BM3 xtal Mic., 37s. HE30 and HE40 communication Rx. All plus p. & p.—Wakeley, 70 Arnold Road, Binstead, I.o.W. (Ryde 3231.)

**TWO** exceptional receivers: AR88D with S-meter, IF gain, £30. Hallicrafters S.27, £25.—(Tel. Collingham Bridge 3205.)

**SELL/EXCHANGE:** HRO-5T (table model), power unit 697, five bandspread coils 3.5-7-14-21-28 mc, coil box, handbook, mint, £30. HRO (table model), power unit 697, set "JR" coils 1.7-30 mc, coil box, handbook, £16. Spare HRO coils 14-30 mc, 3.5-7.3 mc, 180-460 kc, 15s. each. Codar preselector PR-30X, new, £6. American Heath Q-mult. QF-1, £4. Class-D Wavemeter, £2. K.W. "Vanguard" 160-10m, £30. Marconi receiver AD.118, 125-510 kc and 2-18 mc, turret-tuning, crystal filter, crystal calibrator (in oven), film-scale dial, internal mains power unit, almost as much bandspread as an 888, circuit, £16. **WANTED:** BC-221 or LM-14 and VF-1U and Heathkit RA-1 receiver.—Stone, 1 Emperor's Gate, London, S.W.7.

SMALL ADVERTISEMENTS, READERS—*continued*

**600-WATT** table-top Linear with pair of 4X150A valves, self contained silicon PSU, £60. AR88LF less cabinet, £30. HRO-MX, six GC coils, PSU and manual, £20. BC-221, no PSU, £10. TA-33Jr., £10. Vibroplex original model, *de-luxe*, £5. All above items in first-class condition and will deliver in U.K.—GW3NAM, F. Meredith, 102 Pontypridd Road, Barry, Glam.

**WANTED:** B2 Tx (consider Tx/Rx) TA-12 Tx or any small 14 mc CW Tx; also BC-348 or BC-342 Rx. All letters answered.—Box No. 2988, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

**FOR SALE:** 2m. Converter, 28/30 mc IF, internal power-pack, with unused 5-element 2m. W.S. Yagi, £6; p/p extra.—K. Scott, 122 Woodchurch Road, Birkenhead, Cheshire.

**SALE:** AR88D, £32. Labgear Top-Band Tx, £17. Mosley two-element tri-band beam, £12. G8KW trap dipole with full length feeder, £3 10s. All good condition, carriage paid.—Box No. 2989, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

**EDDYSTONE 840C** receiver, *spotless condition*, used one month only, buyer collects. Green & Davis 2-metre converter, 24-26 mc IF, as new, £5 10s. RF-27, 15s. Transformer: pri. 240v., sec. 6-3v. c.t. 5A twice, 6-3v. 5A, 10s. Oxford.—Box No. 2990, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

**TOP BAND** Tx, PSU and key filter, £7. Details—G5RS, 20 Hedgeway, Guildford, Surrey.

**WANTED:** Bug key and faulty equipment. SALE: 1957 ARRL *Handbook*, 15s.—G2VV, 53 Thames Street, Sunbury-on-Thames, Middx.

**FOR SALE:** New Brookes Crystals: 10,000 kc and 15,000 kc, B7G mounting, 6s. each.—Carter, 4 Green Man Court, Feltham, Middx. (Fel 6955.)

**HAMMARLUND HQ-145X** with crystal calibrator, cost £145 when purchased, 48 hours' use, only £95.—Ewert, 41 Hayes Chase, West Wickham, Kent. (Spring Park 5989, week-ends only.)

**QQV03-20A's** new, 25s.; QQV07-40, new, boxed, 27s. 6d.; 12SF7's, new, boxed, 8s. 6d.; 12AT7's, special quality version, 3s. Command Receivers, 1-5-3 mc, £9; 3-6 mc, £4 10s.; both brand new, original cartons. HRO S-meter, 35s.; O/P xformer, 17s. 6d., both new. Complete set AR88 knobs, 32s. 6d. Browns Type "F" phones, brand new, 21s. 500  $\mu$ A meters, 3in. scale, 22s. 6d.; all plus postage. **WANTED:** SX-100, AR88D, in first-class condition; also manual, trimming tools, original S-meter, cabinet and complete "D" chassis for spares.—Box No. 2991, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

**FOR SALE:** CR-100 Rx, needs attention, £8; new CR-100 handbook, 50s., Creed 3X teleprinter, £9. All plus carriage. **WANTED:** Circuit for FSK drive unit FSK2, information on teleprinter YBO2251.—B. Robertson, 9 Holbeck Lane, Cheshunt, Herts.

**WANTED:** Creed Auto-Tx 6S or similar. BC-950 Tx, R.209 Rx, BC-620 set, Rx to cover approx. 1200-6000 mc but must cover 23 cm. band (R.1619, etc.). W.H.Y.?—Box No. 2992, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

**QUAD Bamboos**, seven available, 12ft. 3in. long, 1½in. butt, original cost 12s. 6d. each, 35s. plus carriage.—G2DC, Morseden, Hightown Hill, Ringwood, Hants.

**FOR SALE:** DX-40U and VFO, £25.—GW3OSV, Park East, Clarbeston Road, Pembro.

**WANTED:** For mobile, Top Band Command Rx, no junk.—Derrick, 23 Withins Close, Bolton, Lancs.

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**V.H.F. RECEIVERS PI04**. Similar to R1132 but crystal controlled. Supplied in good condition, £3/10/-, carriage 15/- . Covers 100 to 150 mc/s. 13 valves. Matching power unit 230v. AC, £2/5/-, carriage 10/-.

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#### SMALL ADVERTISEMENTS, READERS—continued

**BUSH** FM mains radio, £10 10s.; new CR-100 manual, 35s. £15-£18 paid for recent 840A.—Box No. 2993, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

**SALE:** Late model DX-100U (QRP mod. on band-switch), good condition; small mod. for RTTY keying not affecting normal operation; prefer buyer inspects and collects, £55, plus carriage.—G3HVB *QTHR.*

**HRO**, PSU, rack mounting, GC coils 1.7-30 mc, cabinet fair, electrically OK, £10. Additional coils 80-40-20 B/spectrum, 30s. each. BC-453 modified, working, £2 10s. *Electroniques* Q-coilpax unused, 160-10m. B/spectrum, two 1.6 mc, two 85 kc IF's, £6 10s. or offers? WANTED: BC-221, "Valiant" or similar Tx.—G3DSV, 14 Edgcombe Park Drive, Crowthorne, Berks.

**PADDLE** for El-bug, 30s. 620/375v. transformer with two chokes, 40s. UM2, 40s. Carriage extra. G3IRM, 22 Hervey Road, Bury St. Edmunds, Suffolk.

**HALICRAFTERS** S.36, 28-143 mc with handbook and 230-110v. transformer, AM/FM, accurate frequency checking of VHF circuits up to 144 mc, BBC sound, etc., very good condition, little used. Also Collins Rx TCS-12 and power supply, £30 complete.—Box No. 2994, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

**SCANDINAVIAN** Amateurs are constantly requiring the following receivers (working or not): AR88D, CR-100 (especially CR-100/8 mod.), BRT-400, HRO-5T, BC-348, BC-342, PCR3, second-hand Eddystone, Hammarlund, and Collins receivers, etc. Cash payment and collection from your shack within 200 miles London.—Brian J. Ayres, 21 Grange Road, Chessington, Surrey. (Lower Hook 2000.)

**WM3** E.M.I. precision Oscilloscope, perfect order, £25. Brand new CT53 signal generator 8.9 to 300 mc, £14. Murphy TPG11 pattern generator fully interlaced, £8. TS87AP RF power meter 40w., £2. TS-193 crystal test set, £2 10s. Pair HP18A Marconi 12v. mobile transceivers modified 144 mc, complete with crystals, £14 the two. Also TR-1520 24v. modified 144 mc, complete, working, £4. Brand new Lustraphone L.FV 59 table microphone (cost £9 = £6). Vitavox B50 handmic, brand new, £4. Unused Trix M88 (cost £26 = £10). Reslor RBL/WS, brand new, £8. Mullard UHF Tuner, brand new, 50s. Fidelity tape recorder, unused, less amplifier, BSR tape deck, £7. Staar mains autochanger, unused, 75s. Post extra.—V. Cedar, 2A Convent Hill, London, S.E.19. (LIV 8489 after 7 p.m.)

**10 amp 50 p.i.v. silicon diodes**, brand new RCA, 4 for 25s. FT-243 crystals 7000, 7025, 7050, 7075, 7100, 7125, 7150 kc, £1 the lot. Valves, brand new (2) U18, (4) UR150/30, (3) EF37A, (3) EL32, (4) 6SJ7, (4) 6SK7, (6) 12AT7, 3s. each, 8 for 20s. DG7-5, 25s. Taylor model 703, 5A M.I. meter, 30s. Post extra.—V. Cedar, 2A Convent Hill, London, S.E.19.

**WANTED:** TCS-12 and Top Band Command receiver. **FOR SALE:** Various small items, cheap, s.a.e. lists.—Thompson, Mere Close, Hull Road, Hornsea, Yorks.

**WANTED:** CDR-AR22 beam rotator motor unit, must be in good condition; indicator unit not essential.—C. J. Spackman, 175 Marlborough Road, Swindon, Wilts.

**CR-100** (B28) with alignment instructions, circuit diagram, etc., delivered free 50 miles, £15.—Howell, G3GUP, 164 Beeches Road, Chelmsford, Essex.

SMALL ADVERTISEMENTS, READERS—continued

**F**OR SALE: 80w. 2m. Tx, works well, spare valves, £16. DX-40U, 3 xtals, good condition, £16. Power supply, 600v. 100 mA, 270v. 150 mA, reg. 0-100v. bias, 6-3v., in cabinet, £8. Buyer collects.—G3JDN, 14 Rushetts Road, Reigate, Sy.

**E**DDYSTONE 640 receiver, £18—or would exchange for Tokai "Walkie-Talkie." Canadian 58 transmitter-receiver, £8. 48 Set receiver, 30s.—Box No. 2995, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

**C**R-100, good condition, complete with ATU manual and loudspeaker, £18 o.n.o.?—Jones, 53 Ipsden Buildings, Windmill Walk, London, S.E.1.

**F**OR SALE: AR88LF, £35 o.n.o.? Prefer buyer collects. Will exchange walkie-talkie equipment.—Koester, 38 Manor Avenue, Hassocks, Sussex.

**R**TTY SCOOP: New unused ATM model FSY terminal, AFC/BFO, and power units from Sweden. Sell or swap for good SSB gear, receivers, etc., s.a.e. details.—Owen, G2FUD, 184 Hale Road, Hale, Cheshire.

**H**AMMARLUND SP600-JX for sale (list £490), perfect condition. Offers, or exchange for smaller receiver with cash adjustment or W.H.Y.?—Box No. 2996, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

**O**FFERS FOR GELOSO 2m. VFO 4/103, 62 Tx/Rx 1-6-10 mc, 12-volt 68P battery Tx/Rx Top Band, U.S.A. VFO unit.—Box No. 2997, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

**H**RO-MX, 7 coils, PSU, speaker, manual, spare H valves, £18. Top Band Tx, 10 watts CW/Phone, PSU, £7.—Walsh, 110 Westbourne Road, Marsh, Huddersfield, Yorks.

**E**DDYSTONE 888A including S-meter and mounting blocks, £70.—Downs, The Woodlands, Grange Road, Biddulph, Staffs.

**W**ANTED: The Handbook and/or circuit of the Marconi CR-100 (Admy Patt. W2835'D') receiver.—Colin Waters, 14 St. Wilfreds Road, Corbridge, Northumberland.

**F**OR SALE: Table-top AM/CW Tx, 10-80 metres, 120w. to 6146's. Plate mod., Geloso VFO, TVI proofed, £20. Buyer collects. G2AMX. (Phone Farnham Common 1582.)

**B2** Tx/Rx/PSU, £10 o.n.o.? Circuit also VFO and modulator. BC-348R (mains), £12 o.n.o.? Reasonable delivery. 160m. CW/Phone Tx; Avominor; 40/80m. TU7B VFO; TU7B unit. Offers?—Bruce, 437 Helmsshore Road, Helmsshore, Rossendale, Lancs.

**H**EATHKIT Telephone amplifier, new, battery, £7. Grundig TK-14 recorder, mint, few hours' use, with tape, £29. Two new 417A's, 25s. each. Heathkit R/C Bridge, mint, £9 10s. All carriage paid. WANTED: 72 mc xtal.—GW3MFY, 1 Bryntririon Hill, Bridgend, Glam.

**L**M-14, excellent condition, £15. R.1475 (2-20 mc), £7 10s.—A. King, Angel Hotel, Cardigan, Wales.

**T**WO-METRE and four-metre crystal controlled cascode converters, several IF's, £6; or with PSU, £7 10s. 4-metre 10-watt Tx, with inbuilt AC PSU, aerial change-over relay, receiving converter (14 mc IF) AM phone, with mic. and in cabinet, £12. Large battery charger, variable up to 50 volts at 7 amps, metered, with silicon rectifiers, £8. 160-metre Tx, RF section in T.U. case, £4. Miniature oscilloscope, very comprehensive, with DG7-5 CRT, working, but needs finishing, £12. Many P.O. relays, 5s. each (s.a.e. details). All items guaranteed, postage extra.—B. M. Sandall, 21 Dale View, Ilkeston, Derbyshire.

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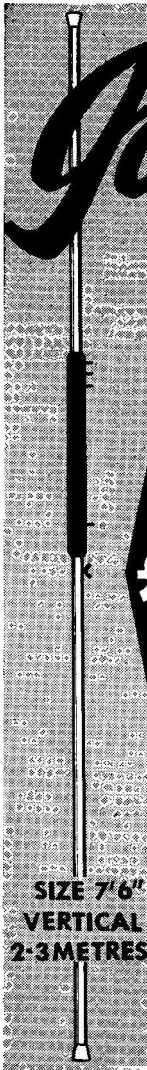
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## SMALL ADVERTISEMENTS, READERS—continued

**SALE:** Panda PR-120V 150w. Tx, excellent condition, £45. Buyer collects.—Powell, The Coppice, Gibraltar Lane, Dunsley, Kinver, Staffs. (Tel. Kinver 2642.)

**FOR SALE:** Collins 75S-1 with 0.5 kc filter and 455.8 kc crystal (fitted by Collins at £40), brand-new factory condition owner's standby receiver. Receiver cost new £275. Also Barker-Williamson 5100-B Tx with 51SB-B generator, factory condition, used only few hours, cost £405. These are specimen equipments for those who require first-class condition; only sensible offers, please. **WANTED:** Similar condition Collins "S" line accessories, must be in factory condition, prices and full details, please.—Box No. 2998, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

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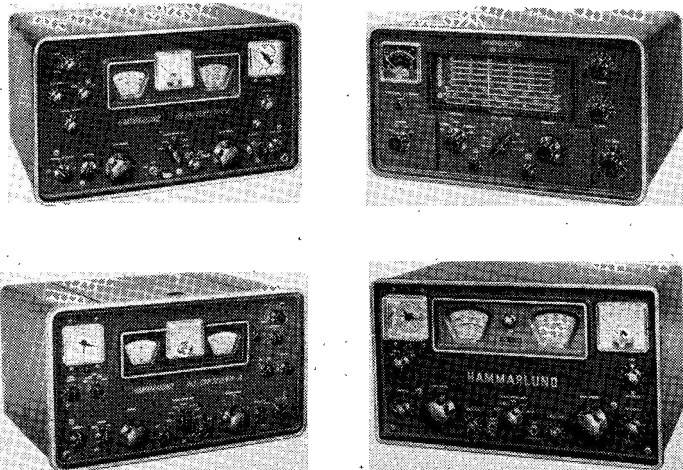
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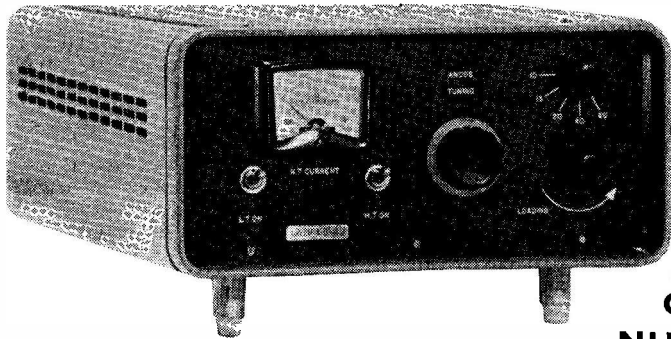
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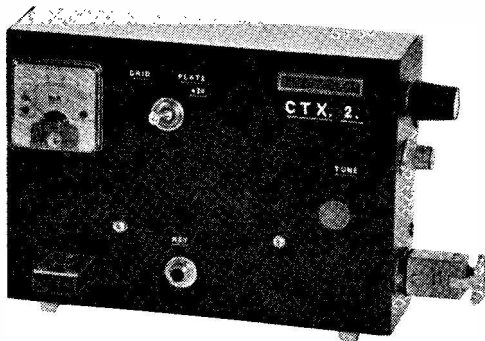
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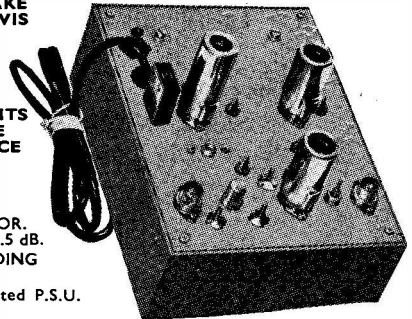
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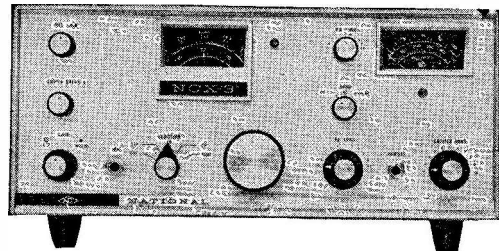
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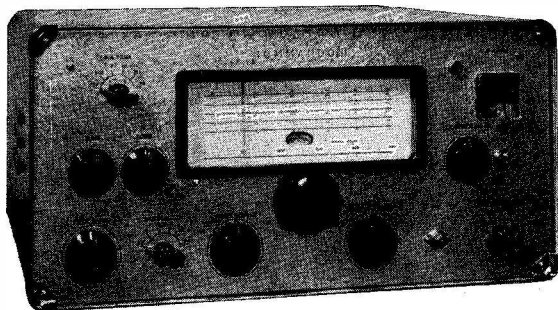
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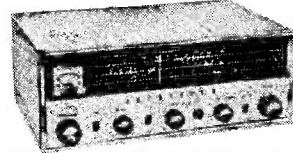
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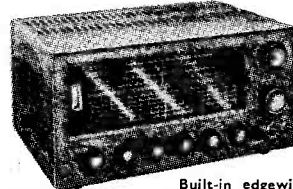
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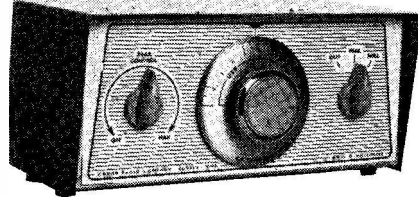


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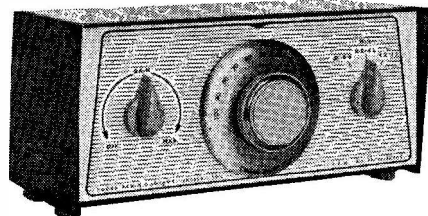
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Frequency range 1.5–30 Mc/s.

Substantially improves the performance of any superhet receiver



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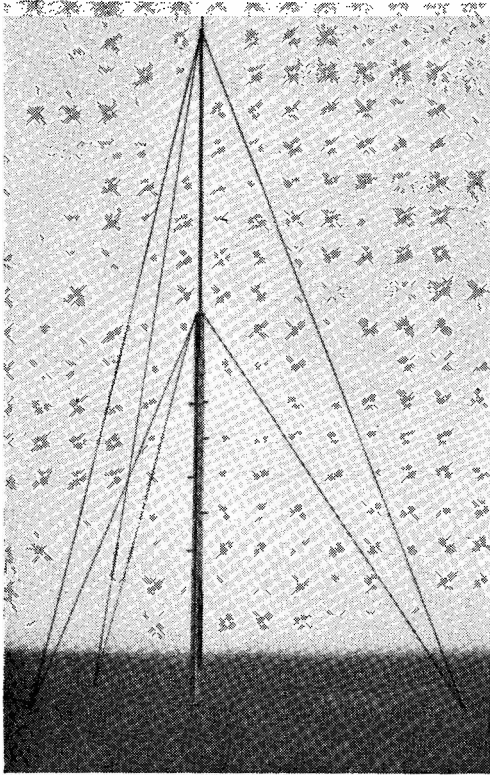
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# SHORT WAVE MAGAZINE

(GB3SWM)

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Vol. XXII                      APRIL, 1964                      No. 246

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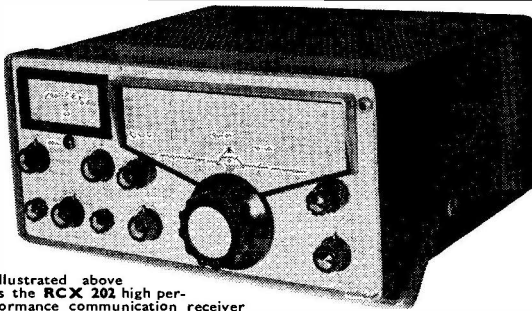
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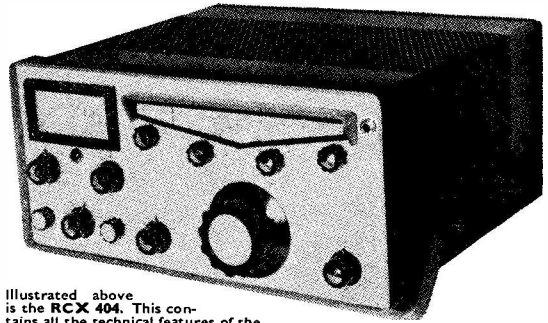
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E.&O.E.



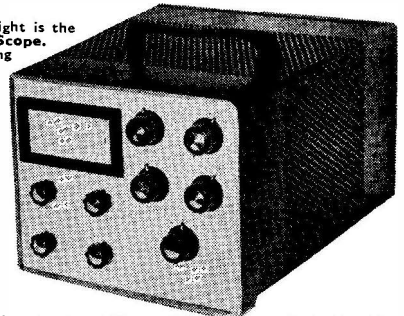
Illustrated above is the **RCX 202** high performance communication receiver designed specially for all modes of reception in the amateur bands 160-10 metres. Technical features include: Twin high gain triode Cascode RF amplifier for the lowest noise and excellent cross modulation characteristics, large illuminated  $3\frac{1}{2}'' \times 5''$  meter, 7" of bandwidth on all bands, precision geared drive to main tuning control with 100-1 ratio, variable selectivity 5 kcs., 2.1 kcs. and 200 cps. employing mechanical filter and lattice crystal filter systems covering am, SSB, CW operations, razor edge slot filter tunable across the I.F. pass-band, efficient adjustable noise limiter, switchable upper and lower sidebands, crystal calibrator, AVC characteristics switchable to fast, slow, off. Small size case  $13\frac{1}{2}'' \times 6\frac{1}{2}'' \times 10\frac{1}{2}''$  making the Receiver ideal for mobile operation. Provision for connecting mobile power supplies at the rear. Ultra modern appearance with super ventilated cabinet for cool stable operation with provision for moving mounting rail across the top for mobile use or this can be removed completely and modern tapered feet fitted underneath for table top use. British manufacture, two-year guarantee. Price £115; also available with general coverage, .5 mc/s. to 30 mc/s. Price £120.



Illustrated above is the **RCX 404**. This contains all the technical features of the **RCX 202** plus the maximum possible crystal stability together with a kilocycle counter that can be read to within 500 cps. with ease, and a tunable Band Pass input filter stage for the maximum rejection of strong unwanted signals. This is a Receiver with wave-meter accuracy for the connoisseur. Price £135 — also available with any 12 500 kcs. sections in the frequency spectrum .5 mc/s. to 30 mc/s. Price £145

Illustrated on the right is the **RCX 101 Analysis Scope**.

This is a matching piece of equipment for the visual analysing of the received and transmitted signals which are automatically switched electronically during the send and receive periods. It contains a two-tone generator necessary for SSB adjustments with a single-tone for am adjustments. Can also be switched to operate as a general purpose oscilloscope having a wide range time base and a wide band 'Y' amplifier when required. Price £40.

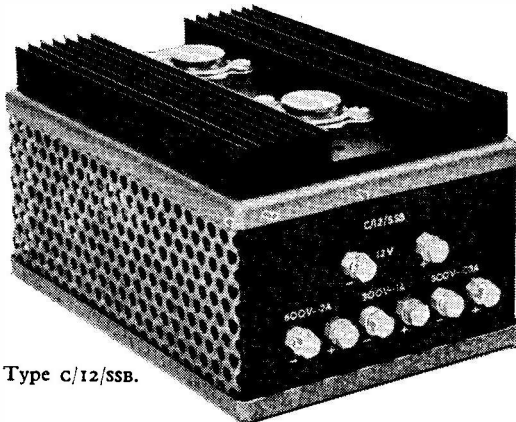


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# The SHORT WAVE Magazine

## E D I T O R I A L

**Outlook** *Quite recently, we had a letter from an irate correspondent who concluded his fulminations with the following, written in red ink “. . . the amateur spirit is dead. Competitions and ladders are the curse of the hobby . . . ”*

*Well, are they? Let us look at the facts. In the first place, nobody need enter a contest or run for a ladder unless he wants to—there is no compulsion about it! Secondly, how many do in fact go in for competitive radio? Taking all our own contests and ladders into account and then doubling the total of operators involved—to cover those who, while not actually appearing in the lists, either aspire to a place on a ladder, or enter a contest without sending in a result—we arrive at a figure which is less than one per cent. of the whole circulation of SHORT WAVE MAGAZINE.*

*Clearly, such a minority interest cannot possibly have the effect implied by our correspondent, which is that competitive operating has killed the spirit of Amateur Radio. And, anyway, is the spirit of Amateur Radio dead? As defined by an old timer it may well be rather a different thing today from what it was forty years ago. But in the last 20 years the whole tempo and focus of the national life has changed, and Amateur Radio has changed with it. Amateurs themselves still represent a cross-section of the whole nation, just as they have always done. Since the ordinary human virtues of generosity, kindness and co-operation have not changed, it follows that they are just as evident in Amateur Radio today as ever they were—if you look across the whole cross-section, and not just at a narrow segment of it.*

*Those who make vague allegations about the spirit of Amateur Radio being dead are nearly always found to be the very individuals in whom the virtues to which we refer are conspicuously lacking. They want everything, while giving nothing. And there are more of them about, because there are something like ten times as many amateurs on the air today as there were thirty years ago.*

*Austin Forsyth,  
G6FO.*

## TWO-METRE TRANSCEIVER FOR PORTABLE/MOBILE OPERATION

CONTROL CIRCUITS AND POWER  
SUPPLY — ALIGNMENT OF THE  
RECEIVER SECTION — SETTING  
UP THE TRANSMITTER SIDE

### Part II

C. BOWDEN (G3OCB)

*The first part of this article appeared in the February issue of SHORT WAVE MAGAZINE, which should be referred to for continuity. Here our contributor goes into final details, giving practical information on construction of the PSU—a transistorised DC/DC converter incorporating a home-made toroid—and discussing the alignment and setting up of the receiver and transmitter sections. Many of his ideas and suggestions will find application in much other transistorised equipment.—Editor.*

As mentioned on p.658 of the February issue, three relays are interlocked electrically so that the receiver is fully protected at all times.

The aerial change-over relay is a surplus coaxial relay type 78A which is obtainable very cheaply and performs quite effectively at 145 mc despite the mismatch. The only disadvantage with this relay is

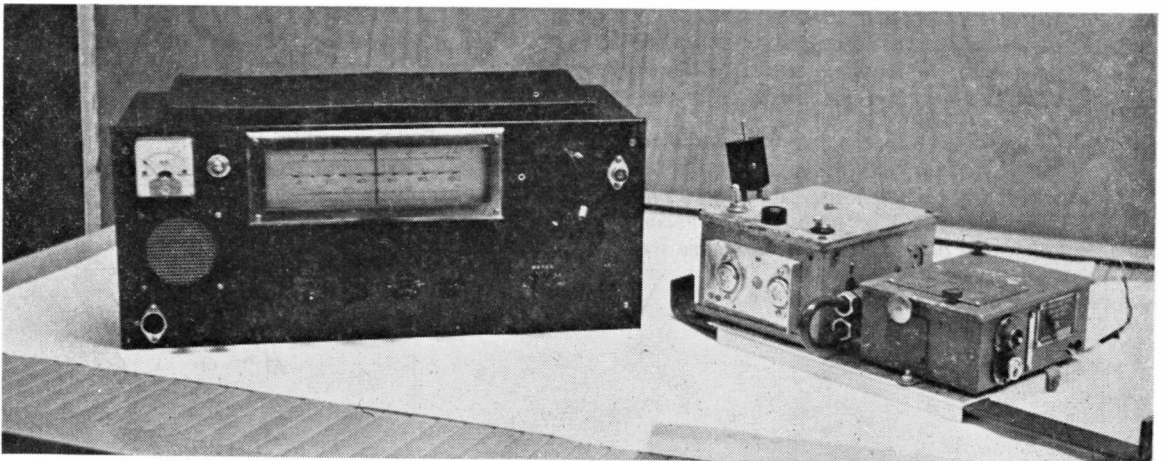
that it is large physically. The nominal operating voltage is 24v. DC, but by shortening or removing the armature return spring and by disconnecting the economy resistor positive action is obtained down to about 10v. DC. It may also be necessary to reduce the tension on the economy resistor shorting contacts but these should not be removed or put out of commission completely as they are needed to control the main switching relay.

The 78A relay incorporates two separate coaxial switches, one set being colour-coded red and the other set being coded green. If the common or armature contact in either switch is called A, and the contact which is made when the switch is non-energised is called B, and the third contact is called C, then connections are made as follows :

Red B and green B are joined together *via* a short length of low-loss cable and a pair of Pye elbow plugs ; red A is taken to the receiver through a short length of cable such that the total *electrical* length from the receiver input socket to the relay contact red C is about half a wavelength. The contact red C is short circuited by means of a sweated copper disc. The contact green A goes to the aerial and green C to the transmitter.

Thus, the receiver input is short circuited when the transmitter is connected to the aerial. In addition, the isolation between the receiver and transmitter is improved by the two relay air-gaps being in series, which results in very little energy leakage to the receiver. Should the shorting contact become open-circuit due to dirt or any other cause, it is quite unlikely that sufficient voltage will appear at the RF transistor to cause damage.

It is advised that the original Pye sockets be retained and low-loss Pye elbow plugs used on all coaxial connections. There is no noticeable change in the signal-to-noise ratio if the aerial is connected directly to the receiver instead of *via* the relay.



General view of the G3OCB two-metre transceiver equipment, with the Tx/Rx unit on the left and the PSU and control box on the right. These items are designed and intended for portable/mobile operation and the equipment has given very good results with the VHF/EDX. The receiver and speech amplifier-modulator sections are transistorised — see Part I of the article, in the February issue, for details — and the QOV03-20A in the PA can be fully modulated by the matched OC35's in push-pull — see circuit p.664, February. Some of the results obtained by G3OCB with the rig are touched upon in the article.

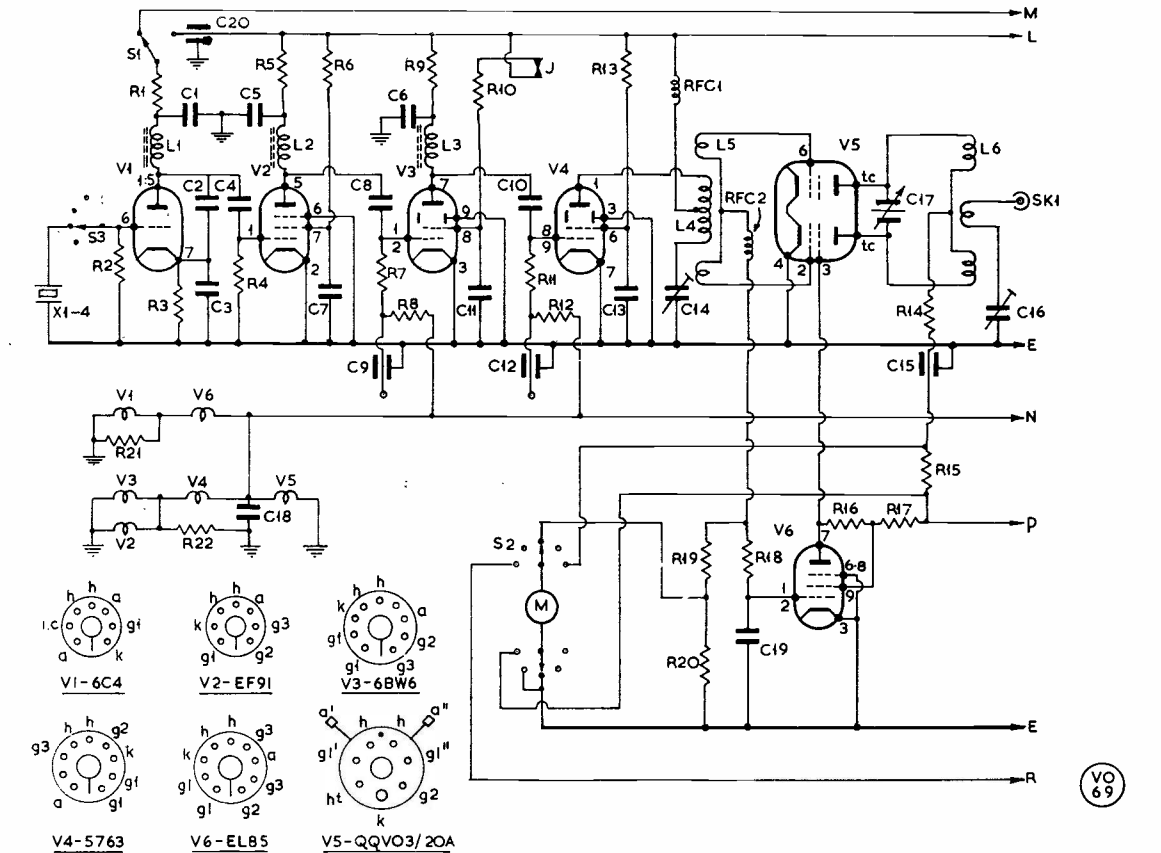


Fig. 6. Circuit of the transmitter section of the G3OCB two-metre transceiver, which is built as a separate and self-contained unit. Conventional circuitry is used and all values are given in the table herewith. Like other parts of this design, the circuit as shown here could be adopted for a low-power fixed-station transmitter, running about 20 watts input, with a conventional modulator.

Table of Values

Fig. 6. Circuit of the Two-Metre Transmitter

C1 = .01 $\mu$ F, cer.	R11 = 68,000 ohms, 1w.
C2 = 30 $\mu$ F, s/m	R14 = 130 ohms, 3w., w/wound
C3 = 220 $\mu$ F, s/m	R15 = Meter shunt, to suit
C4 = 100 $\mu$ F, cer.	R16, R17 = 3,500 ohms, 5w. w/wound
C5, C6, C7, C11, C13, C18, C19 = .001 $\mu$ F, cer.	R18 = 15,000 ohms
C8, C10 = 47 $\mu$ F, cer.	R19 = 27,000 ohms
C9, C12, C15, C20 = .0005 $\mu$ F, feed-thru'	R20 = 1,000 ohms
C14 = 1-8 $\mu$ F, var.	R21, R22 = see text
C16 = 50 $\mu$ F, var.	J = key jack
C17 = 15 + 15 $\mu$ F, butterfly	SK1 = coax socket
R1, R13 = 10,000 ohms, 5w., w/wound	X1-X4 = 8 mc xtals for Zone
R2 = 68,000 ohms	S1 = 1-p, 2-way, net
R3 = 1,000 ohms	S2 = 2-p, 5-way, meter switch
R4, R7 = 47,000 ohms	S3 = 1-p, 4-way, xtal switch
R5 = 5,000 ohms, 5w., w/wound	V1 = 6C4
R6, R10 = 22,000 ohms, 3w., w/wound	V2 = EF91
R8, R12 = 3,000 ohms	V3 = 6BW6
R9 = 220,030 ohms, 1w.	V4 = 5763
	V5 = QQV03-20A
	V6 = EL85

TABLE OF COIL DATA

L1	— 30 turns 36g. enam. close-wound on $\frac{1}{2}$ -in. dust cored former.
L2	— 15 turns as L1
L3	— 5 turns 26g. enam. spaced wire diam. on $\frac{1}{2}$ -in. dust-cored polystyrene former.
L4	— 5 turns 20g. tinned, $\frac{1}{2}$ -in. diam. by $\frac{1}{2}$ -in. long, at centre L5.
L5	— 4 turns 20g. silver plated, two turns either side, $\frac{1}{2}$ -in. diam. by $\frac{1}{2}$ -in. lon., with 1-in. gap.
L6	— As L5, but in 16g., $\frac{1}{2}$ -in. diam., with 2-turn link, $\frac{1}{2}$ -in. diam. by $\frac{1}{2}$ -in. long, in 20g.
RFC1, RFC2	— 19 inches of 36g. enam. close-wound on 1-watt resistor body.

Action of Control Circuit

In order to prevent the transmitter from being energised until the receiver input is earthed, the auxiliary contact (G in Fig. 7) on the relay 78A is used to short circuit the operating coil of relay RL2, the resistor R3 acting as a current limiting device in order to prevent short-circuiting the supply. This results in the voltage across RL2 being only 8v. with the shorting contacts G open, but this is sufficient to cause the particular relay used in this position to

operate. Thus when P.T. (the press-to-talk switch) is closed, RL1 is energised. This causes contact A to open, de-energising the Rx. Contacts B supply 12v. to RL2 via R3. RL2 does not immediately operate as it is shorted by contact G of RL3.

Contact C on RL1 energises RL3 and thus the Rx input is earthed simultaneously with contacts G opening. When G opens RL2 is energised via R3 and the modulator and Tx are energised (contacts D, F). The third contact E is in parallel with contact C of RL1.

When P.T. is released RL1 is de-energised, and the Rx is energised via contacts A. Contact B opens at the same time so that RL2 is de-energised and hence the Tx is de-energised. Contact E of RL2 ensures, however, that RL3 does not operate until the Tx is de-energised and hence the Rx input remains earthed. By the time RL3 operates the Tx is fully dead. The system works very effectively in practice.

### Power Supply

This unit, shown in Fig. 7 on p.79, was made at home and was very easy to get going. For T1, a single-layer winding of about 510 turns of 30g. enamelled copper is wound directly on the nylon core case which is supplied with the core. When the first layer has been completed (leaving about  $\frac{1}{4}$ in. between the start and finish) a further 140 turns are wound on, after a layer of tape insulation has been applied. A tap should be brought out every 50-60 turns from about the 300th turn onwards. There should be no difficulty winding this as the core specified is large enough for a  $\frac{1}{4}$ lb. bobbin of wire to pass through; about a couple of hours should be sufficient time. The tapplings should be insulated with sleeving and the complete secondary covered with a layer of empire tape. The taps should then be brought round so that they all emerge at the same point on the circumference and another layer of tape wound on.

The primary can then be wound. This consists of 19 bifilar turns wound evenly around the whole circumference, care being taken to keep the two windings as even and close as possible. The wire here should be about 16-18g. enamelled copper for powers of about 50-70 watts. Another layer of tape is added and the feedback winding is then wound on, this being about 7 bifilar turns of 24-26g. enamelled. There should be no kinks or twists in the windings and on completion the ends of the primary and feedback windings should be cleaned and the windings checked with a meter to ensure that there are no shorts or twists. If the starts of the primary windings are called A and B and the ends labelled A<sup>1</sup> and B<sup>1</sup>, and for the feedback winding the ends are called C D, C<sup>1</sup> D<sup>1</sup> respectively, then the connections are as shown in Fig. 7. (The polarity of one of these two windings may have to be reversed in order to obtain oscillation.)

The resistor R2 will be experimental, the value used being the highest at which oscillation starts on full load. The number of turns in the feedback winding may have to be increased or decreased for satisfactory performance, but seven turns should work

well with average OC28's. It should be noted that the windings here have been designed for OC28's with the type of core specified. If other cores or transistors are to be used there will be some alterations in the design.

If an oscilloscope is available it can be used to check the waveform, which should be a square wave, possibly with spikes on the leading edge. A drooping top portion indicates that the core is not saturating and more primary turns are needed (providing the LF response of the 'scope itself is beyond suspicion).

The frequency of oscillation of the unit is about 350 c/s. A small filter (Ch1, C2, C3) is used in the lead to the receiver to filter out any ripple voltage. adequate smoothing. The output voltage using 500 turns of the secondary of T1 is about 300-320v. Regulation is excellent and efficiency is about 80 per cent. The transistors TR1 and TR2 are mounted on a small heat sink and during long periods of operation, they are just noticeably warm. No damage due to spike puncture has occurred when running the converter off-load, as the OC28 has quite high voltage ratings. With a 12v. supply it is unlikely that the voltage across either OC28, including spike, will exceed 30-35 volts with a reasonably well balanced bifilar winding. Use of a 'scope, however, would enable the amplitude of these spikes to be seen as the load is reduced, in order to check that the spikes do not reach an excessive value.

It is necessary to use heavy leads between the inverter and battery, as currents of up to 8 amps. or so flow and any resistance in these leads will affect efficiency and regulation, *i.e.*, only a tenth of an ohm lead resistance could cause a drop of nearly one volt and power loss of 5-10 watts.

### Adjustment and Testing—Modulator

After checking for correct wiring and transistor connections, a 10-watt 4K wirewound resistor can be connected across the secondary of the modulation transformer. (A small speaker can be connected in series with this resistor if desired.) With a 12v. supply of the correct polarity (very important) applied, speech input should result in audio of reasonable quality being heard from the speaker. If the speaker is not used the quality will have to be checked on later air tests but an AC voltmeter connected in parallel with the 4K resistor should indicate voltages of 300 or more on speech peaks even at low settings of the modulator gain control. There should be no sign of any instability or distortion.

### Transmitter Testing

Before power is applied the wiring should again be checked. Heater power should then be applied to the valves and the individual heater voltages checked to see that they are reasonably well balanced. Small differences in manufacture result in quite uneven voltage distribution and it may be necessary to wire in resistors, *e.g.*, R21, R22 in Fig. 6, in order to obtain correct balance. The exact value of resistor should be found by trial and error and will be in the region of 40-50 to a few hundred ohms.

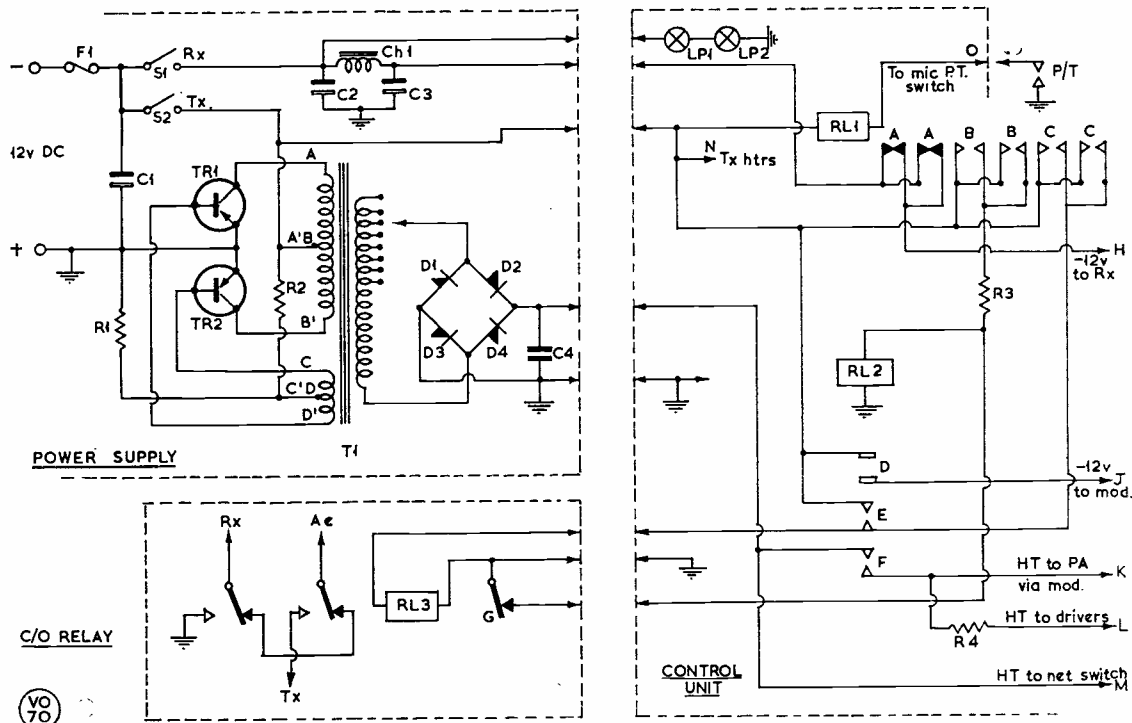


Fig. 7. Wiring of the control panel, power supply unit and aerial relay section for the G3OCB transceiver. The toroid for the transistor power oscillator, using a pair of OC28's, can be home-constructed as described in the text. Though RL3 is specified as a surplus Type 78A relay, any similar coaxial relay could be used and, if necessary, modified to perform the same functions as RL3. Since one pair of the "make" contacts on RL2 has to carry the modulator current of about 5 amps., these contacts should be suitably rated.

Power may now be applied to the crystal oscillator via the net switch and the core of L1 adjusted until stable oscillation is obtained with all crystals. When this stage is operating satisfactorily the net switch may be turned to the normal operating position and the HT should be temporarily disconnected from contact F of relay RL2 (Fig. 7). The control circuit should then be checked and adjusted until it is operating correctly. When the relays are operating in the correct sequence HT can again be applied to contact F and all is now in order to put power on the rest of the transmitter, except the PA stage. The press-to-talk switch may now be set to "transmit" and this should result in HT appearing on all driver stages. The cores of coils L2, L3, L4 and L1 should now be peaked for maximum grid drive and the spacing of the turns on L5 adjusted for full drive to the PA valve. The coupling between coils L4 and L5 is rather critical and again this should be adjusted for maximum grid drive to the PA. When correctly adjusted the following figures give a rough guide to the grid currents that should be obtained: V3, 1 mA; V4, 1.75 mA; V5, 4-5 mA.

HT may then be applied to the PA stage and it should remain stable at all settings of the PA tank tuning condenser, even when there is no load connected. With drive removed the PA should clamp back to about 50 mA or so and should still remain

### Table of Values

Fig. 7. Control Unit and PSU for Transceiver

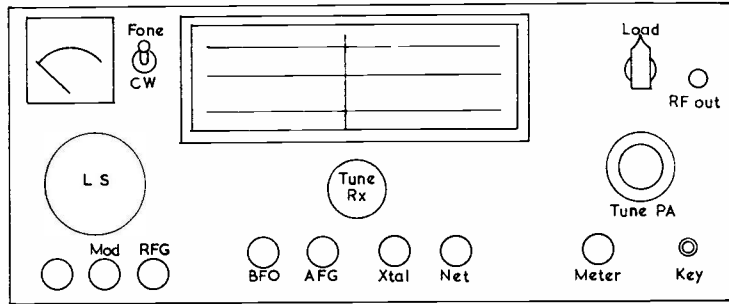
C1, C2, C3 = 100 $\mu$ F, 15-18v. elect.	T1 = Toroid xformer (see text)
C4 = 16 $\mu$ F, 450v. elect.	RL1 = 12v., 2-make, 1-make
R1 = 10 ohms, 2w.	RL2 = 8v. low current, 3-make, one to carry 6 amps.
R2 = 500-2000 ohms, see text	RL3 = Type 78A surplus, or similar
R3 = 5w., value to suit RL2	D1, D2, D3, D4 = Silicon diodes (see text)
R4 = About 300 ohms, 10w. w/wound	TR1, TR2 = OC28, matched
F1 = 10-amp. fuse	LP1, LP2 = 6-8v. dial lamps
S1 = SPST, 1A.	
S2 = DPST, 6A.	
Ch1 = Rated 100 mA	

perfectly stable at all settings of the tank condenser. With an aerial connected it should be possible to load the PA to about 75 mA and maximum RF output should be obtained at about this loading. It should be noted that the grid current will have fallen from the 4-5 mA obtained previously to about 2-3 mA under normal operating conditions. For plate-and-screen modulation at least 1.5 mA of grid drive is required to prevent downward modulation effects. Keying is effected by breaking the screen supply of the 6BW6 stage, V3, Fig. 6. For CW operation the Phone/CW switch breaks the DC supply to the

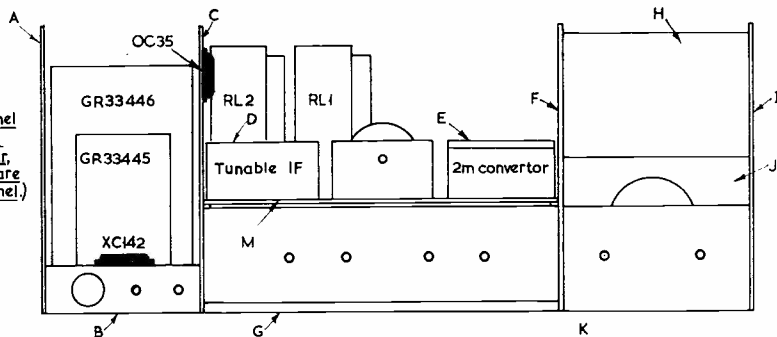


VO  
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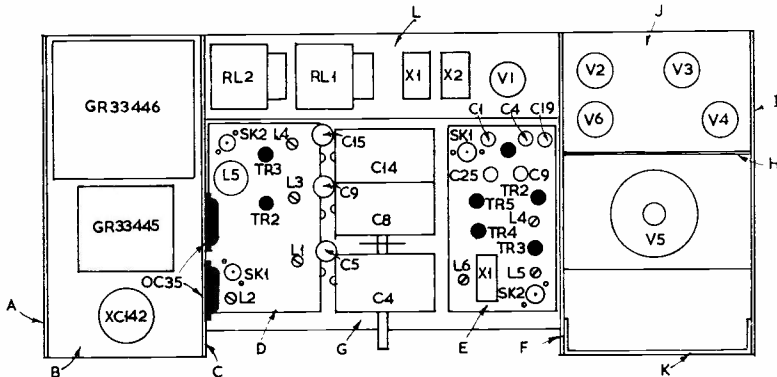
1. Front view



2. Front view with panel removed. (The PA tank coil, condenser, and load control are mounted on the panel.)



3. Plan view showing main components



4. Under chassis view showing main details (bottom removed from IF chassis).

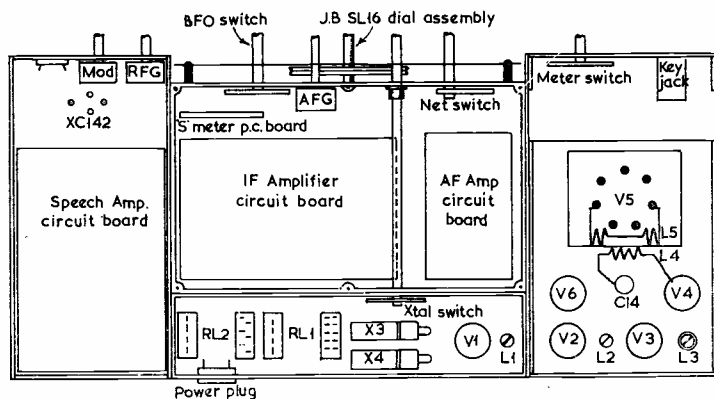


Fig. 9. These sketches give general guidance on the layout of the transceiver sections, showing how the various units are mounted in the single cabinet used. Dimension details are given in the panel "Cabinet Construction" on p.81.

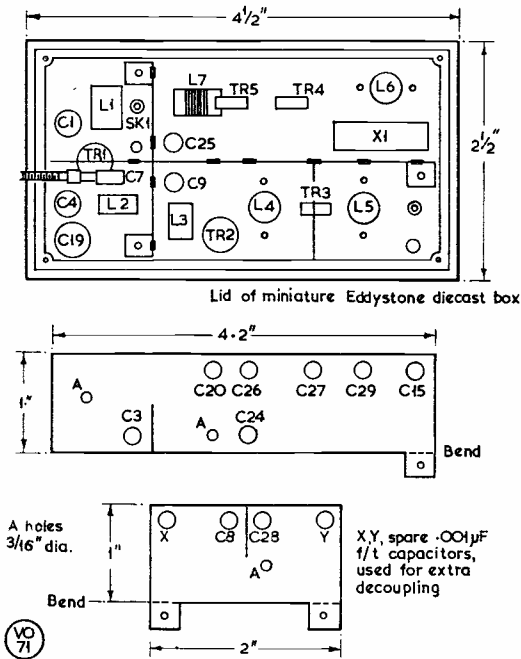


Fig. 8. Layout sketches for the placing of the main components and the screens for the two-metre converter in the G3OCB transceiver — see p.659, February, for circuit.

modulator and short circuits the modulation transformer secondary.

**Receiver**

This was fully described in the February issue of SHORT WAVE MAGAZINE. In order to align the receiver effectively and simply it will be most helpful if either a GDO, signal generator or accurately calibrated receiver is available. Wiring should be checked and, if plug-in transistor holders are used in any stages, the transistors should be checked to ensure that they are inserted the correct way round. If all is well each stage or unit can be checked, care being taken each time to use the correct polarity.

A load of some 12-25 ohms should be connected to the AF amplifier and a low-level audio signal fed in from a suitable source. An astonishing amount of

**CABINET CONSTRUCTION**

- Panels — A, I: Rectangular or triangular end sections, 6 3/4 ins. x 5 1/2 ins., with 3/8-in. flange.
- C, F: Inter-compartment screens, 6 3/4 ins. x 5 1/2 ins.
- H: PA compartment screen, 3 1/2 ins. x 2 1/2 ins.
- K: Strengthening member, 2 ins. x 3 3/4 ins. with 1-in. flanges.
- M: Spare lid from large Eddystone box.
- Chassis — 3 1/2 ins. x 6 3/4 ins. x 1-in.
- D, E: Eddystone diecast boxes, 4 1/2 ins. x 2 1/2 ins. x 1-in., mounted on M.
- G: Eddystone diecast box, 7 1/2 ins. x 4 1/2 ins. x 2 ins.
- J: Chassis with sloping front portion, as sketch.
- L: 7 1/2 ins. x 1 1/2 ins. x 2 1/2 ins. high.

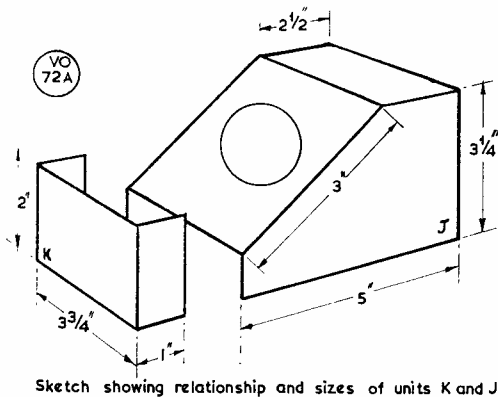


Fig. 9. Details for the chassis and panel for the two-metre transceiver. Except for the Eddystone diecast boxes, all metal-work is in 16g. aluminium. Dimension details are given under "Cabinet Construction."

audio should be available before noticeable distortion occurs. It may be necessary to connect a resistance in series with the audio source in order to make the input current fed.

The IF strip (p.662, February) should be aligned to 465 kc and the core of the BFO coil adjusted until the latter oscillates. If the transistors are performing correctly and there are no circuit errors there should be no difficulty with any of these adjustments. (The earth paths of the P.C. board should be earthed to the chassis at several points to prevent instability.)

The selectivity of the unit is not high, but is perfectly adequate for mobile use and gives reasonable results even when used with the tunable IF fed directly from an aerial and receiving signals in the 80-metre band.

The tunable IF section (see p.661, February) should be aligned by adjusting the oscillator so that it covers about 4.0-6.5 mc. The RF and mixer circuits are then peaked around 5.7 mc by means of the trimmers and at 3.8 mc by adjusting the cores so that the circuits gang reasonably well over the range 3.5-6 mc. A short aerial connected direct to the input socket SK1 should result in a large number of stations being audible over the range. It should be possible to resolve 80-metre SSB signals without difficulty, although the BFO will be on the wrong side of the IF peak for best results on this band.

**Converter**

This is shown in detail on p.659 of the February issue. The crystal oscillator should first be got going and by adjustment of the core the stage should take off without difficulty. (It may be necessary to reverse the connections to the link feedback coil on L6 in order to obtain oscillation.) With the converter feeding into the tunable IF, the cores of L4 and L5 in the converter should be set to 4.5 mc and 5.5 mc respectively, simply by setting the tunable IF section on these frequencies and peaking for maximum noise.

The core of the quadrupler stage, L7, TR5, should then be peaked for maximum noise output. Several

peaks may be found and the correct one will have to be picked out by trial-and-error unless a receiver or sensitive wave meter tuning to 140 mc is available (due to the low circuit impedances in transistor gear it is often difficult to get good results with a GDO, and in addition it is very easy to damage transistors due to the relatively large amount of RF given by valve GDO's).

Now, with a low powered two-metre transmitter or signal generator set to a suitable frequency in the band the tunable IF section should be set near the correct frequency with the BFO switched on. If it is a transmitter that is being used to provide this local test signal it may be necessary to connect a small aerial *very loosely* to the receiver but care must be taken to ensure that there is minimum energy pick-up, *i.e.*, use 6 inches of wire and wandering 1-turn link coil. When the signal has been located the various tuned circuits L1, L2, L3 should be peaked for maximum signal and the input to the converter progressively reduced. In some localities there may be local on-the-air signals strong enough to provide a test signal, or one of the beacons may be in range.

For best results a noise generator should be used in later stages of alignment and a simple generator of a suitable type is shown in Fig. 10.

With a certain noise-reading on the S-meter, say, W mA, then if the noise generator is switched on and set to a certain current, say, X mA, the S-meter

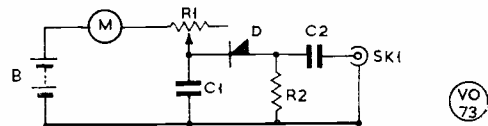
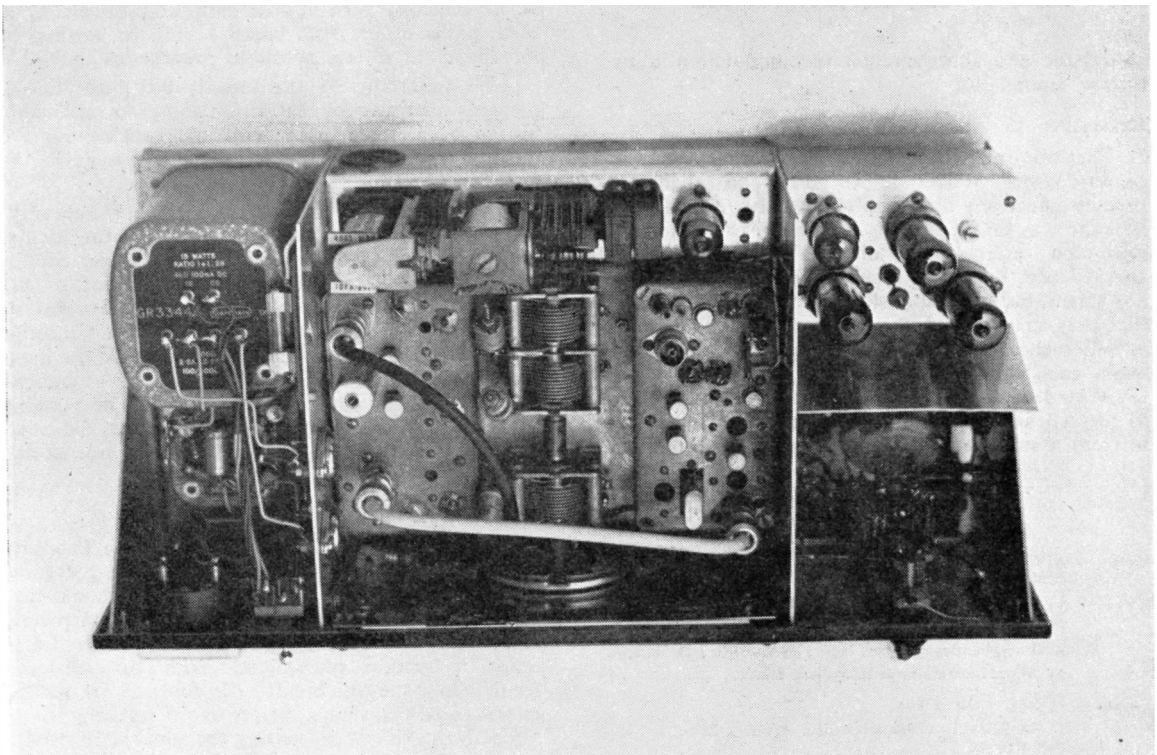


Fig. 10. The diode noise generator used for setting up the converter, as explained by G3OCB in his article. Values are: C1, .001  $\mu$ F; C2, 500  $\mu$ F; R1, 100K potentiometer; R2, 68 ohms,  $\frac{1}{2}$ W; D, silicon or germanium diode, selected for best noise output from those available; M, 0.1 mA meter; and B, 6-volt battery. Wiring should be kept short and construction small and compact.

will rise. The noise generator is now left at this setting but is switched off and adjustment is made in the converter. The RF gain control is now set so that the noise reading on the S-meter is the same as it was previously (W mA). The noise generator is now switched on and the noise reading on the S-meter will again rise. If the S-meter is now reading higher than it was previously with the N.G. switched on, *i.e.*, more than X mA, then an improvement has been made. Adjustments should be made to trimmers C1, C4, C7 and C9 (Fig. 1, p.659, February) for highest noise increase above the original S-meter noise reading.

Mixer injection is also important. A 10Kohm p.v. voltmeter (or better) should be connected across R8 and with the 35 mc oscillator disabled it should read



Plan view of the over-chassis layout of the VHF transceiver. The two-metre receiver converter is in a separate screened box, and the whole of the construction is in unit form.

near-enough 1v., representing an emitter current of about 1 mA. When the oscillator is operating the 140 mc input to the mixer should cause the voltage reading to rise to about 1.2-1.3 volts. These figures only apply to the 2N1743 transistor when used as mixer.

#### General Comments

Despite its compactness, this converter performs very well indeed and on a listening test no difference is noticeable when it is compared with a 6CW4 cascode converter, although on a noise generator test the 6CW4 version performs slightly better. If a noise generator is not available the converter must be aligned on a steady signal, but this method is more tedious and not so reliable.

Power requirements are less than ¼-amp. on "receive," including dial lamps, rising to about 2½ amps. on "standby." On "transmit," the drain is 6-7 amps., rising to 8-9 amps. on speech peaks. With 25 watts input to the PA about 12-15 watts of RF output should be obtained.

While it is not expected that this design will be copied in its entirety and down to the last detail, it

is thought that other constructors might find some aspects interesting and worth incorporating in their own equipment. One point that might be mentioned here in respect of copying from other designs: The author's experience has been that coil data taken from other designs quite often fail to give the performance expected due to differences in materials, winding and strays. For this reason all coil sizes given here should be taken as a *rough guide*.

Finally, as to performance under mobile conditions and the occasional spot of portable operation, all in the Cornwall area: This rig used in conjunction with the halo aerial on the car has resulted in Phone QSO's with EI2A, GW2HIY, G5TZ and GC2FZC—in all cases with good or excellent reports both ways; on one mobile trip LX1SI was heard at strengths from S6 to 9+. When used in conjunction with a 5-element Yagi mounted about 6ft. above ground numerous GDX contacts have been made. Best QSO's have been with DJ3GF and PAØJWL, both at about 500 miles, with reports of 5 and 7/8 both ways, although conditions were not at their peak at this time.

(concluded)

### Do You Know That —

— Burnt-out power transistors may have one side intact and, if so, they can be pressed into service as diode rectifiers for battery chargers and relay power supply units. (G3JEQ.)

— It is advisable to have some reliable indication that the AC mains supply in the station is switched on. This can conveniently take the form of a low-wattage lamp, permanently wired in on the distribution side of the station main switch. (G3SKA.)

— Station DHJ, at the LF end of Top Band, is a German naval transmitter located near Kiel. His signal has become a conditions-marker for 160m. operators in many distant parts of the world. (G3SWH.)

— If you are short of space for a 160m. aerial, or want something quickly to radiate on that band, a mobile whip fastened to a window sill will put out a very healthy signal. If it is fed through a *pi*-network, the coil dimensions and whip length are not very critical. (G3ESP.)

— Clear nail varnish (XYL-type), when painted over knobs, meters, dials and other panel fittings, will give them a very good appearance. This varnish dries quickly and is hard wearing. (G3MWW.)

— Though *Thawpit* is harmless, and very effective, as a crystal cleaner (see p.23, March) the warning printed on the bottle about not inhaling the vapour and using it under ventilated conditions should be heeded. This is because a concentration of carbon tetrachloride fumes can be harmful—one reader says "long-continued exposure can lead to hepatic cirrhosis of the liver." *Phew*—and we've been using the stuff for bathing crystals for the last 30 years!

— The screwed brass sleeves found in the cheaper type of porcelain connectors (for ordinary electrical work) can be easily extracted and make very good aerial connections; they can be used outside, obviate the need for soldering, and the only protection required is a dab of *Bostik* or insulating varnish. These connectors can be obtained in a variety of sleeve diameters, and the right size to use is that which enables both wire ends to be pinched under both screws.

— The Czech Government is now issuing a special novice transmitting licence for juniors, valid for three years, for the 160m. band with 10w. input, for communication only with other OK stations. Callsigns in this category are in the sequence OL1-OLØ. These lads are specifically forbidden to work foreign stations. (G-LO17.)

— A good way to resolve SSB when using a standard receiver is to beat the Sideband signal, not with the Rx BFO, but with an external oscillator, such as the station frequency meter, or even the transmitter VFO. Superior results are usually obtained because for one thing the BFO injection in most communications receivers is at too low a level for the best SSB result, and for another an external oscillator is easier to adjust correctly.

— Aluminium off-cuts (for chassis making) can often be obtained very cheaply—and often for nothing—from the larger garages which specialise in car-body repair work. For light chassis, the ordinary domestic baking-tin is ready-made.

(Half-a-guinea is being paid for these ideas and suggestions. If you have one, send it in to the Editor, with name, callsign and QTH, on a separate slip, please—and no diagrams.)

## NO-SPACE AERIAL SYSTEM FOR SIX BANDS

GETTING THE MOST FROM  
THE MINIMUM SITE AREA

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

WHERE aerial systems are concerned nearly all amateurs work under difficulties—that is to say that they are seldom in a position to put up the aerial that is theoretically best suited to their requirements, or even anything remotely resembling it.

The main reason why we, as amateurs, are achieving results which no commercial communications system designer would look upon as possible, is that we have the gift, or the knack, of improvisation, forced upon us by circumstances. And the chief of these is lack of space.

The few fortunate owners of "aerial farm" facilities can choose and decide upon direction, length and height, and put up exactly what they want for each band. But for every one of these exceptional cases, there are a thousand amateurs who say "I only work Twenty, because my garden is only 35 feet long," or "No good trying Top Band, because I can't get out with a 67-foot wire" . . . and so on.

It is chiefly the man who would like to work all bands who suffers from lack of space; if you are content with good DX on Twenty, you can probably put up a small beam and call it a day. Or if Forty is your favourite, a ground-plane or loaded vertical will see you through. But to work all bands, Ten to One-Sixty, with reasonable efficiency, you need either a lot of space or plenty of patience, time and ingenuity. And even then you mustn't expect to beat the top DX'ers at their own game!

### No Space at All!

To show what can be done by almost any amateur transmitter, without heavy expense or even any purchase of commercial gear, it was decided to start from the premise that no space at all was available in the way of a garden. The house or bungalow itself would have to form the boundaries of the aerial system, with no masts or erections of any kind permitted in the backyard, or whatever space might in reality be available. This was taken to be about the most difficult case with a definite object in view (although it is realised that some people in flats or terraced houses could be even worse off).

The basis of the aerial system was a mast of the usual TV variety, fixed (by the local TV dealer) to the chimney-stack at the centre of a smallish bungalow. A 20-ft. length of dural was used, but allowed to overlap the chimney by four feet or more, to give a really firm support. A continuous halyard of

tough nylon line (435 lb. breaking-strain!) was run through an insulator which was securely fixed to the top of the mast instead of a pulley.

Since the band of greatest interest was to be *Twenty*, a dipole for that band was chosen, and in view of the fact that sloping dipoles (mis-named "Inverted V's," which are something quite different) are so efficient, this type was decided upon. Indeed, it was mandatory, since one cannot put up a horizontal dipole without *two* supports!

It was found that the two legs, cut to 16ft. 6in. each, sloped down at about 40 deg. from the horizontal when they were pulled out to the extremities of the building (again using nylon cord for the purpose). With some shapes and sizes of building the angle of droop will be steeper, but this does not appear to be critical, and since tuned feeders are used, any deviation of the centre impedance from 72 ohms is of no consequence.

A length of open-wire line was made up, and fortuitously turned out to be roughly 33 feet from dipole centre to lead-in insulators, allowing for a slight pull-out to avoid guttering and so on. The feeders were made of ordinary plastic-covered lighting flex, 33 feet of the "flat twin" variety being pulled apart into two single wires. Polythene curtain-rail was the material chosen for the spreaders. (An article on p.126 of the May, 1962 issue of *SHORT WAVE MAGAZINE* gives full details for the construction of such feeders, which are light, flexible, efficient and cheap.) The curtain rail, in this instance, was cut into three-inch lengths and drilled to give a slight clearance for the flex. One spacer every eighteen inches was used, and each one was sealed to the plastic insulation of the wire by a dab with the soldering iron.

### Supporting the Aerial

The centre should obviously be hauled up to the very highest possible point, with both legs and the open-wire feeder drooping down the roof. Even this simple arrangement gives scope for some vicious tangles and catchings-up on obstructions, under tiles and at the eaves—but keep a clear head and

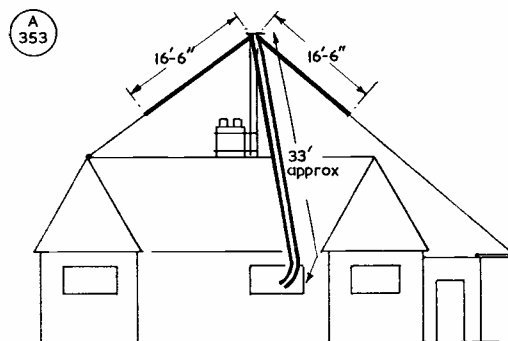


Fig. 1. General layout arrangement of the inverted-V system discussed by G6QB in his article. In suitable locations, the arm-lengths could be doubled and a higher roof-mast used. The feeder-terminating configurations for six-band working are shown in Fig. 2.

you will end up with the feeder coming down centrally, and the two legs of the dipole, extended to any convenient length with nylon or polythene cord, dropping on either side. From this point everything depends upon the shape and size of the house or bungalow.

In this particular case it was a longish shape, with garage at one end, and the anchorage points for the cords were pretty obvious. At one end a slight extension was made by means of a horizontal pole attached to the garage roof, and a similar dodge could have been used at the other end had it been necessary. Small egg insulators were used between the dipole ends and the nylon cord, but the insulation of the latter is so good that they are hardly necessary. The general configuration is shown in Fig. 1.

Erection completed, and the feeder connected to two lead-in insulators, all that remained was to make sure that the thing worked! There was obviously going to be no doubt about this on Twenty, so that band was taken first, and then the scheme for each of the other bands tried out.

#### Six-Band Suitability

The configurations are shown in Fig. 2, from which it will be seen that the aerial is used as a loaded vertical on One-Sixty and Eighty; as a tuned vertical on Forty; as a straight doublet on Twenty; and simply as a centre-fed wire tuned to resonance on Fifteen and Ten. On Ten, actually, it can be regarded as two dipoles in phase, whereas on Fifteen it is a kind of elongated dipole, part of the feed-line having been separated out, so to speak, and allowed to radiate along with the aerial.

On Twenty, if the feeder is roughly 33 feet long, it will give a good match into 72-ohm line and no ATU will be necessary. This is because the half-wave of feeder will show the same impedance at the bottom end as it is confronted with at the top, and will therefore be very near 72 ohms. If the 33-ft. line is not practicable, no matter—use the ATU to produce a match into whatever impedance the bottom of the feeder looks like.

If a choice of direction is possible (after all, most houses have four corners!) a little thought about this will be worth while. The natural run for the actual aerial described was roughly NE-SW, which meant that it was extremely good for the U.S.A. (check up on your *DX Zone Map*!) but very poor for New Zealand and South America. Unfortunately, being good for the U.S.A. meant that it was also good (much too good) for South-East Europe, whence so many strange noises originate. Eventually, by means of some juggling, a run was fixed upon which was almost East-West . . . but you will have to make your own individual decision according to local circumstances.

Excellent reports were received with 150 watts into this aerial on Twenty—comparable with, or even better than, those from a long-wire which had previously been in use. Countries worked included KH6, KL7, ZL, JA, W, VE, ZS, CE, VP8, FB8, VS9, VU, VS1 and many others.

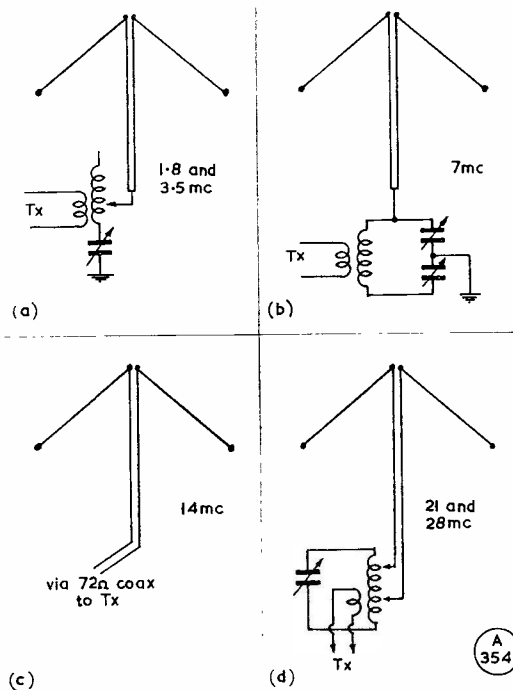


Fig. 2. In (a) it is shown that by strapping the feeders and series-tuning the whole system against ground, operation on both LF bands can be obtained. The other sketches show the Tx-end arrangements for working the HF bands. The only requirement at the station end is a versatile ATU.

And so to Forty! On this band the aerial is a vertical quarter-wave which has been made somewhat too long by the arms of the dipole—the feeder alone would make the quarter-wave. By means of the usual type of ATU a good match was obtained, and it was very heartening to note that it *did* exhibit the characteristics expected from a ground-plane. European stations were one or two S-points lower compared with the long-wire (which had been left up for comparisons, but was later taken down), and this led to the belief that the efficiency was not going to be high. However, after darkness had come, the heartening discovery was made that W and VE stations were two S-points *better* on the vertical than on the long wire! Switching over quickly from one to the other, using two ATU's, confirmed that the ratio of DX to European QRM was very much better on the vertical.

A really good earth connection is obviously a necessity here, and since the "no-space" claim had been made, it was felt that the use of radials or a counterpoise would be cheating. So the mains earth was carefully bonded to three different water-pipes within the house, and a long earth-spike (six feet of it) was knocked in the ground just outside the window. Results spoke for themselves, reception being excellent, and transmission on 40m. (with 150 watts of CW) fetched in 579 and 589 reports from

W1, 2, 3 and 8 as early as 2130 GMT.

### The LF Bands

There has been little compromise so far; on Twenty, fed as a doublet, the aerial did what was expected, and on Forty, with the feeders strapped, it definitely exceeded expectations. So to Eighty, with some trepidation, where the feeders remained strapped, but the aerial was a pretty short vertical for the band. Serious loading was used, as in Fig. 2 (a), and the normal run of SSB and CW contacts around Europe were made. The pleasant surprise came when 5A3CJ appeared on 3785 kc SSB, quite early one evening (around 1900) and was at least one S-point better on this small vertical than on the long wire. At the time of testing, Eighty was going through a bad patch for DX, and the early morning ZL's had gone, so, regrettably, it was not possible to test the aerial on them. But on reception it seemed excellent on any stray DX that did come up; and on the transmitting side good reports were received from all the normal run of 80-metre contacts. After all, some of the keen DX types achieve outstanding results with 60-foot verticals on this band, and the total length of this one, from the bottom of the strapped feeders to the dipole tips, is 50 feet or thereabouts, so it is not too much of a compromise.

On One-Sixty, though, it really *is*! It is definitely not the aerial for attempting DX on Top Band. But for local and semi-local work, and even for occasional GDX, it is more than adequate. After all, it is a pretty good aerial compared with some of the mobile whips that achieve excellent GDX results. The same series-tuned loading coil was used both for Eighty and Top Band; it was the same size as a normal Top-Band tank coil, and provided with numerous taps. The best combination of coil size and tuning-condenser setting was found simply by playing with both until the maximum aerial current was obtained at the lead-in point, where the feeders were strapped together.

The best contacts on One-Sixty were with DL, OK and HB9, all with pretty weak reports—but at least the ten watts did get there. Those who fight shy of the 160m. band because they think they can't put up a good enough aerial might at least try this arrangement, and would probably be surprised.

### Ten and Fifteen

It has been difficult to assess results on these bands, which have not often been open at the times available for testing. But the performance on Fifteen seems at least equal to that on Twenty. An ATU is necessary, of course, and it can be either of the kind shown for Forty (Fig. 2.b) or just a simple tuned coil with tapplings (Fig. 2.d). You *can*, of course, strap the feeders and try it as a vertical on these HF bands, but the TVI situation is likely to be worsened if this is done. As a "long dipole" on Fifteen, and two dipoles in phase on Ten, no TVI was encountered and the reception characteristics were extremely good.

On Fifteen, in fact, some amazing reports were

received from W's on one of the rare days when the band was wide open. CW produced several 599 reports, and SSB brought in some 8's and 9's and even a 9-plus or two; the direction of the aerial was favourable for U.S.A. at this time.

Contacts on Ten were confined to locals and the odd European when conditions permitted, but it is pretty obvious that the aerial would perform excellently in the preferred directions when that band is once more open for consistent DX.

### Summary

There may even be reasons why people who have plenty of space might like to try this simple aerial system, which is so compact that it can often be installed without interfering with any other wire or beams that may already be up.

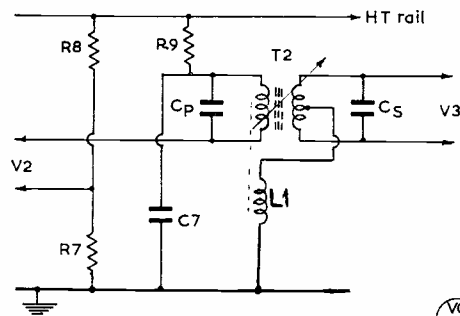
Its advantages are: Simplicity of erection (one pole only); no need for space apart from the actual house plot; versatility (six bands); and certainty of excellent results *now* on at least three bands (Fifteen, Twenty and Forty).

Among the disadvantages should in fairness be mentioned the need for a really good earth system for the bands on which it is used as a vertical; also the fact that there will still be some readers who cannot make use of their roof or chimney-stack in this way owing to the prior claim of TV aeriels; and its possible unsuitability for terraced houses, flats or council houses in which roof masts are not allowed.

However, it may possibly prove helpful to quite a number of short-garden owners to whom it has not previously occurred that one good high mast can be put to just as great a variety of uses as a variety of small ones, fences, trees and so on.

Try other lengths of radiator, by all means, if you have the space available; two sloping lengths of 33 feet each, if they can be accommodated, will give you two dipoles in phase on Twenty, and a rough equivalent of a vertical half-wave on Forty. They would probably be more interesting on Eighty and Top-Band, too. But the basic idea of starting with a Twenty-metre doublet is simple and effective.

"PHASE MODULATION ON TWO METRES"



To illustrate the correction to the circuit on p.22 of the March issue. Only the relevant part is shown here, and the method of producing the L1 winding will be clear from the text—see pp.22-23, March.

## TRANSISTORISED ELECTRONIC MORSE KEY

### CIRCUIT AND CONSTRUCTION

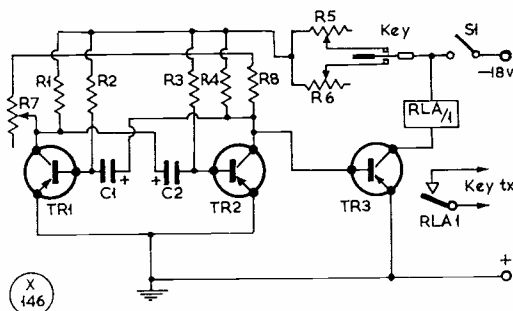
J. H. TINKER (G3LRO)

It was with a simple type of Electronic Keyer in mind that the writer developed the T.E.M. key. As can be seen from the diagrams TR1 and TR2 form a multivibrator and TR3 is working in a switching mode, with a relay in its collector. The base of TR3 is driven negative by the negative-going pulses from the collector of TR2, thereby switching TR3 in any of its bi-stable states, *i.e.* off/on.

The relay was tried in the multivibrator itself, in order to save a transistor, but it was found on testing that it did not follow very well, due to the relay holding on too long on "make"—the reason being the time constant of the charging resistors and condensers. So TR3 was introduced. A transistor working in a bi-stable mode is the nearest approach to a switch that one can get. The only current flowing in TR3, when switched off, is the leakage current of TR3, but an on/off switch is used in order to cut off the keyer when closed down.

Resistance of the relay in the writer's keyer is 1000 ohms, this one happening to be available. It works very well, and is positive, with a voltage of 18v., although with a relay having a lower resistance, a lower voltage would be possible. As one does not want to be having to change the battery every five minutes in a unit like this, at G3LRO a nine-volt grid bias battery is used, which has a current capacity of 300 mA. As the keyer needs only 35 mA maximum, this type of battery meets the requirement very nicely, so two of these grid bias batteries are put in series, to make the 18 volts.

The key itself was produced by fixing a short



Circuit for the electronic (automatic) key for CW transmission, described by G3LRO. The secret of success with any sort of el-bug is correct adjustment of the dot-dash ratio. A certain amount of practice, with an audio oscillator, is also very advisable before attempting operation on the air, as the action is quite different from that of a straight, or pump-handle, Morse key.

### Table of Values

#### Transistorised Electronic Key

C1, C2 = 25 $\mu$ F, 12v.	R7 = 500-ohm potentiometer (speed)
R1, R4 = 1,500 ohms	R8 = 1,000 ohms
R2, R3 = 33,000 ohms	TR1, TR2, TR3 = OC81, OC83 or similar
R5 = 5,000-ohm potentiometer (dash)	
R6 = 2,000-ohm potentiometer (dot)	

length of hacksaw blade to a  $\frac{1}{4}$ in. brass right-angle bracket, fitted very firmly to a  $\frac{1}{4}$ in. thick steel plate, to give the key some weight in order that it will not slip and slide all over the operating table while in use. The key was then fitted into a small case made of tin-plate—this type of case fitted with 6BA screws makes a nice strong case for the paddle and assembly.

It is left to the individual as to which side of the paddle he has the dots and dashes, as the key can be used by either left- or right-handed operators. It is only necessary to change the positions of R5, R6, or simply just their leads. Setting up is a matter of adjusting the potentiometers till the required keying characteristic is obtained.

### SPECIALY ON THE AIR

If during April 22-25, you hear or work GB2WS on the 20, 40 or 80-metre bands, it will be the Shakespeare Quatercentenary Celebration station operating from the Shakespeare Centre by the river at Stratford-on-Avon. A great deal of effort is going into making this undertaking a success. The QSL address is: H. W. Gannicott, 17 Highfield Road, Stratford-on-Avon.

### RESULTS — DECEMBER R.A.E.

We are officially informed by the City & Guilds of London Institute that for the December sitting for the Radio Amateurs' Examination, there were 506 candidates. Of these, 383 passed, giving a pass-rate of about 76 per cent, which can be regarded as a satisfactory result, with a fair paper. The Examiner's report shows that the answers on keying a CW transmitter were weak, as were those on an amateur-band ATU. (And after all we have published about

aerial tuning units!) It is also surprising that a good many people did not understand the reasons for fading on the HF bands (*Question 7*). Of a paper of ten questions, eight had to be done, with two compulsory questions. The one question which was generally well done and on which most candidates gained good marks was on the explanation of terms in connection with the transmission of radio waves (*Question 8*).

### RESPONSE TO A SMALL ADVERTISEMENT

G3IUG, Poole, Dorset, writes as follows: "I can definitely say that it pays to advertise in SHORT WAVE MAGAZINE. I put an advert. in the March issue and since Saturday 7th I have developed typists' fingers, tennis elbow, aching eyes and I have run out of paper, envelopes and stamps (3 doz. @ 3d.) returning remittances for the 35s. transformer already sold. My sincere thanks to you for the pull and power of SHORT WAVE MAGAZINE." G3IUG's letter is dated March 10, four days after publication of the March issue.



# tone Modulating A Sideband Transmitter

SUITABLE AF CIRCUIT, FOR  
CW KEYING AND SETTING UP

J. M. COX

**T**HE idea of modulating an SSB transmitter with a single audio frequency is probably as old as single sideband itself. Let us consider what in fact we are going to produce by this type of modulation.

Fig. 1 shows a typical single-sideband generator employing the filter method of generation. It will be obvious from this diagram that the voltage present at the output of the filter (USB or LSB) will be at a single frequency.

Now let us substitute actual frequencies for the symbols in Fig 1:

Let  $f_m = 1000 \text{ c/s}$

$f_c = 460 \text{ kc}$  (a typical frequency at which to generate SSB)

and let the filter passband be :

460.3 kc . . . 463.0 kc

substituting, we find two frequencies present at the output of the balanced modulator, i.e.

$f_c + f_m = 461 \text{ kc}$

and

$f_c - f_m = 459 \text{ kc}$

passing this signal through the filter suppresses the lower sideband component,  $f_c - f_m$ , leaving us with the upper sideband component,  $f_c + f_m$ , a single frequency of 461 kc.

The signal at this frequency may now be heterodyned to the required transmitter output frequency in the usual way.

**Circuitry**

Although the filter in a single-sideband generator has a good rejection characteristic at frequencies adjacent to its passband, this does not necessarily hold true at frequencies somewhat removed from its passband. For this reason any signal used to modulate a single sideband exciter must be as free from distortion and harmonics as possible. The audio oscillator which most readily meets this requirement is the phase-shift arrangement, the circuit of which is shown in Fig. 2A. Readers will no doubt be familiar with this circuit, but for the uninitiated the operation is briefly as follows :

The RC network, comprising C1, C2, C3, R1, R2, R3, provides a 180-degree phase shift at a frequency:

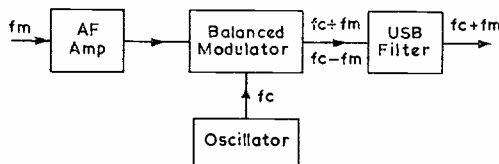


Fig. 1

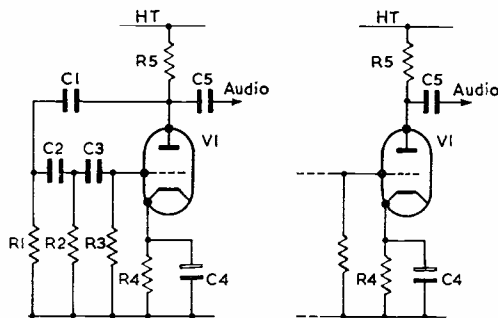


Fig. 2A

Fig. 2B

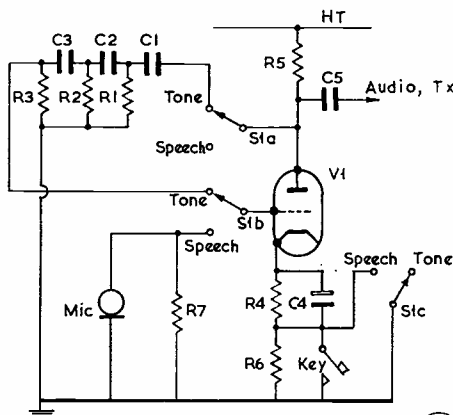


Fig. 3



These circuits are self-explanatory when read with the text. Fig. 3 shows the finalised arrangement, where the first-stage valve functions either as tone modulator or speech amplifier — values are given in the table opposite.

$$F = \frac{1}{2\pi RC\sqrt{6}}$$

Where F is the frequency in c/s,

R is the value of the resistors in ohms.

and C is the value of the capacitors in farads.

The values of R and C shown in Fig. 2A will produce an output at approximately 1000 c/s. Although, theoretically, countless other frequencies will also be present at both the anode and the grid, oscillation cannot take place because the voltage fed

### Table of Values

Figs. 2 and 3. Tone Modulator Circuit, SSB Tx

C1, C2,	R5 = 47,000 ohms
C3 = 390 $\mu$ F, s/m	R6 = 2,200 ohms (Fig. 3)
C4 = 25 $\mu$ F, 25v. elect.	R7 = 1 megohm (Fig. 3)
C5 = .01 $\mu$ F, 350v.	V1 = $\frac{1}{2}$ -12AT7, or similar
R1, R2,	
R3 = 180,000 ohms	
R4 = 2,200 ohms	

to the grid will not bear the required phase relationship to that at the anode to sustain oscillation.

Fig. 2B shows the oscillator denuded of its phase shift network, and will, of course, immediately be recognised as that of a straightforward voltage amplifier. It will also be realised that, before oscillation can occur, this amplifier must have a minimum gain to overcome the inherent loss in the phase-shifting networks.

#### Practical Application

Fig. 3 shows how these facts may be used to convert the first AF amplifier of a single-sideband exciter to perform the duties of both speech amplifier and tone oscillator. The addition of the resistor R6 in the cathode circuit of the valve permits keying of the oscillator for CW operation.

Although a triode is shown as the amplifier in the diagrams, there is no reason why a pentode should not be used providing the gain of such an amplifier is in excess of about 29-30 dB.

It will also be apparent that, apart from its use as a keyed tone-modulator, this circuit is an invaluable aid to setting up a single sideband transmitter.

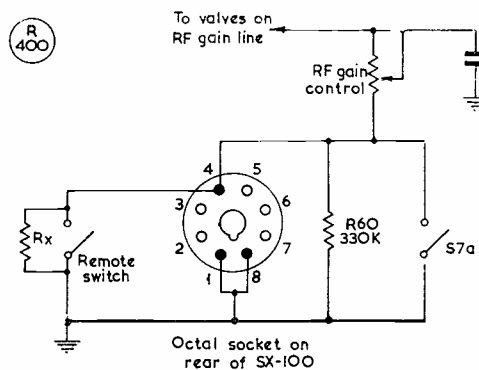
## MONITOR MODIFICATION FOR THE SX-100

### SIMPLE CIRCUIT CHANGE FOR MUTING CONTROL

R. L. EDGINTON (5B4GF)

IN its standard form, the SX-100 receiver is completely muted when switched to "standby." A simple modification to the remote control standby switching will enable the operator to hear his own signal when transmitting, and is effected as follows: There is standard provision for remote switching by a lead which runs from the junction of the RF gain and the 330K resistor to pin 4 of the octal plug on the rear skirt of the receiver. This same line also goes to the front-panel switch, S7A.

It will be seen that if a resistor is placed either between pin 4 of the rear plug and earth—or across a remote switch which is connected between pin 4 and earth—the total resistance of R60 and the unknown resistor will be less than the original 330K ohms. The receiver is no longer completely muted



Circuit for the modification to the Hammarlund SX-100, to enable it to be used for monitoring the radiated signal. The resistor Rx is selected to choice—see text. R60, of 330K, is as in the original, as are the RF gain and S7A, both panel controls. This modification should not be attempted without reference to the SX-100 manual.

and a signal from the local transmitter will be heard. To use the receiver by remote control, the front-panel switch must be in the standby position.

The value of the unknown resistor (Rx) in the author's case is 30K ohms, but could differ in other installations for various reasons. Values of 5K to 45K ohms have been found effective, depending on how loud a monitoring signal one likes to hear.

In the author's installation a surplus 12-volt coaxial aerial relay is used which (fortunately) has a pair of spare switching contacts that are closed in the "receive" position; it is these that function as the mute control in the circuit shown. Aerial change-over and receiver muting are therefore possible with a single switch controlling the relay.



This is an example of the new Hammarlund range of monitor receivers, intended for crystal-controlled fixed-frequency working in the amateur and commercial bands 25-54 mc and 144-174 mc. Selection of up to six channels is provided by panel control, for either NBFM (5 kc deviation) or WBFM (15 kc deviation) depending on model used and service required. The main application of these receivers is in government communications services and on business or industrial radio networks.

# DX COMMENTARY

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

CONDITIONS on all bands from *One-Sixty* to *Fifteen* have been pretty variable, but on the whole good. Probably much better than we have any right to expect! The chief effect of the lack of sunspots is to cram into two bands (*Forty* and *Twenty*) what ought to be spread out over four (guess which two are missing).

Added to this, that notorious creature the Eurolid has been multiplying rapidly. Always a pest in the garden at this time of year, it seems that the spring of 1964 is a specially good season for it. Those who have not come across the Eurolid before will have no trouble in identifying it, chiefly by its chirpy sounds, sometimes increasing to a shriek, and its other "call" which sounds like centipedes running along a plank with hob-nailed boots on.

It is a persistent creature, and once it has established a hold on a particular frequency it is very difficult to eradicate. Making its peculiar mating call over and over again, if no reply is heard it will simply repeat itself indefinitely, with seemingly no time limit. (Most other creatures are observed to make one or two exploratory calls and then to give up and lie quietly around, waiting for a mate to appear—not so the Eurolid, who shouts all the time.)

Many skilled specialists have tried to evolve a Eurolid-eradicator, but it seems that nothing but a strong dose of sunspots has any lasting effect upon this strange creature. During the winter it is observed in great quantities only during the mornings on *Twenty*, and the first part of the evenings on *Forty*. Now,

however, with the changing season, it remains active until much later on each band. Its time of retirement, at present seems to be as late as 1700 on *Twenty*, and midnight or even later on *Forty*. Research continues . . .

Thank goodness for Top Band—at present the only one on which you have a reasonable chance of an uninterrupted QSO. And even that is a bit difficult at times, especially if one trespasses on the sector appropriated by the DX-perts as "their" territory.

## DX News from All Quarters

The co-efficient of rarity has decreased quite a lot since the return to his native heath of Gus Browning, whose current call is (strangely enough!) W4BPD. The final exploit of his incredible expedition was operation from inside China, signing XW8AW/BY. Not a hit-and-run affair, either, but at least 4000 QSO's, after which he took the logs home personally to W4-land, to hand over the mighty chore of QSL-writing to W4ECI and the other helpers.

Thus ended (we quote now from the WGDXC *Bulletin*) "a DX-pedition that may never be repeated or duplicated by anyone in length of time, countries visited, QSO's logged, and therefore establishing a record that may stand for all time in the annals of amateur accomplishment." (That man at the back, there, muttering "Who the heck is this Gus, anyway?" . . . you're not supposed to be reading this. If you had the slightest interest in DX-ing, or the smallest clue about the HF bands, you couldn't help knowing quite a lot about him; and *that* is the measure of the influence that this one man's operating has had on us all.)

VP8HF duly showed up on March 7, as planned, from South Sandwich Is. Elusive and not always strong, but workable by the knowing types—though one could have hoped for a higher

percentage of CW operation . . . Likewise FB8WW continues to activate Crozet Is. and to drive some of the 'chasers frantic by his quick instructions to call him on some other frequency. (He means it, too—if you don't get smack on the stated frequency you haven't a hope!)

The Chagos/Agelega/Rodriguez trip by VQ9HB was unavoidably held up for three weeks or so, and the new starting date is not yet fixed; you may still be in time to work them.

Angus, HZ2AMS, may already have been in evidence as 8Z2AMS from the Neutral Zone. Not there at the time of writing, though . . . WPX-hunters will no doubt have discovered that Ukraine is now using UY, in addition to UB and UT (UY5BE has been in evidence lately).

ZL4JF (Campbell Is.) has been working into the U.S.A. around 1130 GMT on 7 mc . . . VK9MD (Christmas Is.) likewise at 1430 on 14 mc . . . KG6IF appeared on Marcus Is., SSB with several operators; duration of stay unknown.

Yemen—4W1B is HB9ZY, one of the Swiss operators officially licensed to operate thence . . . YA4A, Kabul, is K4UTE, who will be there about ten months and then move to YI, YK, 9K3 and finally off to the Pacific area . . . YK1AA and YK1AL both active from Syria—one on SSB and the other on AM, both 14 mc.

The Hammarlund DX-peditions are proceeding more or less according to earlier announcements, plus the following: CR5SP (St. Thome Is.) will be activated on SSB during May; he is at present busy on 14 and 21 mc CW and AM, but only operates for about ten hours per week. A YV8 in Venezuela will likewise be put on the air, for about the first week in April. Of interest to WPX-hunters, and also in view of the "All Continents Award" for the Hammarlund DX-pedition of

the Month contacts. (YVØAA, one of the former spots, counts as North America; this coming YV, on the Venezuelan mainland, will be the first such effort from South America).

The Aland Islands (OHØ) must have been worked by everyone in Europe long before now; but they are still of interest to DX'ers in many other parts of the world. Mailing of cards for the February DX-pedition is now under way, and there will be further activity during the summer.

VS1LX and VS4XK will both operate SSB for a period, as and when the gear reaches them; QSL's via WA2WUV . . . TR8AD is active on 21 mc AM, TU2AW on 14 mc CW . . . PJ5SA and 5SB will be on from Saba Is. for two weeks from mid-April; SSB with Swan single-band transceivers on 14 and 7 mc . . . SU1IM (for those who still haven't worked Egypt, and there are plenty of them) is very active on 14 mc CW; note is T7 or 8, signals very strong in U.K.

#### Around the Bands

So much for some of the DX available; now for the people who manage to work it—or some of it! For an interesting band-survey we can always rely on G2DC, whom is quoted once again: "Fifteen, as I predicted, has played up trumps over the past month. On most days it is wide open from 1000 to 1300 for the Far East, followed in the afternoons by most of Africa and then South America. Not overcrowded, even at the week-ends, real DX QSO's may be had in comfort."

Jack then alludes to our aforementioned Eurolids and the way they are now spoiling 14 mc with atrocious signals. As he says, "Especially in the morning or early afternoon, to put out a call means that five or six of these Klub boys come hurtling back at one. I tried new tactics recently; normally just ignore them, but decided to start answering some, especially those with real stinkers of notes, but a report like RST

ZONE-BAND TABLE

Station	Zones Worked						Total Zones
	28 mc	21 mc	14 mc	7 mc	3.5 mc	1.8 mc	
G2DC	40	40	40	36	25	5	186
G6QB	38	40	40	34	20	7	179
G3DO	39	40	40	25	24	2	170
G3IGW	36	37	37	31	17	11	169
OH3NY	32	30	40	25	10	7	144
G3NOF	34	38	39	6	8	1	126
G3PEK	2	21	35	30	17	4	109
G3OIN	2	7	11	16	3	4	42

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

596 means nothing to them, and they came back with 'Tks for UFB report dr om.' One of these coves called me four times recently when I was in QSO with VS6EY; every time I went over, back came this UA station calling me endlessly . . . wonder what they would do if they ever heard a real DX station?"

However . . . some early morning periods on 14 mc have produced Pacific DX and the like over the long path; and late afternoons have been tolerable, after the raucous noises have faded down a bit.

Forty—"Same old cry," says G2DC; "it's there if you can stand the QRM from all and sundry." And on Eighty quite good conditions prevail, and it's worth giving the band a going-over between 1900 and midnight, and also during the usual DX period around 0700.

So there's a brief summary of the active bands, with the exception of One-Sixty, with which we will now deal.

#### Top-Band Topics

Trans-Atlantic DX has continued, but at a rather slower pace. It could hardly be otherwise, after the fantastic winter season we have had. And now the time of year is such that a few of the really determined types are run-

ning skeds with ZL's! We do *not* intend to publish times or frequencies—they get enough trouble from intruders as it is . . .

On a slightly lower plane, we were glad to note that Austria has now issued licences for One-Sixty, and OE3LI has already been worked by many G's and also, it is believed, by W1BB.

G3IGW reports that 3V8US has, as yet, no gear for the 160m. band but hopes to be using it "within about a month" . . . G3IDG remarks that the present "possible" Top Band countries workable from the U.K. now number 86; so, as he says, with WAC on the band already established, DXCC coming up, the next Thing is probably WAS, which should ensure plenty of hard feelings for some years to come. He adds "What a blessing that most of this DX takes place when it does—just think what the band will be like when some joker discovers how to work W at midday on a Sunday."

G3NOW (Wolverhampton) has just settled down at a new QTH, and is back in business, but with a 150-ft. wire instead of the late lamented half-wave . . . G3PEK is very pleased to have worked three W/VE stations on his "piece of wet string"—a 66-ft. top only 27 feet high, sloping down to ground level at both ends and loaded to make a half-wave for Top Band. VE1ZZ, VO1DX and W2KQT were the three who

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**CALLS HEARD, WORKED and QSL'd**

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brought joy to the proud owner ! (And he disagrees with us over W1BB, who has been called until the face-blueing point has been reached and passed, with no luck as yet.)

GM3IAA reports a unique piece of liddery, which occurred after W1BB had gone QRT one morning. A station called him; Jim VFO'd and told this station that W1BB had gone; and back came the station, convinced that W1BB was now calling him, and having a "QSO"—phantom or otherwise. Ah, well ! GM3IAA adds that although he has built a very modern receiver, he still finds his old HRO and Q-Fiver holding their own; he has also been playing with indoor loop aerials to reduce QRM—one turn 16ft. by 8ft., or two turns 8ft. square.

G3REA, who advocated shorter calls (in these pages last month)

says he has had lots of favourable comments, and asks whether we might not now appeal to the DX stations only to answer short calls; this would scare the long-calling types stiff for fear that they might be ignored. Pertinent queries, too, from G3REA: "Can ten watts really give key-clicks here in Lancs from Southern England stations? And with S-meter readings equal to my nearest neighbour five miles away? And what about the T5 note heard calling VS1LP recently? And do the authorities really care?" The answer to that last question is not what you might think, as one or two characters have found out, recently, in a rather painful way.

G3PLQ, writing from Sierra Leone, has been keeping up his /MM operation (receiving only) and sends many pages of log. It makes it pretty clear which G stations have the really outstanding signals; even after some 589 and 599 entries, someone else appears who is described as "fantastic!" He is repeating the trip, leaving the U.K. about the first week in April, and keeps listening skeds 2100/2130 GMT and also 2359/0100, between 1800 and 1850 kc. John is still negotiating for a /MM licence, but meanwhile has worked other /MM amateurs . . . on 500 kc ! G3KGR, G3OSR and LA5EG, on other ships, have all been encountered in this way.

SWL Barry Curnow (Plymouth) described W1BB as "frequently audible at 579, all times between 2300 and 0800 GMT." And in addition to a long string of W's he lists OH3NY and 2YV, 6YACZ and 6YAXG, HK4EB, CO2CY, VP7NS, ZB1BX and OE1KU. Best W's logged were KØOEH and WØAIH.

And about five minutes before the final deadline we hear that C16TK worked HK4EB on the morning of March 8. Yes, it is One-Sixty we are talking about !

#### Eighty Metres

We are only too glad to note that G3PEK disagrees with the statement, last month, that this band is disappointing for the CW types. Not so, says he, and to prove it he quotes: 5B4KG (0225),

YA5A (1812), VS9AAA (2116), 5N2JKO (0548), 9Q5AB (2312), KV4CI (0711), VP9BM (2303) and ZL4BO (0728). As well as these, plenty of W's and VE's. Nice ones heard, but not raised, were MP4BBE, VS1LP, 6W8DD, 9G1EI, 5H3HD, 6YAXG, KP4AOO, HI3PC and 4DP, ZS6DL and 6AJH. All on CW, remember, and not, as G3PEK says, at all disappointing.

G2DC reports contacts with VP7EM, VP9BO, VS1LP, VK5NO, W 1-5 and 8-Ø, VE1-3, VO and 5N2JKO. All these, too, were on CW.

Lots of SSB types are known to have been working good DX on this band. Some of our SWL readers mention the following, all Eighty SSB :—TG9SC and 9FA (0810), 5N2CKH, 9Q5RK (2200), VP9FE (2210), 5N2JKO (2300), 7X2VX (2235), YV5ANS (2320) . . . (Barry Curnow, Plymouth). HK4EB, KZ5CI, TI2PI and 2JIC, VS9AAA, TL8SW, PJ2CY, YV's (very numerous), 4X4DK, 9A1IJ and ZL4LM (David Whitaker, Clitheroe) . . . 4W1B Yemen (3798 kc at 2130) . . . (Dave Gray, Croydon).

Reverting to the CW end, G3IGW reports "scores of W's worked almost nightly, 2200-0100, two QSO's with KC4USK (Antarctica), 3V8US, TF3KA, KV4CI, UD6BD, UA9 and I1." And Barry Curnow logged ZD3A on CW at 0350, as well as many others already mentioned.

All this is worth noting well, because it proves that it *pays to listen*. We are quite sure that 90 per cent of the people using Eighty Metres simply don't know that there is such a thing as DX propagation on the band. If they don't care either, well . . . they don't have to be interested, anyway. Though a lot of them would give their back teeth for a bit of DX, they simply don't listen for it.

#### Forty Metres

Precisely the same remarks (but more so) apply to Forty. On the actual day of writing this we heard a DJ happily working an HA and saying "DX conditions very bad" . . . while on their frequency a G station was struggling to read a

### TOP BAND COUNTIES LADDER

Station	Confirmed	Worked
<i>CW and Phone</i>		
G2NJ	98	98
G6VC	98	98
G3GGS	97	98
GM3KLA	95	96
G3REA	94	95
G3LWQ	94	95
G3PLQ	92	92
G3OLN	86	92
G3PHO	76	92
G3RHM	72	75
G3RJH	67	80
G3REP	65	77
G3NOW	62	68
G2BP	54	63
GM3PPJ	52	69
G3IDG	50	54
G3SNU	11	52
<i>Phone only</i>		
G3FS	88	89
G3NPB	85	86
G3RHM	64	67
G2NJ	51	51
G3REA	36	45

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

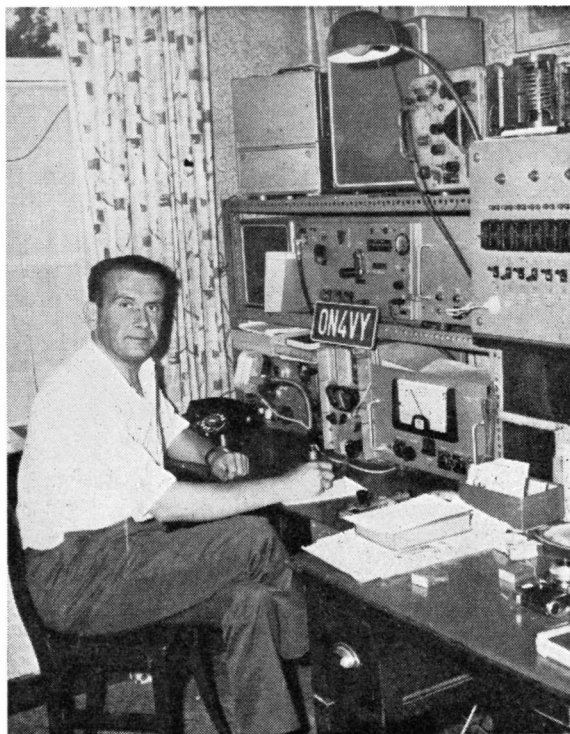
KH6 right through the pair of them! Once again, one is aware that there are hundreds of stations on Forty that know nothing of DX and don't even *want* to know—and they have a perfect right to be that way—but it seems odd that the many, many people on the band who would dearly like to work some of these DX stations won't even stop yakking for a few minutes in order to listen for them.

G3PEK worked our friend Gus, when he was at YA5A, four separate times, and says "the reason was because he was always calling CQ but seldom getting replies" . . . see what we mean? Others worked on CW by G3PEK were 4X4DH, MP4QBF, XW8AW, VS1LP, VK2QL, 5N2JKO and 9Q5AB (all between 1700 and 1930); MP4BBL, UM8KAA, 6YAXG, VP2KJ, KC4USK, 6W8DD, ZD3A and 5Z4IV (midnight and small hours); and VK3XB, VK7SM, W6HOC and VK2QL (0700-0800). Heard, but not raised—CE3ZK, CP5EZ and XW8AW/BY.

G3LPS worked CW with UL7BM, UJ8AR, KC4USK, HK7AHM, KZ5FP and KP4BJM. Also heard were 9X5MH, PZ1CM and VP3VN (the two last in QSO). The previous month G3LPS sent in a much longer list, which just missed the boat. Comparison of the two lists shows how much Forty has fallen off since February; this is normal, as "summer" approaches (the snow outside has nearly melted now).

G3LPS has been facing the problem of how to squeeze out one more S-point on this band, and he says that the biggest improvement so far has come from raising the radials of his ground-plane by six feet, and also increasing their number. This is confirmed by G2DC, who says that increasing the number of radials to seven has certainly improved things for him. His own bag for the month (CW) included KC4USK, MP4BEE and 4QBF, ST2AR, VS1LP, VS9AAA, VP8GQ, VK3VX, ZD3A, 6YAXG, 9L1TL, VS's and W's—all between 1700 and 2330.

SWL Curnow says "Conditions on this band have been simply



Station of ON4VY, Rene Vanmuysen, 81 Rue Joseph Baus, Wezembeek-Opem, Brabant, who is president of U.B.A., the Belgian national Amateur Radio organisation. It is he who has been largely responsible for obtaining /M licensing facilities for foreign amateurs visiting Belgium.

wonderful—every night there is DX from somewhere." His list is so long that we can only quote a few unusual ones such as XZ2ZZ (1936), VP8HF/MM (0100), KC4USK (2300), FB8XX (1845), XE1AX (0035), KG4AM (0045), VK5KO (2350).

The SSB side of the picture is covered by SWL Whitaker, who logged TI2EW, VK2ALR, VK3TW, VK3XO/Mobile and YV5AHG (all 0700-0800) and UQ2FX, VK3BM, 4U1ITU, 4X4DK and VK2AVA (all around 2000). He reminds us that the VK's on SSB use 7044 kc in the evening and 7095 kc in the morning, but *some* DX is heard in the American band (7205-7210 kc).

#### Twenty Metres

As the band gets better, the QRM gets worse—the old tale! But the short-skip noises from Europe seem to have reached a new peak during the past month, and nowadays even on Twenty,

of all bands, it seems that a G can't call either a CQ or a DX station without being pounced on by the characters we have already mentioned (and promise not to mention again this month!)

The strange thing about Twenty is that on some nights it's dead and buried by 2000 GMT; on others it is mostly full of South Americans until a much later hour; and, yet again, as on the night this is being written, there are VE8's and W6's with good signals at the CW end, even at 2030. All the excitement of variety, and you never know what's coming up next.

G3LPS heard three new ones in a week—PJ2AA, FG7XC and FM7WP—all with good signals but in heavy demand. He worked Gus at XW8AW/BY, and also VS4RS, both of which he needed; others raised were VP8HD and 8HJ, VE8RN, VP8GQ, TN8AF, 9Q5HD and CP3CN—all on CW.

G2DC found signals from the



Even when Stewart Perry, W1BB — so well known to all 160m. DX operators — is away from home, he keeps a watch on the band. Here he is in his hotel room when staying recently at Lovell, Maine.  
W1BB print

Pacific on a few mornings—FU8AG and W5HJ/KJ6 among them. And in the evenings the usual signals from South America were sometimes livened up by a sprinkling of Caribbean DX. His bag for the month included AP5HQ, ET3GC and 3RR, JA 1-5, TU2AJ and 2AW, VS1LP and 1LV, VP7EM, 8HJ, 8GQ, VQ8AI, XW8AW/BY, XW8AL, ZD6OL, ZS3A, ZD3A, 4W1B, 5H3's, 6YAXG and 9L1TL. All this, as ever, on CW.

GM3JDR also put in a nice CW list, including FB8XX, FY7YJ, KV4BE, PZ1AH and 1BH, VU2GG, YV's, ZL's, 5N2JKO, 5Z4JN, 8W8AC, 7X2NJ, 9L1TL and some 9Q5's. His "other half" worked SSB and managed to collect EL2I, HBØTL, JT1CA, VK4JQ, VP8GQ and 8HF, VP9FK, XW8AW/BY, YS1O, ZD6PBD, ZL's, 5N2's, 606BW, 6W8AE, 9M2DQ and 9Q5's. Don says "the band is staying open much later, with propagation favouring the South chiefly . . . Gus had an exceptional signal from BY on both SSB and CW."

G3NOF, also reporting SSB, found Twenty open until midnight on occasions and he worked EL2I, HC5NW, HR1SO, KP4's, KZ4's,

KZ5, OA4KY, TI2SS and 2ZZ, TU2AW, PJ2AA, PZ1AG, YS1O and 1JP, 4W1B, 5N2's, 6W8AE, 9G1DY, 5Z4's, 6YAUC and 9K2AN—a goodly bag selected from his even longer list.

G3PEK, absorbed in the LF bands, spent little time here but did raise VS4RS (1420), CP5EZ (1845), KC4USK (2125) and VP8GQ (2110) as well as a PY7 and a VE5—all with 25 watts and long wire.

Long lists of AM and SSB stations acknowledged from SWL's David Whitaker and B. F. Hughes—but may we ask SWL's not to bother to report on the normal DX bands in future, please? Only loggings of special interest on unusual bands are wanted for this feature.

#### Fifteen Metres

Apathy and inactivity is still the curse of this band. SWL Dave Gray echoes our own opinion when he says "People may criticise or ignore contests, but when 21 mc is full of activity because of one, I say—let's have more of them."

G2DC considers that between 1000 and 1700, especially at a week-end, no one should have

difficulty in working a WAC on this band. His list of CW contacts shows CR6 and 7, CR8AD, ET3's, JA 1-7, MP4's, TU2AJ and 2AW, VU2GG and 2HS, VQ2W and 2BC, VK's, VE 1-6, VS1's, VS6EY, 6FC, VS9AAA and 9ART, VP8GQ and 8HL, XW8AW/BY, 8AL, ZS's, ZD3A, ZD6's, W 1-Ø, 4S7NE, 5Z4IV and 4AQ, 6O6BW, 9Q5's and 9L1TL. Now this is just about as good as his 20-metre list, and, remember, it's CW. So no more, please, about Fifteen being a dead loss.

G3PEK found some openings to the Far East and was amazed to hear Gus, XW8AW/BY, at 599 for a solid hour around 1100. With his 25 watts he raised MP4, UAØ, ZD3A, 5N2JKO, ST2AR, ET3GC, 9Q5TJ, VQ2W and 2WR, KG4AM and lots of W5's.

G3NWT finds the band "definitely on the upgrade," and says that all sorts of DX circuits are wide open—all they need is someone active at each end. He adds "To support a fast-subsiding ego I went in the shack today, supplied the XYL with the log, tuition and six ballpoint pens, and on the strength of three or four CQ's around 21.4 mc I worked 120 W's. (We hope the ego was suitably restored!) Also worked, on SSB, 6O6BW, 4W1B, 5Z4ET, AP2MI, VS1LX, VQ2's, 9G1DV, ZS7R, 9Q5's, MP4QBF, LU, ZS's and W6.

G3NOF confirms the lively state of the band at certain times, and has worked AM phone with ZE's, ZS's, 5A's, 5N2FEL, 2JKO, 2LJM and 2RAM. Also SSB with ZE, 9Q5EI and four U.S.A. districts. G3LPS reports CW contacts with 9Q5TJ and TL8SW.

#### That Other Band

Oh, yes—we have another 1700 kc of band-space. A little affair called Ten Metres! No DX traffic whatever is reported, which is hardly surprising when we are at the very bottom of an eleven-year cycle. But it is being used for local natter, more than one would suspect, by little groups up and down the country. The first squeak of real DX on Ten will bring the pack into action . . . but meanwhile let's try and stir up a little more interest in Fifteen, shall we? (Late Flash: G3HCU worked

CR6BR on 28.4 mc, 5 and 9 both ways.)

### General Chat

G3IDG's plea for an "AMY" code (age, marital status, and years on the air) has brought in a few responses. Notably from G3WW, who writes "How simple if we were all young bachelors, but he must provide for (a) unmarried, (b) married, (c) divorced, (d) separated, (e) widower, (f) multiplier for status, (b) to (e), plus (g) prefix for grandparent status, and suffix for (h) number of children and (i) grandchildren. Also (j) pre-prefix or follower for the great-grandfather state, not forgetting special coding for the number of nephews and nieces . . . anyhow it all sounds fun—is G3IDG trying to start a matrimonial agency or a Lonely Hearts Club?"

A card from Armin, DL1FF, tells us that he has been in hospital for some weeks, and will be there until April 20. "I suddenly got a heart attack—never been ill since my school-time." Very sorry to hear of this, and we send him best wishes from all his friends in this country. He also tells us that he scored about 37,000 in the 160-metre DX Contest, and worked 38 W's and VE's. Good luck, Armin!

G3NWT writes: "Once more a pre-announced DX-pedition appears to have achieved S7 in every part of G except Sandiacre, where it has been completely inaudible. If attentive, I can usually detect a transmission which is two or three S-points below the noise level; DX out of the blue I can usually hear as well as the rest, and on rare occasions I can hear DX that they can't. What is the answer to this mystery?"

G3IDG comments "Half the trouble on Top Band stems from certain people not being content with proving once that they can work, say, a W. They have to go on and on proving it. If they left it at that, others would have a better chance to do so, tempers would get less frayed, and old Top Band would return to normal." Our own opinion is that the regular weekly working of the same DX stations has become

a status symbol, which can be just as much of a curse on the amateur bands as it can in daily life. (All right, you Big Boys—we *know* your status now, and you don't have to go on proving anything.)

### More Shorts from Readers

VS4RS has had a promotion and is now in charge of all Sarawak communications, having been moved from Sibu to Kuching. His proposed trip to ZC5 is therefore cancelled. New QTH: Ron Skelton, VS4RS, A.C.T., Telecommunications Hq., Kuching, Sarawak. VS4XK is expected on, any day, with Collins gear, also from Kuching. (W6YY.)

"Re the comment that a small handful of DX'ers make a big noise, both on the bands and in print. I like chasing DX, and only wish that more people sent in

reports as I am always interested to know what the other fellow is doing. Many overseas amateurs tell me that they read DX Commentary with great interest for the same reason." (G3NOF.)

G3HCL's rig is *en route* to Malaysia by sea and air, and he is following on April 1 (no comments, please, he asks!) They already have one volunteer to take it over to VS5, and Danny will be operating from 9M2. Meanwhile, he looks forward to the eventual end of service life, and a cottage of his own with two acres and a panoramic view . . . (Don't we all!)

G2DC is again in trouble with his Quad, storms and high winds having broken the wire of his 14 mc reflector. Down it comes again, as soon as possible . . . Jack without his Quad is rather like a



9M2SR is the club station of 17 Gurkha Signal Regt., now at Seremban, Malaya. Their Tx is an ET-4336, which has been extensively modified and rebuilt by club members—in the photograph is Cpl. Tika Gurung, the first Gurkha to operate on the amateur bands. A two-band Quad is used on 15-20m., and the rig puts out a good signal. The club has sister-stations in 9N1BG, Dharan, and VS4CS, Kuching, also operated by Gurkha Signal Regt. members. The C.O. of the Regiment is Lt. Col. J. C. Clinch, 9M2ER—who says he tries to keep his end up, with his 50w., against this keen competition!



dog without a tail !

G3WW is looking for contacts on Eighty and Forty, AM and SSB, towards the "WALT" (Worked All London Town) award. London Postal Districts, please oblige.

A brand-new award known as the P-75-P emanates from the Central Radio Club of Czechoslovakia. It is really "Worked 75 Zones," and the Zones are those set up by the Geneva Conference (1959) for world broadcasting. This will be much more difficult than the old-established WAZ; for instance, Asiatic Russia contains thirteen zones, one of which comprises only the Kamchatka Peninsula and the Kuril Is. Although we are, on the whole, against the continual announcement of new awards, this one strikes us as very worth-while, quite difficult, and quite unambiguous. For full details send IRC's to Central Radio Club, Post Box 69, Praha 1.

#### Late Flashes

VK2AGH will be on from Lord Howe Is., April 15-29. He thinks the best time for European con-

tacts will be 0700-0800 on 7 mc, also 0800-1000 (long path) on 14 mc, and possibly 0900-1400 (short path) . . . It seems that Gus didn't even finish his exploits with XW8AW/BY; on the way home he signed JA1YL/Gus (!) and KH6EZ/W4BPD . . . VP8HF was worked by G2DC on 21022 kc CW (1800).

ZL4JF (Campbell Is.) worked by G3HDA on 7082 kc CW (0750), and is active most days, 0600-0800 on either 7 or 14 mc . . . FO8AR also heard working Europe on 7020 kc CW (0100) . . . KH6CV/KG6 and W5INO/KG6 are both on Marcus Is. and work SSB (14270) around 0600-0700 . . . W9WNV (Don of HL9KH) has an XE call and hopes to get an XE4 (Socorra) permit . . . It seems that the pirate who used VS1LP's call on 80 metres has also "borrowed" two other well-known calls—5N2JKO and, more recently, ST2AR. May his power-pack blow up !

*Top Band:* GM3KLA (Shetlands) says his 128-ft. mast blew down, and he put up a new 100-ft. vertical, but it is not doing the

DX job that he expected of it. He worked GC3EML, and his only gaps in the counties list are now Armagh and Antrim . . . W1BB's total of DX stations worked this season (reported last month as 99) is now 130, in 22 countries . . . VS1LP, after making history with his 160m. contacts with W6ML, worked KR6ML, G3GRL and finally W1BB for his first East Coast contact.

#### Sign-Off

So much for this month's doings, pretty lively on the whole. Next month we shall be announcing another **Ten-Metre Activity Sunday**—during either May or June. Watch for it, and please get on. The deadline for the May issue is **first post on Monday, April 13** (rather early, but that's the fault of the calendar). Don't miss it, and address everything to "DX Commentary," *Short Wave Magazine*, 55 Victoria Street, London, S.W.1. We look forward to hearing from more and more readers—and don't forget those Tables ! Until then, Good Hunting, 73 and—BCNU.

#### WARNING ABOUT WALKIE-TALKIES

The G.P.O. ask us to make it clear that the walkie-talkie sets now generally on sale cannot be licensed for the commercial (business mobile) bands and, if to be used on the amateur bands, an AT licence under the usual conditions is necessary. This warning does not apply to G.P.O.-approved apparatus obtainable under commercial licensing conditions for private mobile services in the 80, 160, 170 and 460 mc bands. The prohibition applies to walkie-talkies operating on frequencies around 27 mc (a reserved band) and 28.5 mc (which is, of course, in the 10-metre amateur band). The G.P.O. will prosecute in any instance of the use of unlicensed apparatus on unauthorised frequencies.

#### ARTICLES FOR PUBLICATION

We are always on the look-out for good material of Amateur Radio interest for paid publication in **SHORT WAVE MAGAZINE**. If article-writing looks too tall an order for you to tackle, remember that it has been truly said that almost anyone can express himself coherently on paper on a subject that he really understands. The woolly stuff we eliminate at this end ! The Editor is always glad to consider material for publication, or to have suggestions for articles from would-be contributors. And, remember, you get paid for it, not ungenerously either, as soon as it appears in print. At the present time, we are

particularly interested in illustrated constructional articles on modern amateur-band equipment—which covers a pretty wide field. It is material of this sort that makes the highest contributor rate.



“. . . Vladimir Chikovsky, you always used to get T9—please explain this T4. . .”

# THE PRACTICAL APPLICATIONS OF SEMICONDUCTORS

## IN THE AMATEUR STATION— POWER SUPPLIES

### Part I

M. I. DAVIS, B.Sc.

*This is the first of a series of authoritative articles in which our contributor will discuss the circuitry for a number of items of amateur equipment in which it is possible to use transistors and semiconductors generally. The aim of the series is to show where, and how, the valve can be replaced by the semiconductor, whenever preferable and practicable.—Editor.*

THE use of germanium and silicon diodes instead of thermionic rectifiers in power supplies has many advantages, amongst these being smaller physical size, longer life, and lower voltage drop and dissipation. Further, semiconductor rectifiers need no power supply for heater current, a most important consideration, especially when a series diode stack for high voltage operation is considered. Silicon diodes have, in general, higher peak inverse voltage ratings (p.i.v.) and lower leakage currents than their germanium counterparts, whilst germanium diodes show a larger forward voltage drop. Hence, silicon devices are nearly always used in high-voltage supplies, while germanium diodes are employed in low-voltage power packs. Semiconductor rectifiers are not easily harmed by short-term current overloads, but are prone to damage by reverse voltage transients. However, with careful design, this can be avoided.

Fig. 1 shows the characteristics of a typical semiconductor diode, the shaded area containing the normal working range of voltages and currents

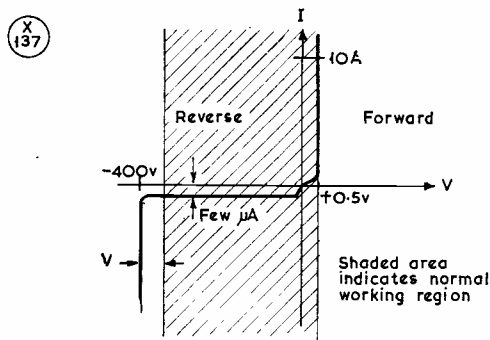


Fig. 1. The characteristic behaviour of a semi-conductor diode, discussed in the text.

applied to the device. If, however, a voltage surge ( $V$ ) occurs in the reverse direction, very heavy currents will flow, and since there is a large voltage drop across the rectifier, excessive dissipation will take place and damage will occur.

It should be pointed out that only 50 c/s AC power supplies are dealt with here. Inverters and RF oscillator EHT supplies will be the subject of a later article in this series.

### Low-Voltage Pack

A very simple capacitor-smoothed, full-wave, low-voltage supply is shown in Fig. 2. The Mullard OA10 has a maximum p.i.v. of 30 volts, and in this circuit each diode is subjected to a p.i.v. of about 17 volts. This value is arrived at as follows: Suppose  $C_1$  has charged to the peak secondary voltage. This puts the cathodes of  $D_1$  and  $D_2$  at  $6 \times 1.4 = 8.4$  volts. On the next half-cycle, the anode voltage of one diode will be  $-8.4$  volts peak, and assuming that there is no load current to discharge  $C_1$ , the voltage across this diode will be 16.8 volts. The resistor  $R_1$  prevents a very high current flowing through the diodes when the circuit is first switched on, as  $C_1$ , which is as yet uncharged, presents virtually a short-circuit for a fraction of a second. *This is a precaution which should always be taken.* The maximum average forward current for the OA10 is rated at 220 mA, and since in a full-wave system the output current may be twice the diode current rating, this circuit will safely deliver an output current of 400 mA. This principle of choosing rectifiers with a p.i.v. rating of *at least* twice the peak value of the secondary voltage should invariably be followed. For instance, the diodes used to rectify a 250-0-250 volt input need to have a 750v. peak inverse voltage rating, as an absolute minimum. A more conservative rating is preferable to allow for transient variations in input voltage.

### Transients

Voltage transients which may cause damage to rectifiers can take several forms. One is a gradual increase of mains voltage, and diodes should be chosen which can cope with the maximum secondary voltage likely to appear in the extreme condition. Other transients are in the nature of spikes of short duration and large amplitude, or else they are damped sinusoidal oscillations ("ringing"). These are caused by abrupt current changes when the circuit is switched on or off, and when associated equipment is switched into, or out of, circuit. For instance, in high-power transmitter design, it is

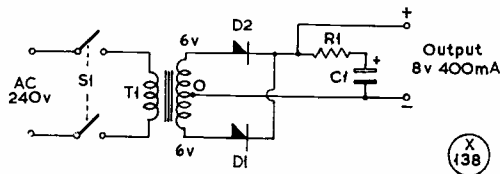


Fig. 2. The basic circuit for a full-wave low voltage power supply, which is discussed above.

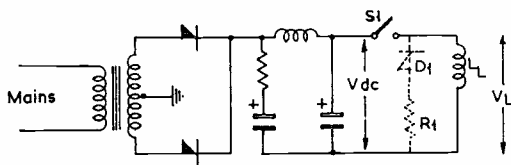


Fig. 3

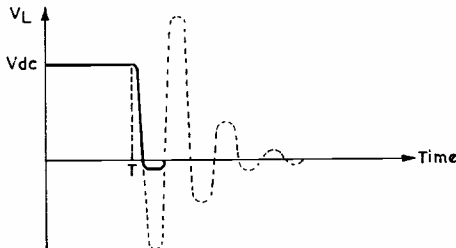
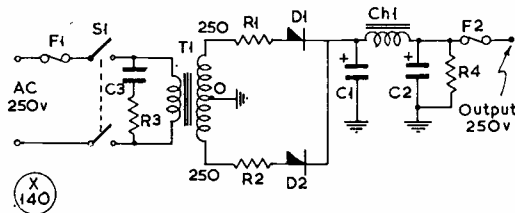


Fig. 4

(X 139)

Fig. 3. Protection in the case of inductive loads — see text. Fig. 4. The appearance of an inductive-load transient when S1 is opened at time T; the dotted line shows how the transient behaves without the D1, R1 of Fig. 3.

common practice to connect the fan motor (highly inductive) in parallel with the primary of the mains transformer. This must be adequately suppressed against turn-on and turn-off spikes; it is often the case that, since the motor is of the synchronous variety, it does not cause interference with the normal operation of the gear, and suppression is forgotten. A .02  $\mu$ F capacitor across the motor is usually sufficient. Similarly, inductive loads applied to the output need attention—see Figs. 3 and 4. It is too much to hope for that S1 will be a perfect switch. On turn-off it will probably break the circuit, causing a large voltage spike, and then either arc or bounce, momentarily reconnecting this voltage, via the filter circuit, to the diodes. To prevent this, D1 and R1 function to prevent a negative voltage spike



(X 140)

Fig. 5. Circuit for a general-purpose HT power pack, suitable for a wide range of voltage/current outputs — see Table I for diodes available for various ratings and loads. Some points about this circuit are discussed in the text.

**Table of Values**

Fig. 5. General purpose Power Supply Unit

- C1 = 16  $\mu$ F, 450v.
- C2 = 32  $\mu$ F, 450v.
- C3 = see text
- R1, R2 = 47 ohms,  $\frac{1}{2}$ w.
- R3 = see text
- R4 = 100,000 ohms,  $\frac{1}{2}$ w.
- T1 = 250-0-250v., or as Table I
- Ch = 10 Hy., 250 mA, or as required
- F1, F2 = Fuses as required
- D1, D2 = see Table I

appearing. D1 should have a high peak current rating, so that R1 may be kept small, and the inductive current can then flow round the loop without a voltage spike of any magnitude occurring. The inductive current will, of course, be at first equal in magnitude to the load current.

The way in which switch-on and switch-off transients (which can produce a spike of several times the peak input voltage) may be caused will not be entered into here, but their effect may be greatly reduced by the connection of a condenser C3 across the transformer primary (see Fig. 5).

For C-core transformers, the value of C3 is given by:

$$C3 = \left( \frac{700 \times \text{total transformer VA rating}}{(\text{Diode p.i.v.})^2} \right) \mu\text{F}$$

and  $R3 = 38 \sqrt{\frac{R_L}{C3}}$  where  $R_L$  = load resistance in ohms.

C3 = value of suppression capacitor in  $\mu$ F.

For instance, if the transformer T1 in Fig. 5 is a C-core, 50 watt, 250-0-250 volt type, and we present a load of 2.5K ohms drawing a current of 100 mA, then C3 should be about .04  $\mu$ F and R3 around 10K. To be on the safe side, C3 should have a working voltage of at least 750v. DC. R1 and R2 limit the peak current through the diodes when the circuit is switched on, and their voltage drop is negligible, being only about  $\frac{1}{2}$ -volt at full load current. For non-C-core transformers, or if the VA rating is not known, C3 should be made at least three times the magnetising current (in amps.) microfarads. This magnetising current is most easily found by connecting an AVO on an AC current range in series with the primary of the transformer, and completely open-circuiting the secondary.

Power supplies of this type can be used for receivers, amplifiers, and low-power transmitters. A

**Table I**  
*Suitable Diodes for circuit Fig. 5*

Rating	50 mA	150 mA	250 mA
150v.	2E8 (I)	2E8 (I)	5E6 (I)
	DD007 (L)	DD007 (L)	SJ501B (A)
	BY114 (M)	BY114 (M)	1S117 (T)
	SX635 (M)	SX635 (M)	BY114 (M)
250v.	RS28AF (S)	RS28BF (S)	SJ1003F (A)
	2/DD007 (L)	2/DD007 (L)	BY100 (M)
	BY100 (M)	BY100 (M)	OA211 (M)
	OA211 (M)	OA211 (M)	1S117 (T)
			S10AR2 (W)
350v.	3/DD007 (L)	3/DD007 (L)	1N1131 (T)
	2/RS28AF (S)	S15AR2 (W)	S15AR2 (W)
	2/OA211 (M)	2/OA211 (M)	

Notes: Letter bracketed is key to maker: A, A.E.I.; I, I.R.C.; L, Lucas; M, Mullard; S, S.T.C.; T, Texas; and W, Westinghouse. Surplus equivalents of many of these types are available through usual suppliers.

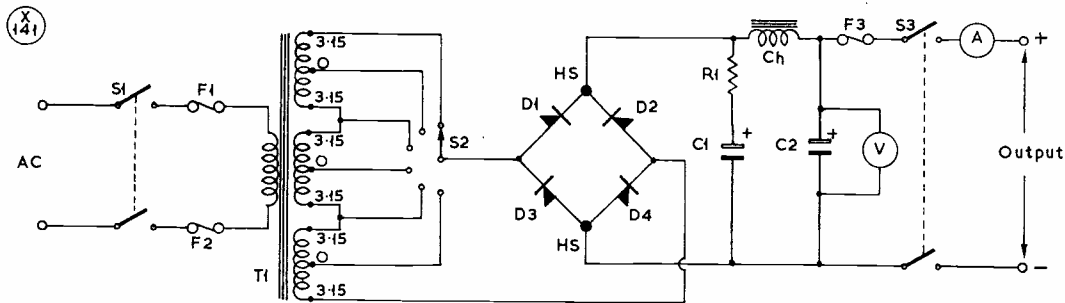


Fig. 6. The circuit for a variable low-voltage general-purpose power supply, for which suitable diodes are suggested in Table II. In construction, heat sinks should be provided at the points HS if heavy currents are to be drawn — see Table II. The smoothing choke Ch. should be chosen to pass the maximum load current without saturating, and should have as low a DC resistance and as high an inductance as possible.

table of suitable diodes for various voltages and currents is given in Table I. These all cost less than 15s. and some are as cheap as 6s. In addition to the devices listed, many surplus diodes are available, and suitable components may be found among these.

Care must be taken to ensure that the filter choke Ch. does not saturate at the maximum load current. At the expense of regulation and ripple, it may be omitted, and a resistor put in its place to save space and weight, and reduce stray magnetic fields. This contingency occurs particularly in the case of oscilloscope pre-amplifiers.

It is interesting to note at this point that the rectifier valve in an existing power supply may be replaced by the simple expedient of obtaining a plug to fit the rectifier valveholder and soldering the two semiconductor diodes across the appropriate pins. The protection components should be added at the same time. This reduces the heat dissipation in the unit, increases efficiency, and avoids the need for periodic replacement. That this is industrial practice is illustrated by the fact that there are commercially available diode packages with valve-base plugs for just such a purpose.

### Some Diode Circuits

The constructional details of this sort of circuit need little comment. The diodes require no heat sinks, and should merely be placed where plenty of air can circulate around them, and away from components which are dissipating much heat.

Fig. 6 shows a straightforward low-voltage power supply which will find a variety of uses in the AT station. Apart from the obvious one of supplying other semiconductor gear, it will give power for relay driving, beam rotation motors, and even for battery charging. It uses one of those hefty heater transformers, a multi-way switch, four diodes and a normal filter circuit. Load currents of up to twice the maximum current rating of the diodes may be drawn, and the input voltage is so small compared with the p.i.v. rating of the bridge that no transient protection is required. Output voltage is switchable in 3-volt steps, from 3 to 18 volts. By use of the appropriate transformer, and the correct set of diodes from Table II, any output current up to 20 amps.

### Table of Values

Fig. 6. Variable low-voltage general purpose PSU

C1, C2 = 100 $\mu$ F, 25v.	HS = Heat sinks
R1 = 0.5 to 1.5 ohms	S1, S3 = 2-p, toggle on-off
F1, F2, F3 = Suitable fuses	S2 = 1-p, 6-way wafer
Ch = High L/Low DC res. (see text)	A = Ammeter for load
	V = 0-20v. m/c meter
	D1-D4 = see Table II

Table II

Suitable Diodes for circuit Fig. 6

TYPE	RATED CONTINUOUS DC CURRENT
DD000 (Lucas)	500 mA
GJ4M (A.E.I.) DD320 (Lucas)	2 amp.
GEX541 (Mullard)	2.5 amp. 6.0 amp.*
BY22 (Mullard) SL101A (A.E.I.)	10 amp.* 10 amp.*
DD510 (Lucas)	20 amp.*

\* Indicates heat-sink (HS) required.

can be obtained. The smaller components may be mounted on a tagstrip, or on a small piece of *Vero-board*. Note from the Fig. 6 data that diodes with stud anodes or stud cathodes are available. If these are used, no mica washers are necessary, since the points HS on Fig. 6 may each be a heat sink—A having D1 and D2 cathodes bolted to it, and B carrying D3 and D4 anodes.

For circuits where the continuous current is negligible, but large currents may be drawn for short periods, as in a Class-C audio amplifier or modulator, the filter circuit may be omitted, the reservoir condenser supplying the high current peaks for the short time that they are required. The circuit then reduces to the type shown in Fig. 2, p.97.

Should the available diodes not be of a sufficiently high rating for the output current required, diodes