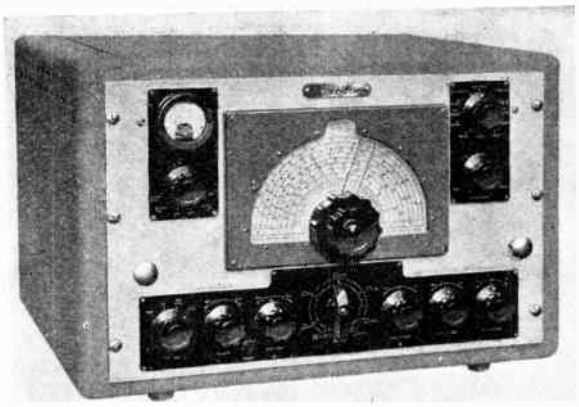

TEST REPORT

REDIFON MODEL R50

Wide-Range Tropicalized Communications Receiver

The Redifon R50 communications receiver has an attractive front with well-balanced controls.

AS one of the many functions of the general-purpose communications receiver with which we are here concerned is for merchant ship work, it has been designed to comply with certain requirements laid down by the Postmaster-General as to specification and performance.

One of the requirements for a set of this kind is that it must provide a continuous frequency coverage over the band 100 kc/s to 25 Mc/s. For certain ships a curtailed range may be permissible but in order to cater for all requirements the full coverage has been provided. In addition, an extra-low range of from 13.5 to 26 kc/s is included.

With this wide coverage the problem arises of where to place the intermediate frequency. Below 100 kc/s is not very satisfactory, especially for reception over about 1 Mc/s. In this receiver the problem is neatly circumvented by providing two i.f.s and selecting the most suitable for the band of signal frequencies in use.

The actual coverage of the receiver is somewhat greater than the minimum requirements for ship-borne apparatus. There are eight ranges marked, for convenience, A to H inclusive. A is the highest frequency range and H the lowest. H covers 13.5 to 26 kc/s; G, 95 to 250 kc/s; F, 240 to 600 kc/s; E, 585 to 1,550 kc/s; D, 1.5 to 4 Mc/s; C, 3.8 to 8 Mc/s; B, 7.7 to 16 Mc/s and A, 15.5 to 32 Mc/s. It will be seen that for ranges G to A inclusive there is a useful overlap in all cases.

As regards the use of the intermediate frequencies, on ranges H and F an i.f. of 110 kc/s is used since it is well outside the coverage of either. On ranges G, E, D, C, B and A, one of which includes the 95- to 250-kc/s band, an i.f. of 465 kc/s is employed. This i.f. could not, for very good reasons, be used on range F which covers 240 to 600 kc/s. Nothing is to be gained by employing 110 kc/s on the higher frequency ranges as the image signal discrimination would be somewhat unsatisfactory.

The changeover from one i.f. to the other is automatic, being performed by the waveband switching so that the operator has no need to concern himself with it and, of course, mistakes cannot arise. Two complete sets of i.f. transformers and two crystal filters are embodied in the i.f. unit. The arrangement of the circuit between the mixer valve and the first i.f. stage is given in Fig. 1 which shows also the circuit switching for the two narrowest bandwidths.

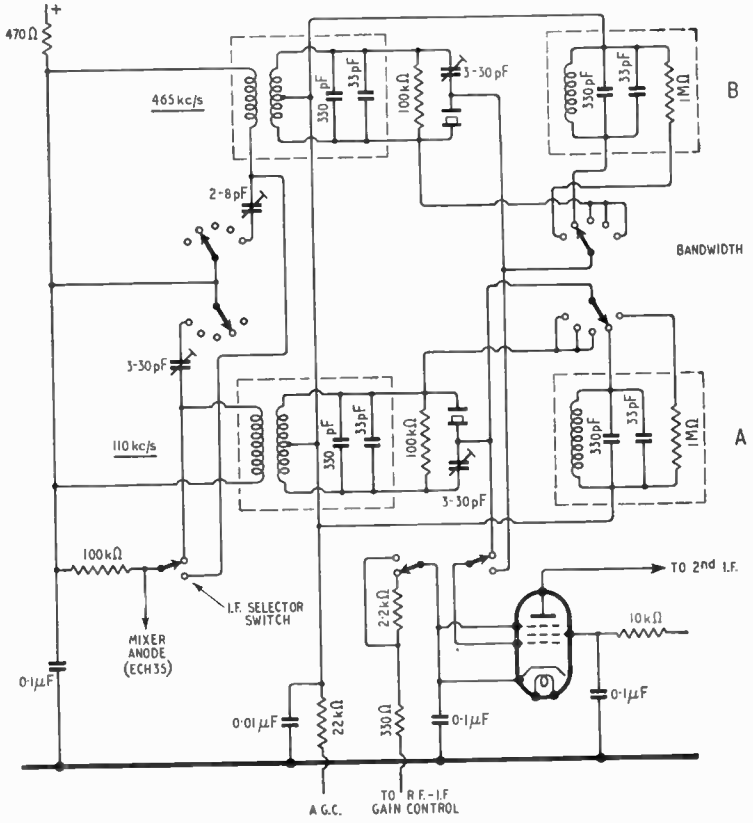

Fig. 1. Arrangement of the circuit between the mixer and first i.f. stages in the Redifon R50 receiver. This includes part of the bandwidth switching and i.f. switching.

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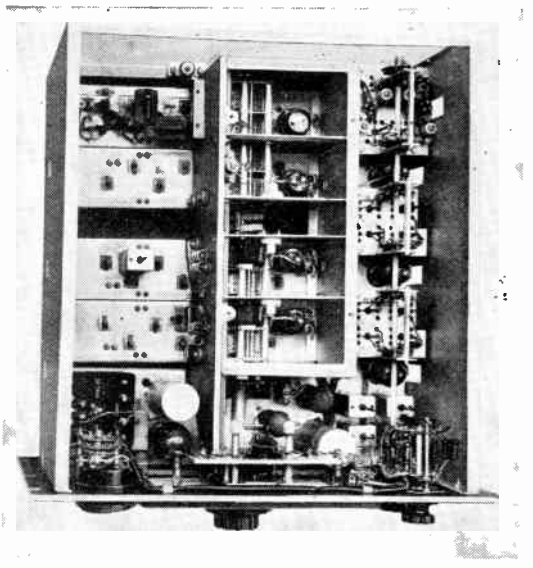
In all there are five bandwidth positions; two include the crystal filter and give either 150 c/s or 1.5 kc/s. The three other positions without the filter give 4, 11 and 17 kc/s respectively.

The narrowest bandwidth is obtained with the crystal filter working into a high-impedance load which in Fig. 1 is the 1-MΩ resistor in the subsidiary circuits A or B. The next widest, 1.5 kc/s, is obtained by modifying the load into which the crystal works, in the case of either of the subsidiary circuits A or B, the former on 110 kc/s and the latter on 465 kc/s, they are adjusted to provide an impedance of the order needed to open the bandwidth to 1.5 kc/s.

With the waveband switch set to any of the other three positions the crystals are short-circuited and the bandwidth is determined by the coupling between the primary and secondary circuits of the transformers in the latter part of the i.f. amplifier. The couplings can be varied by switching in the appropriate parts of tertiary coils which augment the inductive coupling between the primary and secondary windings.



Looking down on to the top of the chassis with the screens removed can be seen, on the right, the i.f. sub-assembly; in the centre the ganged tuning unit and on the left the subsidiary units. The switch assembly in the right-hand front corner is the metering network.

In order to achieve adequate selectivity with the crystal filters, twelve high Q tuned circuits are employed in the i.f. amplifier on either 110 kc/s or 465 kc/s. Each of the 24 circuits—12 only are, of course, in use at any time—are temperature compensated, the dust iron cored coils having two padding capacitors across them, one of a negative and the other of a positive temperature coefficient. Trimming of the i.f. circuits is effected by adjustable dust cores.

In all, three stages of amplification are employed in this unit, the valves being EF39s. Two only are included in the a.g.c. system and they receive a portion only of the total a.g.c. voltage available.

The rear end of the set is reasonably orthodox, a double diode (EB34) acting as detector and a.g.c. stage with another EB34 functioning as an optional noise suppressor. It can be switched in or out as required and there is also a control for setting the threshold point at which the suppressor begins to operate.

D.C. voltage for automatic gain control is derived from the primary circuit of the last i.f. transformer and applied, after some delay, to the two r.f. stages, and as already mentioned, in part to two of the i.f. valves but leaving the mixer and last i.f. uncontrolled.

In some communications receivers the a.g.c. system becomes inoperative when the b.f.o. switch is set for c.w. reception, but in the Redifon R50 a.g.c. continues to operate, but with a much longer time constant than for telephony.

A.G.C. can, however, be suppressed if desired and this facility is embodied in a four-position switch marked "AVC-NS." In one position a.g.c. functions as usual, in another it is inoperative and all control of volume is by the r.f. and a.f. gain controls, in a third position a noise silencer with a.g.c. is brought into circuit while in a fourth position the

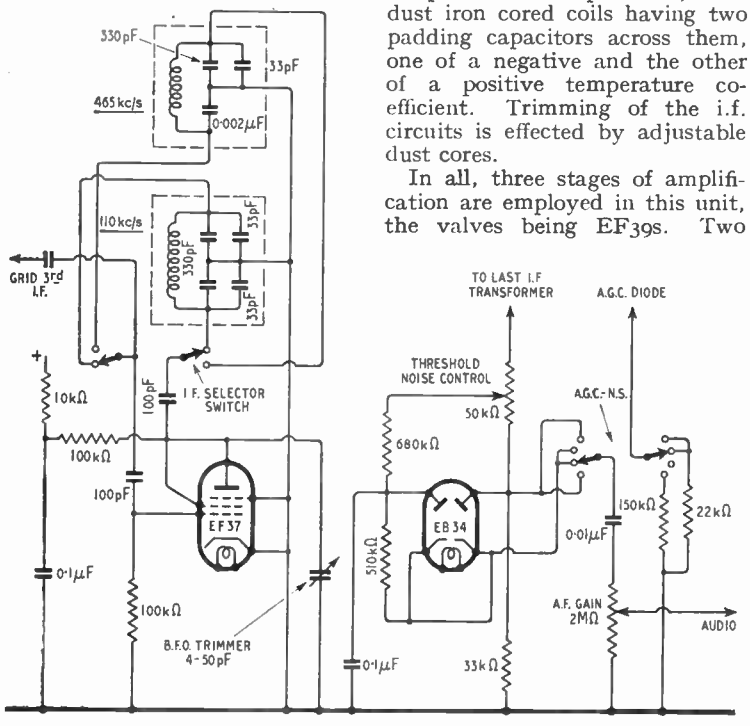


Fig. 2. The b.f.o. and noise suppressor circuits of the Redifon R50. Included also is the "AVC-NS" switch. It will be seen that two complete circuits for 110- and 465-kc/s i.f.s. are incorporated.

noise silencer is used without a.g.c.

Audio amplification is provided by an EF37 voltage amplifier and a 6V6 power valve with some negative feedback from the anode circuit of the 6V6 to the anode of the EF37.

Because alternative i.f.s are provided, the b.f.o. stage must generate heterodyne oscillations for either the 110- or 465-kc/s channels as required. An EF37 valve and a parallel-fed Hartley circuit, with entirely separate circuits for each frequency, is employed for this purpose. Both circuits are temperature compensated and the change from one to the other is synchronized with the i.f. selector. Details of the b.f.o. oscillator and of the noise silencer are given in Fig. 2.

In order to obtain a good signal-to-noise ratio and, perhaps what is of greater importance, an adequate image signal discrimination on the higher signal frequencies, two r.f. stages with EF39 valves are provided. These are followed by a mixer consisting of the hexode part of an ECH35 and a separate oscillator, which function is performed by a L63 triode with its grid joined to the normal oscillator grid of the ECH35 for voltage injection. The triode anode of the ECH35 is earthed.

There is little out of the ordinary in this part of the circuit except that each tuning capacitor has dual sections of 224-pF maximum. One section only is used on the three highest ranges but both are used in parallel on all other bands. These circuits, and those in the local oscillator, are frequency stabilized by a combination of negative and positive temperature co-efficient capacitors. The sectional circuit in Fig. 3, which shows the local oscillator, indicates these compensating capacitors, the negative temperature type having a short horizontal bar below the capacitance value. Also included is the dual tuning capacitor and the oscillator waveband switching.

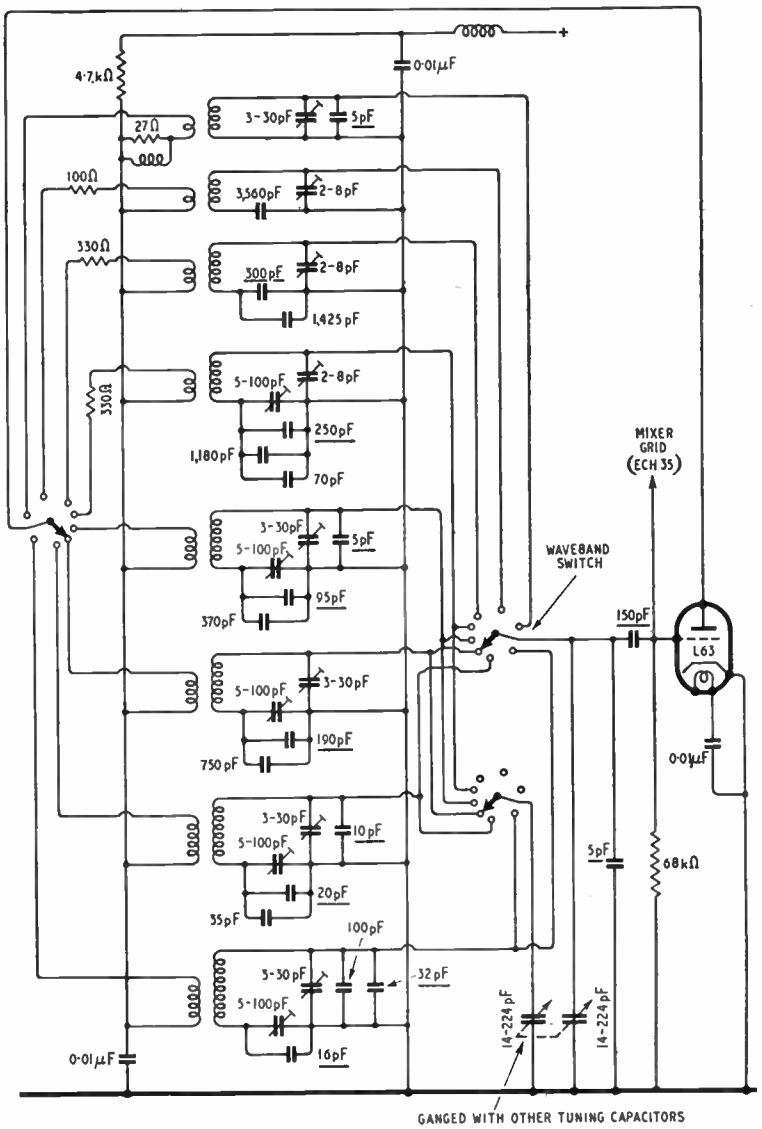


Fig. 3. A separate triode is used for the local oscillator with injection into an ECH35 mixer. Temperature compensation is used in all oscillator circuits, the negative co-efficient type capacitors being identified by a short horizontal bar below the capacitance value.

This receiver has provision for remote control and also for diversity reception if required. The screen grid supply lead for the i.f. and r.f. valves is accessible at the output socket and by simple switching, or by a relay, the voltage can be reduced so that the receiver is de-sensitized to such a degree that it can be employed to monitor a telegraphy or telephony transmission. It can also be arranged for "break-in" operation when required up to a speed of about 40 words per minute. The time constants of the receiver permit recovery to full sensitivity in the "break" periods up to this speed of sending.

Power supply for this receiver is provided by a separate unit and normally this will be a.c. operated. In addition to the usual rectifying and smoothing circuits the power unit contains a voltage regulator tube giving a stabilized h.t. supply to the mixer g_2 grid and the oscillator anode. The a.c. consumption is 80 watts. For battery operation there is another power unit and this has a rotary converter for h.t. supply. There are also available supply units with rotary convertors for various d.c. voltages up to 220.

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A receiver of such high selectivity as the R50 must of necessity possess extremely good frequency stability. From the brief foregoing description it will have been seen that quite a lot has been done to ensure that this condition prevails by the judicious use of temperature compensated circuits and stabilized voltages. But these precautions alone would be of little value unless they were supplemented by good mechanical rigidity. It is unusual to find quite such a massive construction as in the R50.

The individual sub-assemblies, as well as the main framework, are well braced to withstand the hazards of transit and to stand up to the stresses that must be imposed during rough weather on board ships at sea. Rubber suspension is used for the r.f. unit, with which is incorporated the ganged tuning capacitors, largely to combat any likelihood of microphony.

Although light alloy is used extensively in the construction of the set, it is not a light-weight receiver. The chassis alone weighs 55 pounds and, enclosed in a sturdy metal cabinet it weighs 92 pounds. The dimensions are $14\frac{1}{4} \times 21 \times 22\frac{1}{2}$in.

The set is fully tropicalized and while miniature components are included no attempt is made at miniaturization. When out of its cabinet every part of the set is readily accessible which makes for easy maintenance and testing.

In order that a quick check can be made on the set under working conditions a comprehensive metering system is embodied. A single meter is employed and this can be switched to measure the anode currents of r.f., oscillator and i.f. valves and the cathode currents of the a.f. amplifiers.

The performance of the R50 is fully in keeping with what might be expected of a set of this kind. With a little care in tuning and judicious selection of the bandwidth, a weak signal can be separated from between two quite powerful ones and held almost indefinitely provided the transmitter frequency is fully stabilized. After the initial warming up the oscillators settle down to their work and remain remarkably steady.

The h.t. smoothing is quite adequate and on the highest frequency range in the 30-Mc/s region, c.w. signals are receivable with pure beat notes and without a trace of ripple due to mains frequency modulation.

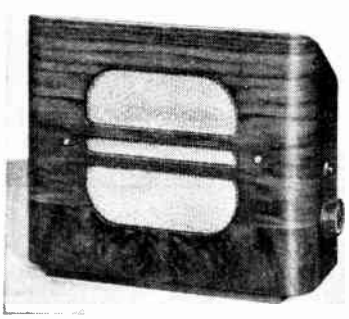
An epicyclic drive giving an 80 to 1 reduction is employed for the main tuning control. It incorporates a spring-loaded chain of gears driving a subsidiary logging dial, which, in conjunction with an additional scale on the main dial, enables any station to be accurately logged. The logging dial is visible through an aperture just above the main scales and a single division represents about a 10-kc/s coverage at 30 Mc/s. At lower frequencies it is considerably less. Frequency calibrated scales are provided for each of the eight ranges.

The R50 is made by Rediffusion, Ltd., Broomhill Road, Wandsworth, London, S.W.18, and the price of the cabinet model is £180. The set is also available with a panel for mounting in the standard 19-in rack.

REMOTE CONTROL EXTENSION LOUDSPEAKERS

TWO of the three new models in the "Stentorian" range of extension loudspeakers, made by Whiteley Electrical Radio, Mansfield, Notts, are fitted with push-button switches for remote control of the receiving set.

The system is the Whiteley "Long Arm" remote control in which a relay controlling the mains



"Beaufort" model with "Long Arm" remote control in the new "Stentorian" range of loudspeakers.

supply to the set is operated through three-wire extension leads from any loudspeaker position. When the set is switched on from another room, only the loudspeaker in that room is operative, all the others remaining silent. Alternatively, when the set itself is switched on manually, none of the extension loudspeakers will work unless specifically required.

Six-inch permanent-magnet units with die-cast chassis are used in the "Bristol" loudspeakers which have plywood fronts with rounded corners and are enclosed at the back with perforations in the covers to relieve back pressure. Constant-impedance volume controls are fitted and a choice of output impedances is provided.

The frontal dimensions of the "Beaufort" are $12\frac{1}{2}$in × $10\frac{1}{2}$in and of the "Bristol" $10\frac{3}{4}$in × $9\frac{1}{8}$in; both are $3\frac{1}{2}$in deep. Prices, with and without transformer, are: "Beaufort" £3 15s, £3 7s 6d; "Bristol" £2 19s 6d, £2 13s 6d. A cheaper model, the "Bedford," with 5in unit, but without the "Long Arm" control feature costs £2 5s 6d or £1 19s 6d without transformer.

MORE COPIES OF "WIRELESS WORLD"

As announced last month, the Government's decision to increase the allowance of paper for technical periodicals makes it possible to print more copies of *Wireless World*. Starting with the August issue (published 26th July) there should be enough for all anticipated requirements. But the number of copies will still be limited, and so it will be necessary for an order to be placed with a newsagent.

NEWS FROM THE CLUBS

Brighton.—Meetings of the Brighton and District Radio Club are now held on Tuesdays at 7.30 in the club's new headquarters at the Eagle Inn, Gloucester Road. Sec.: L. Hobden, 17, Harlington Road, Brighton, Sussex.

Exeter and District Radio Society is organizing a 7-Mc/s d.f. contest on Woodbury Common on July 3rd, which is open to other clubs. Sec.: E. G. Wheatcroft, 27, Lower Wear Road, Countess Wear, Exeter, Devon.

Slough.—Readers in the Slough, Bucks, area who are interested in the formation of a radio society in the district are invited to a meeting to be held at 7.30 on June 30th at the Slough Public Library. Acting Sec.: F. J. T. Tuckfield, 13, Quaves Road, Slough.

Southend.—The transmitter, G5QK, of the Southend and District Radio Society will be demonstrated at the Leigh-on-Sea Horticultural Society's Show at Chalkwell Park, on July 9th and also at the Scouts' International Jamboree at Rochford from August 13th to 20th. Sec.: J. H. Barrance, M.B.E., Swanage Road, Southend-on-Sea, Essex.