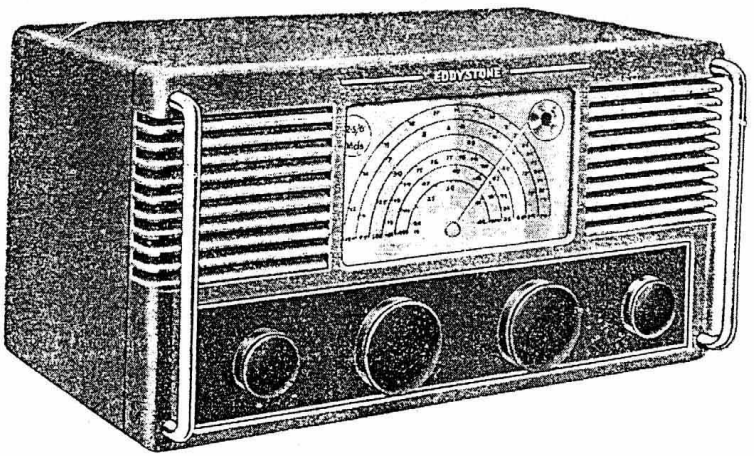
SPECIFICATION



RECEIVER TYPE 556

GENERAL.

This highly sensitive receiver is designed for the reception of broadcast programmes at long distances. It incorporates a power supply unit, twin matched loud speakers, and switched coils. The latter provide a coverage of 30,000 to 600 Kilocycles (10 to 500 metres) in five bands.

Range 1	13·2	to	30·5 Mc/s.
Range 2	6·25	to	13·4 Mc/s.
Range 3	2·9	to	6·5 Mc/s.
Range 4	1·34	to	2·9 Mc/s.
Range 5	580	to	1340 Kc/s.

Two models are made, one for A.C. mains operation and the other for battery operation. The former requires 200/240 or 110 volts, 40/60 cycles, the consumption being 65 watts. The battery model requires a 6 volt supply at 6·5 amperes, the power unit being of the vibrator type.

The controls, all on the front panel, are on off switch and tone control combined ; wavechange switch ; tuning ; volume. For ease of tuning, an electronic tuning indicator is provided, fitted to the top right hand corner of the dial. In the opposite corner is the wave-band indicator. The tuning dial, which is effectively illuminated, consists of five calibrated scales with an inner logging scale marked 0–100 degrees. Concentric with the latter is a fine tuning scale, traversed by a small pointer having a ratio to the main pointer of 20 to 1. The reduction ratio of the tuning control knob to the main pointer is approximately 140 to 1.

At the rear of the receiver are the mains input plug, aerial socket, and jacks for an external loud speaker and for a gramophone pick-up. An earthing terminal is also provided.

SPECIFICATION—continued.

CIRCUIT (*see Fig.* 3).

Two R.F. stages, using high gain low noise pentodes, are followed by a triode-hexode frequency changer which precedes two intermediate frequency amplifier stages. A double diode triode fulfils the functions of detector and first audio amplifier and provides A.V.C. The output stage is a beam power valve capable of giving up to 3 watts output. In addition, an effective noise limiter circuit, with a separate valve, is incorporated. The tuning indicator is of the popular " magic-eye " type. A full wave indirectly heated rectifier valve completes the circuit.

VALVES.

The positions of the valves are shown in Fig. 1 and the types used are as follows :—

V1	EF39	Mullard	1st R.F. Amp.
V2	EF39	,,	2nd R.F. Amp.
V3	ECH35	,,	Frequency changer.
V4	EF39	,,	1st I.F. Amp.
V5	EF39	,,	2nd I.F. Amp.
V6	EBC33	,,	Det. A.V.C. and 1st A.F. Amp.
V7	6V6GT	Brimar	Output.
V8	5Z4	S.T. and C.	Rectifier.
V9	EB34	Mullard	Noise Limiter.
V10	EM34	,,	Tuning Indicator.

INSTALLATION AND OPERATION.

The receiver has been aligned, calibrated and thoroughly tested before despatch. In the mains operated model, the transformer primary tapping is normally set in the 230 volts position, where it may remain for input voltages between 215 and 250 volts. For mains voltages between 210 and 195 the tapping screw should be placed in the 200 volt socket. A further tapping is provided for operation off mains supplies between 100 and 125 volts. Access to the transformer is obtained by unscrewing the four large screws at the rear of the receiver, when the cover can be removed completely.

Fig. 4 indicates the appropriate connections to be made to the receiver. For general use, an aerial about 60 feet long should be erected as high as possible and clear of other objects, but good results will be secured on shorter aerials, particularly on the higher frequencies. An earth wire should be connected to the screw provided on the cover at the rear, and, providing it is short, will be found to give improved results.

An external speaker may be used by connecting its leads to the plug provided and inserting the latter into the jack indicated in Fig. 4. The speech coil impedance of the external speaker should be approximately 3 ohms. A gramophone pick-up is connected up similarly and plugged into the other jack.

The purpose of the controls are marked on the panel of the receiver. The left-hand knob switches the set on and further rotation of this knob increases the higher frequency audio response. Tuning is then carried out with the wavechange switch set on the desired band, the frequency being read off against the appropriate dial scale. Volume is adjusted by means of the right-hand knob.

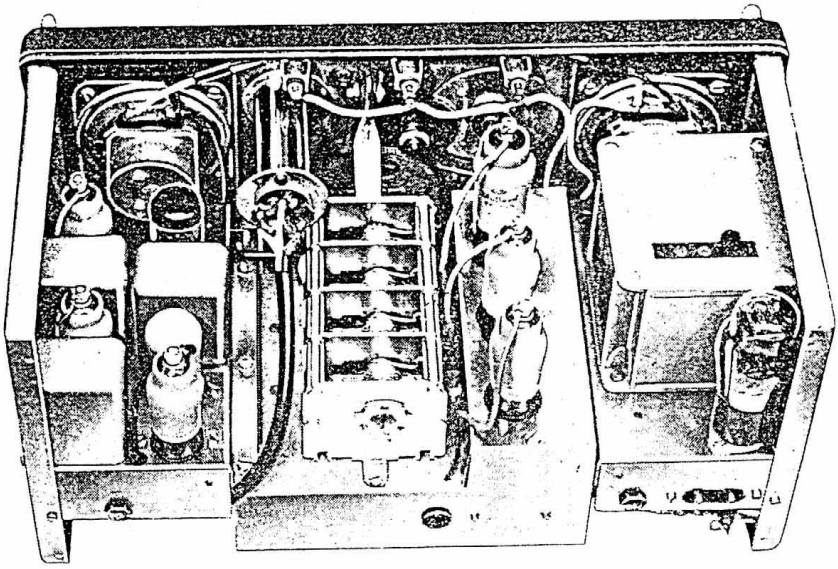


Fig. 1. Plan view of the "556" Receiver.

ALIGNMENT INSTRUCTIONS.

As previously stated, the receiver has been aligned carefully before despatch and the various trimmers should not be touched unless there is very good reason to suspect that one or more circuits have gone out of tune. Proper test equipment and a knowledge of superheterodyne alignment procedure is desirable when making adjustments to the tuned circuits. The instructions which follow should be carried out with care, since the performance depends entirely on the correct adjustments being made.

I.F. CIRCUITS.

The intermediate frequency is 450 Kc/s. The I.F. transformers are unlikely to drift off frequency over long periods and adjustment will rarely be necessary.

If re-alignment is thought desirable, a signal generator supplying a test signal at a frequency of 450 Kc/s, modulated to a depth of 30%, and an output measuring meter, are necessary. Before commencing alignment, ensure that the receiver is otherwise in the same condition as for normal use, i.e., all valves firmly in place, screens in position, etc. Switch on both receiver and signal generator and allow them to warm up for at least five minutes, to minimise frequency drift. The leads from the output meter, which should be set to represent an impedance of 2·5 ohms, are plugged into the external speaker jack at the rear of the receiver. The wavechange switch should be on Range 1 with the tuning set at 13·2 Mc/s.

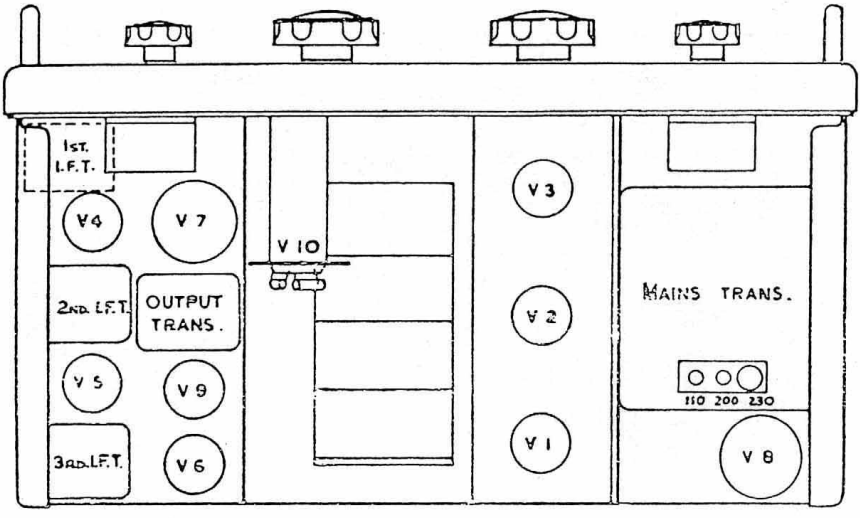


Fig. 2. Plan view in outline.

Connect the output from the signal generator across chassis and the top cap of V3, after removing the connector from the latter and after ensuring that a continuous D.C. path exists between the two leads from the signal generator. If the D.C. path is greater than 3 megohms, connect a resistor of about ·5 megohm across the two leads. With the receiver volume control at maximum, adjust the output of the signal generator to give a reading of not more than 50 milliwatts on the output meter. The cores in the I.F. transformers should then be adjusted, working backwards from IFT3 to IFT1 until a peaked response has been obtained. Access to the cores tuning the primary windings is secured through the side of the receiver bracket and to the secondary cores from the underside of the chassis. The positions of the three transformers are indicated in Fig. 2. During the process of lining up, it will probably be necessary to reduce the signal generator output to prevent the output meter reading going off the scale.

The frequency of the signal generator is then set 2·5 Kc/s on the low side (i.e., 447·5 Kc/s) and the three I.F. transformer secondaries re-aligned at this frequency. Finally, the signal generator is set 2·5 Kc/s high (452·5 Kc/s) and the same process repeated on the cores of the primary windings. The sensitivity of the I.F. amplifier section of the receiver is of the order of 15 microvolts.

TESTING A.V.C. ACTION.

At this point it will be convenient to make a check to ensure that the A.V.C. circuits are functioning correctly. Reduce the volume control of the receiver to about the half-way position to prevent over-loading of the output meter. The modulated input from the signal generator, set to 450 Kc/s, is then increased and up to a certain point a rapid increase of output will be indicated, but beyond this point the increase should be comparatively slow.

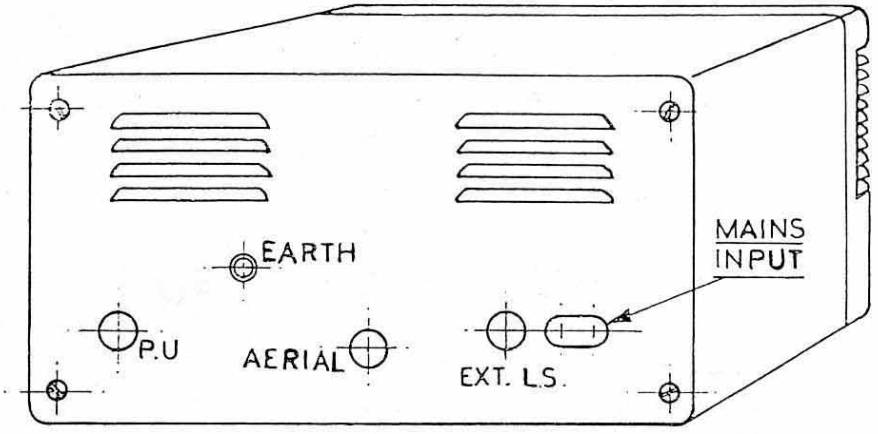


Fig. 4. Rear outline of receiver, with details of external connections.

ALIGNMENT OF R.F. STAGES.

The coil cores have all been carefully adjusted and fixed in position during the manufacture of the receiver. For the sake of completeness, the following instructions include information on the adjustment of the cores, but it should not be necessary to carry out the full procedure unless the positions of the cores have been deliberately altered and the tuned circuits thrown badly out of alignment. In the majority of cases, adjustment of the trimmer condensers will be all that is necessary, using for the purpose, an all insulated (bakelite) trimming tool.

To simplify matters, the coils have been given numbers, which same numbers apply also to the associated trimming condensers. Their positions are indicated in Figs. 5 and 6. It will be seen that the oscillator trimmers, to the front of the receiver, are of the " postage-stamp " ceramic type, all other trimmers being miniature air dielectric type.

Access to the trimmer condensers can be secured from the underside of the chassis, without removing the cover of the coil box. If it is found necessary to adjust the coil cores, the five screws holding the cover in place should be removed and the cover taken off. The metal plate around the bases of the R.F. valves must be in place during the alignment procedure.

RANGE I. OSCILLATOR STAGE.

The oscillator frequency on all ranges is 450 Kc/s. higher than the signal frequency. The signal generator should be set to 14 Mc/s. and the test signal fed, via the usual dummy aerial, into the grid (top cap) of the frequency changer valve V3. Adjust the tuning control of the " 556 " so that the main pointer also registers 14 Mc/s. The volume control should be at maximum.

With the vanes of the trimmer condenser half engaged, adjust the coil core, marked 4 in Fig. 6, for maximum output, keeping this below 50 milliwatts as before. Next, set the main pointer and the signal generator to 30 Mc/s. and trim condenser No. 4 for maximum response. Return to 14 Mc/s., when it will probably be found that the main pointer is slightly out and further adjustment of the coil core will be necessary. Again go back to 30 Mc/s. and re-trim. This process should be continued until the main pointer registers the correct frequency at each end of the tuning scale.

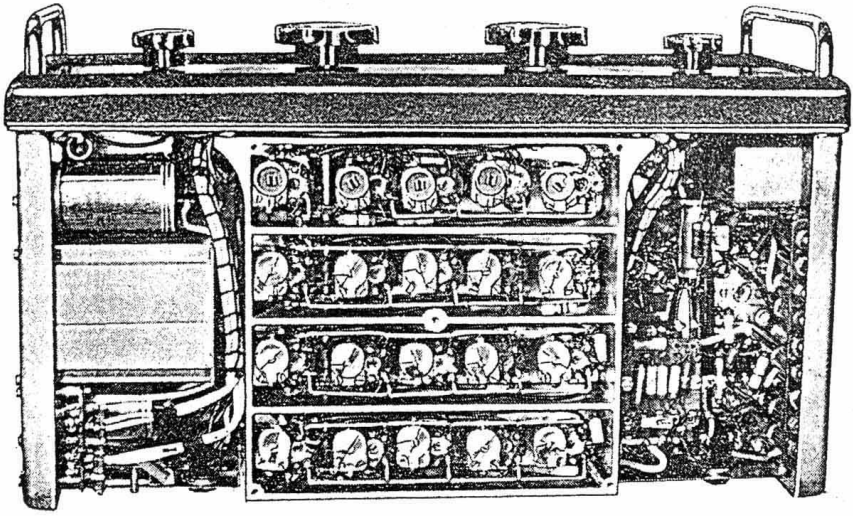


Fig. 5. View beneath the " 556 " Receiver.
Compare with Fig. 6 for location of trimmers, etc.

RANGE 1. OTHER STAGES.

Replace the connector on the top cap of V3 and feed the test signal into the normal aerial input socket. The same procedure as described for the oscillator stage is then carried out on each of the three remaining stages in turn, commencing with the frequency changer (coil and condenser No. 3), then the second radio frequency stage (coil and condenser No. 2), and finally the first radio frequency stage (coil and condenser No. 1).

ALIGNMENT OF OTHER RANGES.

The alignment of the other four wave ranges, is carried out in an identical manner to that described for Range 1, substituting the frequencies shewn below (Range 1 is included to make the list complete).

			COIL/COND. No.			
Range	Adjust Core	Trim	Osc.	F.C.	2nd R.F.	1st R.F.
1	14 Mc/s.	30 Mc/s.	4	3	2	1
2	6·5 Mc/s	13 Mc/s.	8	7	6	5
3	3 Mc/s.	6·5 Mc/s.	12	11	10	9
4	1·4 Mc/s.	2·8 Mc/s.	16	15	14	13
5	600 Kc/s.	1300 Kc/s.	20	19	18	17

Finally, if the coil box cover has been removed, it is replaced and the trimmers finally adjusted at the frequencies given in column 3 above, to take up any slight capacity effects.

ALIGNMENT PROCEDURE WITHOUT TEST INSTRUMENTS.

The foregoing instructions have assumed that a signal generator is available but it is appreciated that circumstances will sometimes arise in which it is required to align the receiver without any additional apparatus. In such a case it will not be wise to do more than adjust the trimmer condensers through the apertures in the cover of the coil box. The oscillator trimmers should not be touched unless the calibration is obviously incorrect.

If adjustment of the oscillator frequency is found necessary, a station should be tuned in, the identity and frequency of which is not in doubt, and preferably towards the high frequency end of the particular wave range. The appropriate trimmer condenser, as set out above, should then be adjusted, at the same time slowly rotating the main dial until the pointer coincides with the frequency at which the selected station is known to be operating.

To tune up the other stages, select a broadcast station which is known to be of consistent strength and not liable to fading, again preferably at the high frequency end of the band. The tuning indicator will be used to give indications of correct adjustment, and to obtain clear indications, it may be advisable to reduce the strength by using temporarily a shorter aerial than is normally employed. The appropriate trimmers are then adjusted, commencing with the frequency changer stage and finishing with the first R.F. stage. This process is followed on each range, as may be found necessary, the aim being to secure maximum closing up of the shadow in the tuning indicator.

The tuning of the I.F. transformers has been staggered in order to secure the proper band width and selectivity and it is therefore definitely inadvisable to attempt to adjust the tuning of the transformers when proper equipment is not available.

SERVICING.

When a multi-range meter is available, the accompanying chart of voltage values, used in conjunction with the circuit diagram, will prove an invaluable aid to the quick location of any fault which may arise. When a meter is not to hand, the task of locating a fault may not be easy, but certain symptoms, outlined below, will be of assistance. If the receiver stops working, it is almost certain that replacement of a component or valve will be necessary and the user who is in an isolated area will be well advised to keep some spare parts ready for use if required.

Under working conditions, a red glow can be seen from all the valve heaters, with the exception of the EB34. Complete lack of H.T. voltage will be evidenced by the failure of the tuning indicator (EM34) to give its normal green glow and by complete absence of sound from the loud speaker, although the latter may result from a defective output valve or output transformer.

If the valves appear to be sound and the H.T. voltage normal, as far as can be ascertained, turn the volume control full on and touch the top grid of V6 (there is no danger of shock). A loud howl or whistle should come from the speakers—if not, the trouble lies in the sections of the receiver associated with V6 and the following stages. If the howl does occur, then the trouble lies in an earlier stage. Touch the top caps of the other valves, working backwards from V5 In each case, at least a click should be heard in the speaker and if, on touching one particular top cap, no sound is heard, it is likely that the fault lies in the circuit elements between the silent valve and the next good one. The actual fault may be in the valve, in a resistor or condenser, or possibly (but rarely) in one of the coils.

CHANGING DIAL LIGHTS.

The holders for the lamps which illuminate the dial are sprung into place. To change a lamp, all that is necessary, is to press the holder and pull out. The lamp is of the miniature bayonet fixing type, rated at 6·3 volts, 1 watt.

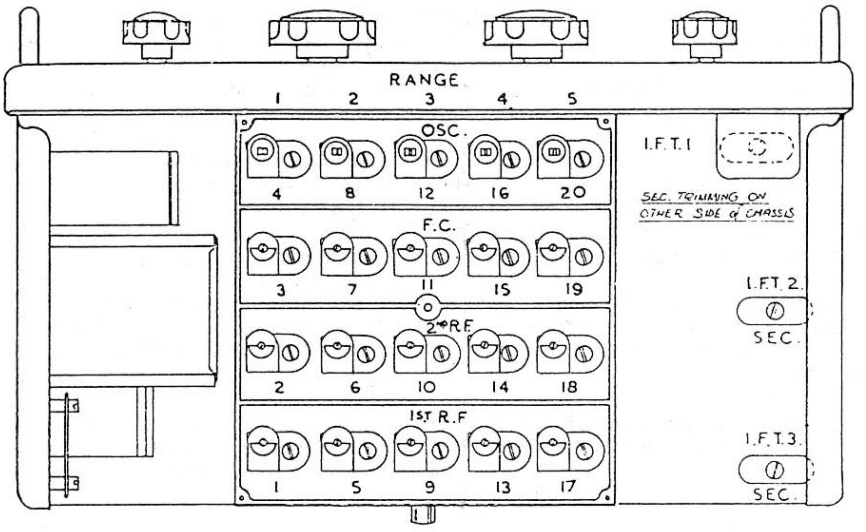


Fig. 6

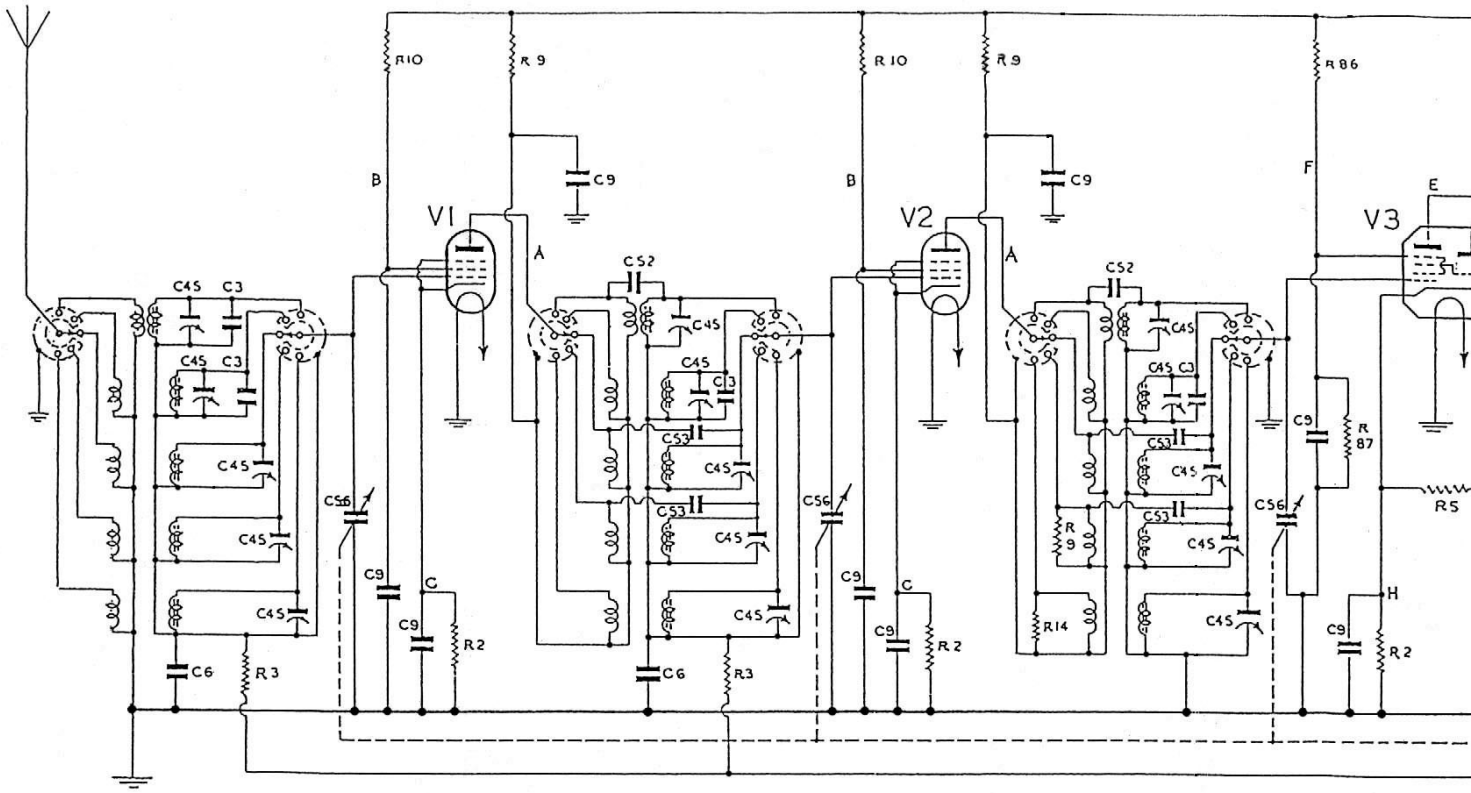
ACCESSIBILITY FOR SERVICING.

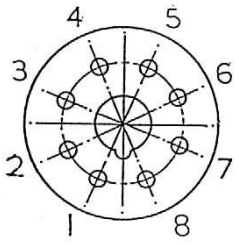
It will be noticed that unit construction has been adopted in the construction of the " 556 " Receiver, there being three major units, viz., tuning assembly, power unit and I.F. and output sections. The majority of the condensers, resistors, potentiometers, etc., are readily accessible but it may be necessary, in some cases, to remove certain parts of the receiver. To change the left hand speaker, for instance, it will be advisable to remove the power unit completely To do so, disconnect the wires from the terminal strip and unscrew the handle and other fixing screws. Two of the latter are located beneath the screening cover over the R.F. valve bases and this cover must be removed also. Removal of the smoothing condensers, without necessarily disconnecting them, will also prove helpful on occasions.

With the tuning condenser at maximum capacity, the scale pointer should be truly horizontal and register zero degrees on the innermost scale. Should it be necessary at any time to readjust the pointer the grub screws holding the flexible coupler should be loosened, the pointer lined up with the condenser fully meshed and the grub screws tightened up again.

PERFORMANCE AND OTHER FIGURES.

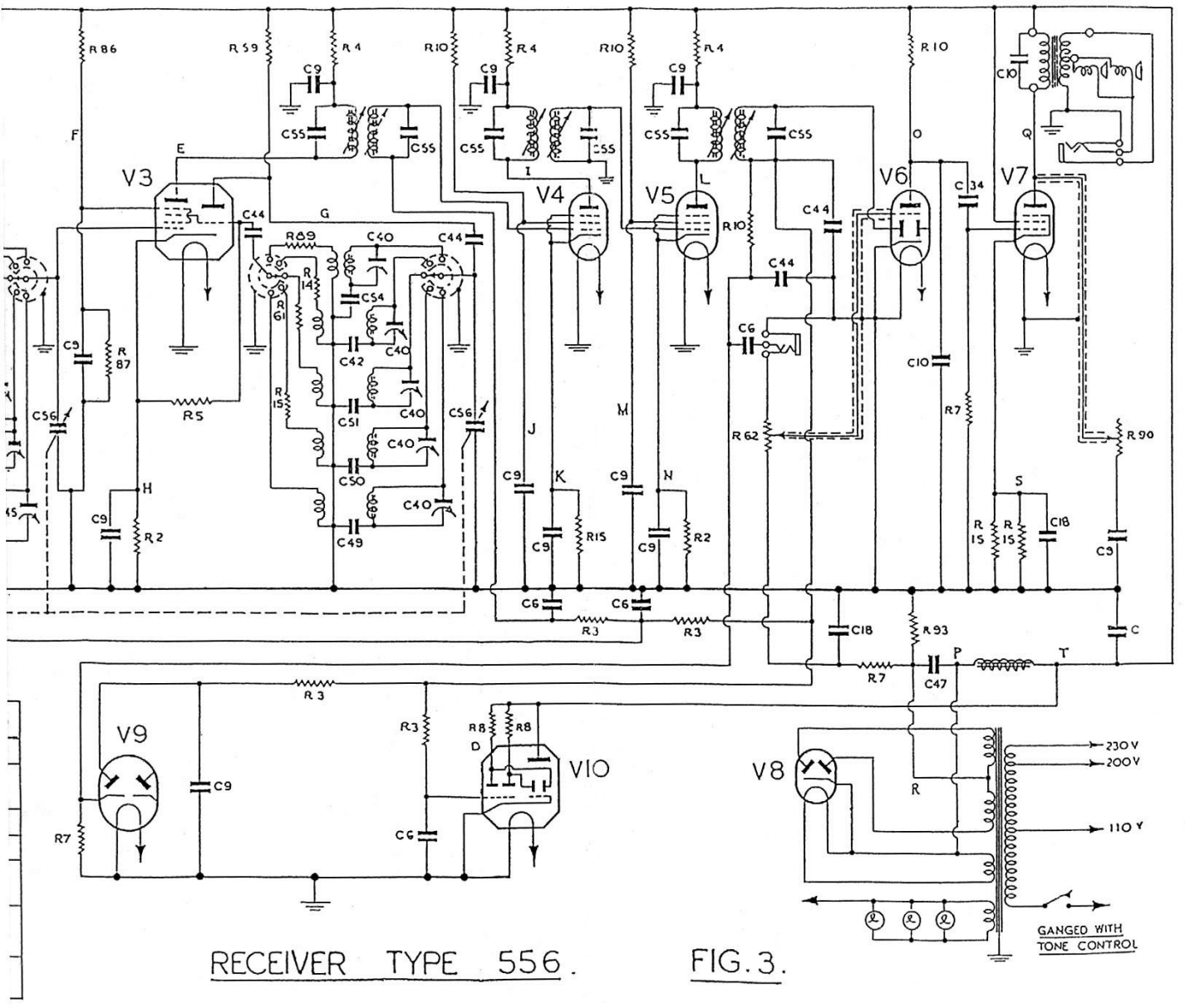
Overall Sensitivity	...	2 microvolts input for 50 milliwatts output.
I.F. Sensitivity	...	15 microvolts input for 50 milliwatts output.
Selectivity ...	...	30 dB attenuation 5 Kc/s off resonance.
Image Ratios	...	35 dB attenuation at 20 Mc/s.
		50 dB attenuation at 10 Mc/s.
		60 dB attenuation at 5 Mc/s.
		75 dB attenuation at 2 Mc/s.
Audio Output Maximum	...	3 watts.





VALVE	1	2	3	4	5	6	7	8	TOP CAP
EF 39	M	H	A	G2	G3	—	H	K	G1
ECH 35	M	H	A	G2 G4	GT G3	AT	H	K	G1
EBC 33	M	H	A	D1	D2	—	H	K	G1
6V6 GT	—	H	A	G2	G1	—	H	K	—
5Z4	—	H	—	A2	—	A1	—	K H	—
EB 34	M S	H	D1	K1	D	—	H	K	—
EM 34	—	H	A1	G	S	A2	H	K	—

R 2: 300 o
R 3: 470 o
R 4: 4.7 o
R 5: 47 o
R 7: 250 o
R 8: 1 MΩ
R 9: 1000Ω
R10: 100 k



RECEIVER TYPE 556. FIG. 3.

R 2: 300 or 330 Ω	R14: 47 or 50 Ω	C 3: 10 pF	C46: 16 μF
R 3: 470 or 500 kΩ	R15: 500 or 560 Ω	C 6: 0.01 μF	C47: 8 μF
R 4: 4.7 or 5 kΩ	R59: 27 or 30 kΩ	C 9: 0.1 μF	C49: 315 pF
R 5: 47 or 50 kΩ	R61: 200 Ω	C10: 500 pF	C50: 640 pF
R 7: 250 or 270 kΩ	R62: 500 kΩ Vol.	C18: 25uF/25 V	C51: 1425 pF
R 8: 1 MΩ	R86: 20 or 22 kΩ	C34: 0.1 μF	C52: 20 pF
R 9: 1000 Ω	R87: 27 or 30 kΩ	C40: 3.5-20 pF	C53: 3 pF
R10: 100 kΩ	R89: 12 Ω	C42: 2000 pF	C54: 3000 pF
	R90: 50 KΩ Tone	C44: 100 pF	C55: 510 pF
	R91: 25Ω W.W	C45: 3-20 pF	C56: 12.5-212.5 pF