A.C./D.C. Communications Receiver

Eddystone Model 840 Seven-valve Superheterodyne Covering 30 Mc/s to 484 kc/s with Flywheel Tuning and Station Logging Scale

THE introduction by Stratton of an a.c./d.c. communications receiver should go some way to dispel any notion that an a.c. supply is really necessary for the satisfactory operation of sets of this type. Communications sets are used in many parts of the world for one purpose or another and flexibility in the mains supply required is an undoubted advantage.

TABLE 1

Circuit Position	Valve Type	Heater Volts	Function
V_1	UAF42	12.6	Tuned r.f. amplifier.
V_2	UCH42	14	Combined mixer and oscillator (frequency changer).
V_3	UAF42	12.6	I.F. amplifier at 450 kc/s.
V_4	UAF42	12.6	Combined detector and 1st a.f. amp.
V_5	UL41	45	Power output pentode.
V_6	UAF42	12.6	Beat frequency oscillator (B.F.O.).
V_7	UY41	31	Half-wave mains rectifier.

TABLE 2

Range	Coverage	Amateur Bands	Broadcast Bands
1	30.6 to 10.5 Mc/s	28, 21 and 14 Mc/s	11, 13, 16, 19 and 25 metres.
2	10.6 to 3.7 Mc/s	7 Mc/s	31, 41, 50, 60 and 76 metres
3	3.8 to 1.4 Mc/s	3.5 and 1.7 Mc/s	90, 125 metres and lower part of medium wave broadcast.
4	205 to 620 metres (14,600 to 484 kc/s)	None	Major portion of medium wave broadcast

(*Note.* The broadcast bands in the last column are given only in metres as the majority of short-wave listeners are better able to identify them in this form.)

Known as the Eddystone Model 840, the set is intended for general-purpose reception and is suitable for both amateur and professional purposes. It employs seven miniature valves in a reasonably orthodox superheterodyne circuit, the function of each valve, its type and position in the circuit, being given in Table 1.

The adoption of the a.c./d.c. technique has enabled a worthwhile saving in weight to be effected as there is no need for a mains transformer, and this is generally one of the heaviest items in a mains receiver.

Four switched tuning ranges are provided and together they cover 30.6 Mc/s to 484 kc/s. Individual coverages are given in Table 2, which also includes details of the specially marked sections of each range. These take the form of coloured bars embracing small bands of frequency and show at a glance where the broadcast and amateur bands lie. Blue is used for amateur and red for broadcast.

It has been said that the circuit is reasonably orthodox, by which is implied that the main circuitry —r.f., mixer, i.f., a.f. and BFO stages do not depart much from orthodox practice, but there are a number of features which are exclusive to the Eddystone 840. For example, it is usual a.c./d.c. practice to connect all valve heaters in series, using valves of the same current consumption throughout. In this set a combination of series and parallel connections is adopted and details of the arrangement are given in Fig. 1.

Of course, there is a very good reason for this choice. If all valve heaters were joined in series their combined voltages would add up to 140 V and it would then be impossible to operate the set on 100/110 V. Against each valve in Table 1 is marked its voltage requirements, and this will enable the rather unusual arrangement of valves V_2, V_5 and V_7 to be appreciated. The heater voltages of V_2 and V_7 add up to that of V_5, so that these two are connected in series and the pair joined in parallel with the third (V_5). Incidentally, all valve heaters take 0.1 A, but by this method of connection the filament consumption is 0.2 A and the total set consumption amounts to 0.275 A at any voltage.

The component marked T in Fig. 1 is an anti-surge thermistor to keep the current to a safe value at the moment of switching on, while L represents the dial light. The other components are readily identifiable.

One of the requirements of a communications receiver is the facility to monitor the transmitter when one is used at the same station. As in some cases the

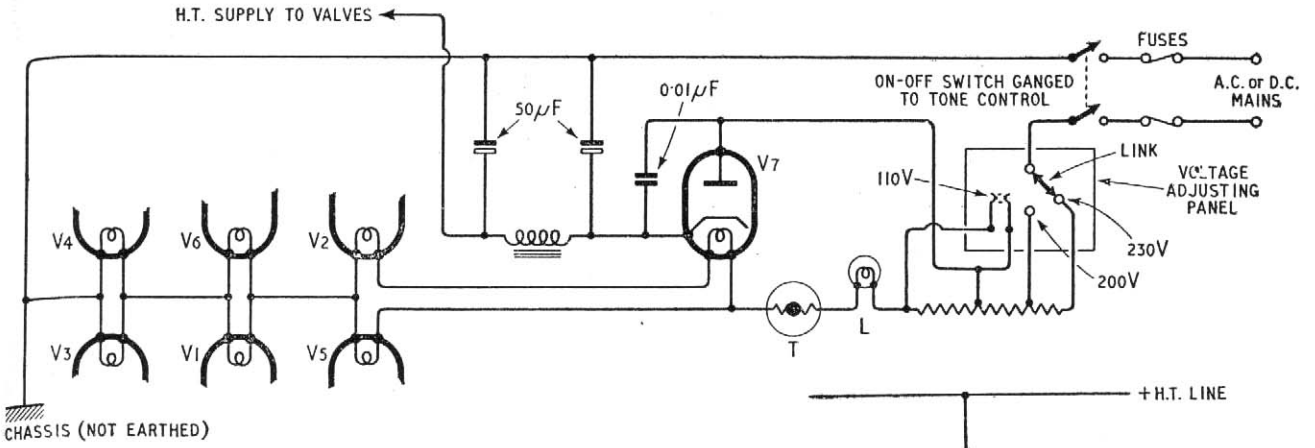


Fig. 1. Series-parallel arrangement of the valve heaters in the Eddystone Model 840 communications receiver.

receiver will be tuned somewhere near the transmitting frequency, it will either have to be switched out entirely, or adequately de-sensitized when transmitting. It is generally more convenient to de-sensitize the receiver and use it as a monitor.

All Eddystone communications receivers include this "stand-by" feature, and in the Model 840 de-sensitizing is effected by applying a rather large negative bias to the r.f. and i.f. stages (V_1 and V_3) by making the cathodes of these two valves more positive than normal. A simple on-off switch suffices and the arrangement employed is shown in Fig. 2. With S_2 closed valves V_2 and V_3 have the normal fixed bias derived from their respective cathode resistors and the r.f. gain control, which is augmented when receiving a signal by the a.g.c. negative voltage provided by a diode in V_3 (the UAF42 r.f. pentodes all contain a single diode). With S_2 open an additional 47-kΩ resistor is inserted in this circuit and as some current is "bled" through the network R_{33}, R_{32}, R_{34} from the h.t. positive line the point of connection of the cathode resistors becomes some 18 V positive and the grids of these valves take up about

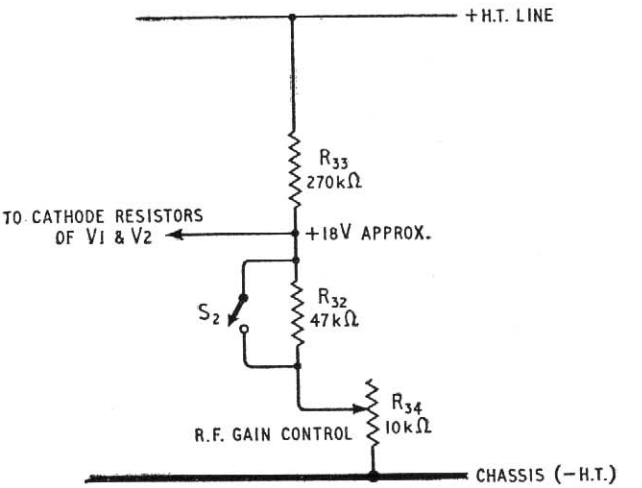
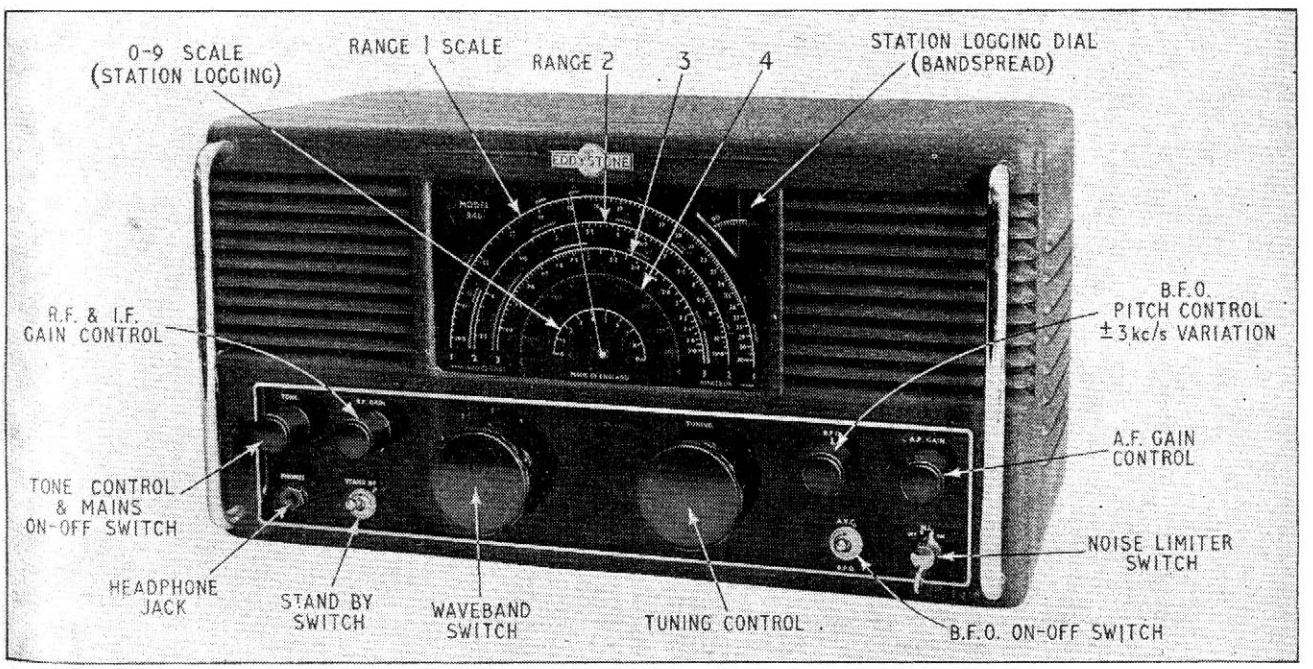


Fig. 2. The stand-by switch raises the cathode of the r.f. and i.f. valves about 18 V positive, the resulting negative grid potentials de-sensitize the set sufficiently for monitoring a local transmitter.

Front view of the Eddystone Model 840 a.c./d.c. communications receiver with the controls annotated.



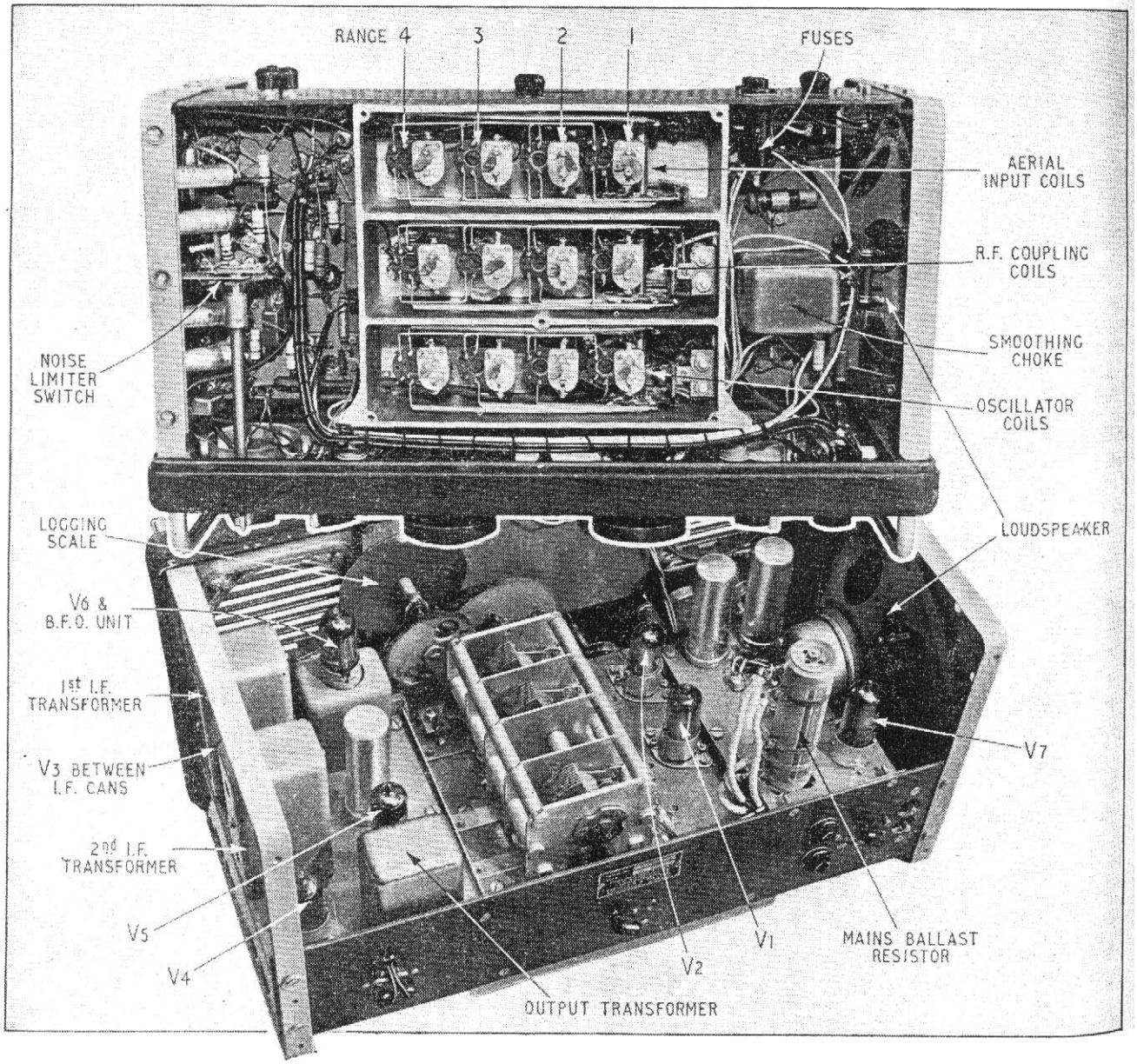
the same negative potential. This de-sensitizes the set sufficiently (or if it does not the a.f. gain control can be backed off) to enable the local transmitter to be monitored either for modulation or, with the BFO on, for c.w. telegraphy operation.

The BFO is a normal electron-coupled oscillator, the only interesting feature from the circuit angle being that its "on-off" switch is ganged with another which in its "on" position short-circuits the a.g.c. line to earth (chassis of the set, not the real earth). A.g.c. can be a nuisance when receiving c.w. telegraphy unless a particularly long time-constant is used and then this may become a nuisance for telephony reception as it will not respond to fast fading. So unless suitable time-constants can be selected for each type of service it is better to dispense altogether with a.g.c. for telegraphy work.

One other circuit feature of interest is that a crystal diode is employed for the noise limiter. This is switched in when required and is of the series type, being rendered non-conductive by a strong impulse of noise such as arises from motor car ignition systems. It is included in the circuit between the signal detector diode load and the grid of the audio amplifier (between valves V_3 and V_4). It limits the interference to a tolerable amount but we have handled better examples of the series type. However, the makers say it is intended to have only a limited range of control over the interference and as such can be accepted. In any case this type of interference, which is only really troublesome above about 10 Mc/s, will become less and less as more motor cars are fitted with suppressors.

The 840 is designed to provide communications receiver facilities without the high cost usually associated with this class of set and it is not possible therefore to have all the refinements of a high-priced set in one costing only £45 (U.K. price). The user must be satisfied with a little less effective noise limiter, no variable selectivity and no crystal i.f. filter. However,

The underside of the chassis showing the massive die-cast three-section coil box with cover plate removed. The neat layout of the top section is shown in the lower photograph.



these do not make or mar a set; they only enhance the pleasure of operating it. Just as a good performance can be obtained from relatively inexpensive sports cars, so an equally high performance is possible with an inexpensive communications receiver. If any doubt exists on this point half an hour with the Model 840 will quickly dispel it.

Its performance is unquestionably praiseworthy; sometimes there is a little more interference from adjacent channels and image signals than would be accepted with a more expensive receiver, but here again the price limitation applies. Taken by and large, the 840 will satisfy a large number of people requiring a receiver above the average. Its tuning mechanism is a joy to handle and is entirely devoid of backlash and exact precision in tuning is possible.

The four tuning scales are calibrated either in megacycles or metres and checks of the calibration against a quartz-crystal controlled frequency meter show the calibration to be substantially accurate throughout. In addition there is a small logging scale —some may call it a bandspread feature as it lengthens the readable scale considerably—which enables stations to be logged accurately and, what is most important in a set of this class, to return unerringly to that station, or tune the set to that station if it may not be working at the time with the assurance that when it does come up the set will be tuned to it. This logging dial is in the top right-hand corner of the scale and is used in conjunction with a 0-9 calibrated scale which is the innermost of the five on the face of the main dial.

Good C.W. Reception

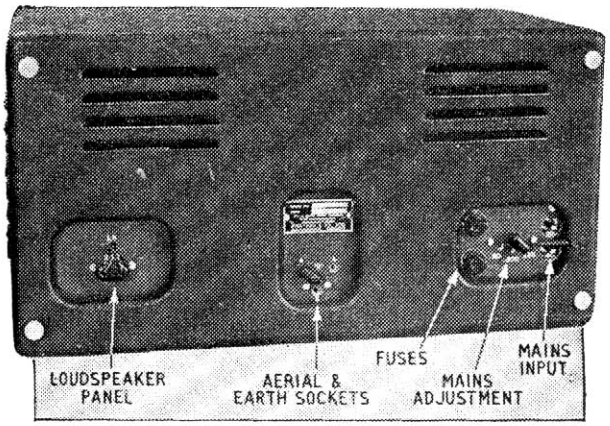
The BFO and the mixer oscillator were found to possess very good frequency stability and when listening to c.w. transmissions only very occasional re-adjustment of the BFO tuning control was required. Even this may not indicate drift in the receiver, the distant transmitter may quite well suffer a little frequency instability.

With both r.f. and a.f. gain controls turned up fully the background noise of the set is surprisingly low. it compares most favourably with other sets we have tested having comparable sensitivity and may even surpass them, but this could be verified only by a side-by-side comparison.

The model 840 is entirely self-contained, even to the inclusion of a loudspeaker. Provision is made for using headphones, the insertion of the 'phone jack automatically disconnects the speaker. The connections from the internal loudspeaker are brought out to a plug and socket panel on the back of the set and if desired an external speaker (3 ohms impedance) can be substituted.

Either a single-wire random length aerial or a dipole with balanced or unbalanced feeders may be used; with either kind the aerial is isolated from the chassis by capacitors. The cabinet is isolated from the chassis also by means of a capacitor and the actual earth connection is made to the cabinet not to the chassis. Good insulation is therefore necessary between chassis and all chassis fittings and the cabinet, and this fact must be borne in mind whenever the set is taken down for servicing.

The set is very robustly built, light alloy die-castings being employed wherever practicable. The cabinet is of rustproofed steel and well ventilated, and tropically tested components are used throughout. The tuning mechanism gives a reduction ratio of approximately 140 to 1 and works on the loaded flywheel principle, one or two spins of the knob sufficing to carry the pointer from one end of the scale to the other.



At the rear of the set are the voltage control panel, aerial-earth connections and loudspeaker panel. These are marked for identification.

In conclusion, the performance of a receiver is no better than its aerial, a point very often ignored and the Eddystone 840 gives of its best when used with a really good aerial. This does not mean that a long, high aerial is essential for receiving as we picked up signals from all parts with only a short indoor wire, but the signal-to-noise ratio was inevitably poor. Changing over to the outdoor aerial, only 50ft of wire in this case but well in the clear, the improvement in signals had to be heard to be believed. This is not an exclusive characteristic of the " 840 " but applies to any receiver. Too many sets are criticized adversely solely because they are expected to accomplish the impossible and give good reception but denied the means whereby those results can be achieved.

The makers are Stratton and Co., Ltd., Eddystone Works, Alvechurch Road, West Heath, Birmingham, 31.

LICENCE DISTRIBUTION

THE regional distribution of sound and vision licences at the end of May, when the respective totals were 10,629,228 and 2,316,600, are given in the following table. The bracketed figures give the percentage of the total number of licences in each region. When giving these figures in reply to a question in the House, the Assistant P.M.G. pointed out that they refer to Post Office Regions and not the B.B.C. Regions.

	Sound only	TV and Sound
London	1,728,457 (70%)	751,452 (30%)
Home Counties ..	1,461,820 (85%)	262,336 (15%)
Midlands	1,319,044 (73%)	489,325 (27%)
North Eastern ..	1,734,433 (86%)	269,308 (14%)
North Western ..	1,348,767 (82%)	301,306 (18%)
South Western ..	1,034,778 (93%)	76,089 (7%)
Wales	671,332 (88%)	88,550 (12%)
Scotland	1,115,353 (94%)	75,854 (6%)
Northern Ireland ..	215,244 (99%)	2,380 (1%)
	10,629,228 (82%)	2,316,600 (18%)