LISSEN

SERVICE MANUAL FOR A.C. MAINS OPERATED THREE-WAVEBAND RECEIVER MODEL 8216

TECHNICAL SPECIFICATION

Model 8216 three-waveband receiver is for use with an external elevated aerial and is for A.C. mains operation. The wavebands covered are 18.5–52 metres (16.2–5.8 Mc/s), 202–560 metres (1,485–536 Kc/s) and 900–2,000 metres (333–150 Kc/s). Four valves including a rectifier are employed.

The first valve (V1) is a variable-mu R.F. pentode which functions as a R.F. amplifier on all wavebands. It is preceded by a tuned grid circuit. An alternative aerial tap provides a rejector circuit for use when the receiver is operated near to the Droitwich transmitter.

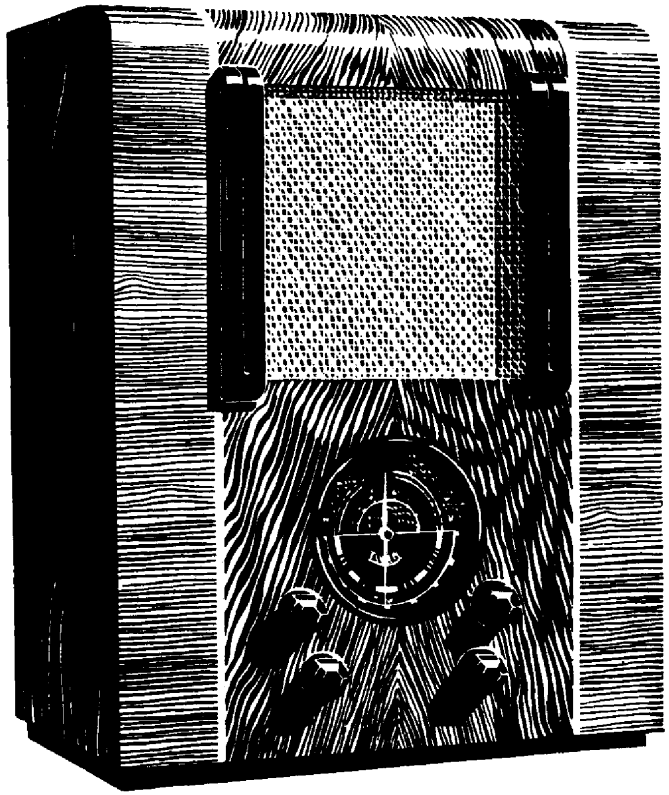


Fig. 1

Variable coupling between the detector anode circuit and the preceding tuned circuit provides reaction. The reaction coils L7 and L10 provide the coupling. The former on medium and long wavebands, and the latter on the short waves, and is controlled by the variable condenser C6.

The detector is resistance capacity coupled to the output valve (V3) a high slope A.F. pentode, which in turn is transformer coupled to the low impedance voice coil of the energised moving coil speaker.

Tone correction is employed and is so arranged that the high note response can be varied by the two position switch S8.

SERVICE DATA FOR A.C. MAINS OPERATED THREE-WAVEBAND RECEIVER MODEL 8216

GENERAL REMARKS

In the event of trouble check the following details :—

(1) Power supply ; If the pilot lamps light it is certain that the power supply is not at fault, otherwise check : (*a*) Pilot bulbs. (*b*) Mains leads, plugs and sockets. (*c*) Mains switch. (*d*) Receiver correctly adjusted for power supply.

(2) Valves : (*a*) Check characteristics, or (*b*) Substitute known good valves.

(3) Locate trouble to a particular stage : (*a*) Check valve operating conditions or (*b*) stage by stage test with a signal generator, A.F. and R.F. stages.

(4) Locate faulty component by testing with voltmeter, ammeter, ohmmeter etc., or by substitution, as the case may be.

(5) Check the alignment of the tuned circuits with a signal generator.

The charts are given in the order they will usually be required. Measurements made should be within + or — 10 per cent. of the readings given, providing the mains input voltage stated below is applied to the particular tap on the mains transformer.

Input 207 volts to the 200–215 volts tap.
„ 225 „ „ „ 216–235 „ „
„ 243 „ „ „ 236–250 „ „

It follows that a lower or higher mains input voltage will give readings in proportion

POWER SUPPLY CIRCUIT

Mains Transformer	Output Volts
Heater winding V1, V2, V3	4 volts R.M.S.
Heater winding V4.. ..	4 volts R.M.S.
H.T. winding	355–0–355
Rectifier	Smoothed D.C. output 255 volts 54 m.a.

OPERATING CONDITIONS OF THE VALVES

All readings are taken with volume control at maximum and no reaction. (All voltages are measured from chassis.)

Valve	Circuit	Operating Conditions
R.F. valve (V1) Ever Ready A50P (Metallized).	Anode voltage ..	207 volts
	Anode current ..	9.5 m.a.
	Aux. grid voltage	205 volts
	Aux. grid current	3.3 m.a.
Detector valve (V2) Ever Ready A50B (Metallized).	Anode voltage ..	120 volts
	Anode current	1.65 m.a.
	Aux. grid voltage	87 volts
	Aux. grid current	0.68 m.a.
A.F. Pentode valve (V3), Ever Ready A70D (Clear).	Anode voltage	235 volts
	Anode current	32 m.a.
	Aux. grid voltage	255 volts
	Aux. grid current	3.2 m.a.
Rectifier valve (V4) Ever Ready A11D (Clear).		

The voltage readings above are measured with an instrument having a resistance of 1,000 ohms per volt.
If a particular reading should vary considerably from the above table, a systematic check of the circuits associated with the particular valve should be made.
The following tables will facilitate the testing of the components concerned.

CIRCUIT ANALYSIS

Valve	Circuit	Associated Components
R.F. valve (V1)	Anode circuit ..	L8, L9, L11. C2, C5, C11. R5. S4, S5 and S6.
	Aux. grid circuit	R1, R2. C9.
	Grid circuit ..	L4, L5, L6. C1, C3, C4. S2 and S3
	Cathode circuit ..	R3, R4. C10.
Detector valve (V2)	Anode circuit ..	L7, L10. C6, C12, C15, C17. R9, R10, R11. S7.
	Aux. grid circuit	R6, R7. C14.
	Grid and cathode circuit ..	C13. R8 and P.U. sockets.
Output valve (V3)	Anode aux. grid circuit ..	T1. C19, C20 and S8.
	Grid circuit ..	C16. R12, R13.
	Cathode circuit ..	R14. C18.

SWITCH POSITIONS

Short Wave	Medium Wave	Long Wave
S1, S2, S3, S4, S6, S7 Closed. S5 Open.	S3, S4, S5 Closed.	S5 Closed.
	S1, S2, S6, S7 Open	S1, S2, S3, S4, S6 Open.

INDUCTANCES AND TRANSFORMERS

Circuit Indication	Specification		Location	Component Number
L1	Droitwich filter 21 ohms ..		Fig. 6	78,051
L2	Short wave aerial coupling coil ..	Aerial coil unit	Fig. 5	78,050
L3	Medium/Long wave aerial coupling coil 39.2 ohms			
L4	Short wave grid coil			
L5	Medium wave grid coil 2.15 ohms ..			
L5, L6	Long wave grid coil 12.5 ohms			
L7	Medium/Long wave reaction coil 4.08 ohms			
L8	Medium wave anode coil 2.1 ohms ..	Anode coil unit	Fig. 5	78,049
L8, L9	Long wave anode coil 13.0 ohms ..			
L10	Short wave reaction coil			
L11	Short wave anode coil			
L12	Speaker voice coil 1.85 ohms		Fig. 8	85,000
L13	Speaker hum balancing coil 1.85 ohms			
L14	Speaker field coil 3,000 ohms			
T1	Output transformer primary 780 ohms; secondary 0.5 ohms		Fig. 6	77,071
T2	Mains transformer, primary 40.9 + 4.3 + 3.3 ohms ..		Fig. 5	77,054
	H.T. secondary 172 + 193 ohms			
	V1, V2, V3 heater winding 0.12 ohms			
	V4 heater winding 0.33 ohms			

CONDENSERS

Circuit Indication	Specification	Location	Component Number
C1	R.F. grid circuit tuning condenser	Fig. 5	80,041
C2	Anode circuit tuning condenser		
C3	Short wave aerial coil trimmer	Fig. 5	80,000
C4	Medium wave R.F. grid circuit trimmer	Fig. 5	80,000
C5	Medium wave anode circuit trimmer	Fig. 5	80,000
C6	Reaction condenser	Fig. 5	80,055
C7	.0003 mfd. Mica	Fig. 6	66,968
C8	.0002 mfd. Mica	Fig. 6	66,967
C9	0.1 mfd. tubular 350v. D.C.	Fig. 6	68,020
C10	0.1 mfd. tubular 350v. D.C.	Fig. 6	68,020
C11	0.1 mfd. tubular 350v. D.C.	Fig. 6	68,020
C12	.0002 mfd midget mica ..	Fig. 6	66,033
C13	.00005 mfd. Hood type (ceramic)	Fig. 5	71,250
C14	0.1 mfd. tubular 350v. D.C.	Fig. 6	68,020
C15	0.5 mfd. tubular 350v. D.C.	Fig. 6	68,019
C16	0.1 mfd. tubular 350v. D.C.	Fig. 6	68,020
C17	.0005 mfd. mica	Fig. 6	66,969
C18	50 mfd. electrolytic 12v. D.C.	Fig. 6	67,005
C19	.0025 mfd. tubular 450v. D.C.	Fig. 6	68,002
C20	.01 mfd. tubular 450v. D.C.	Fig. 6	68,005
C21	.01 mfd. tubular 600v. D.C.	Fig. 6	68,015
C22 C23	8mfd. 16mfd. dry electrolytic block type 540v. D.C.	Fig. 6	67,032

RESISTANCES

Circuit Indication	Specification	Colour Code			Location	Component Number
		Body	Tip	Dot		
R1	10,000 ohms (½ watt) ..	Brn.	Blk.	Org.	Fig. 6	71,923
R2	110,000 ohms (½ watt) ..	Brn.	Brn.	Yel.	Fig. 6	72,005
R3	200 ohms (½ watt) ..	Red	Blk.	Brn.	Fig. 6	71,943
R4	Volume control, 21,000 ohms ..				Fig. 6	81,019
R5	5,000 ohms (½ watt) ..	Grn.	Blk.	Red	Fig. 6	71,935
R6	50,000 ohms (½ watt) ..	Grn.	Blk.	Org.	Fig. 6	71,971
R7	30,000 ohms (½ watt) ..	Org.	Blk.	Org.	Fig. 6	71,949
R8	510,000 ohms (½ watt) ..	Grn.	Brn.	Yel.	Fig. 5	71,944
R9	20,000 ohms (½ watt) ..	Red	Blk.	Org.	Fig. 6	71,932
R10	40,000 ohms (½ watt) ..	Yel.	Blk.	Org.	Fig. 6	71,918
R11	21,000 ohms (½ watt) ..	Red	Brn.	Org.	Fig. 6	71,978
R12	26,000 ohms (½ watt) ..	Red	Blue	Org.	Fig. 6	71,974
R13	260,000 ohms (½ watt) ..	Red	Blue	Yel.	Fig. 6	71,945
R14	200 ohms (½ watt) ..	Red	Blk.	Brn.	Fig. 6	71,991

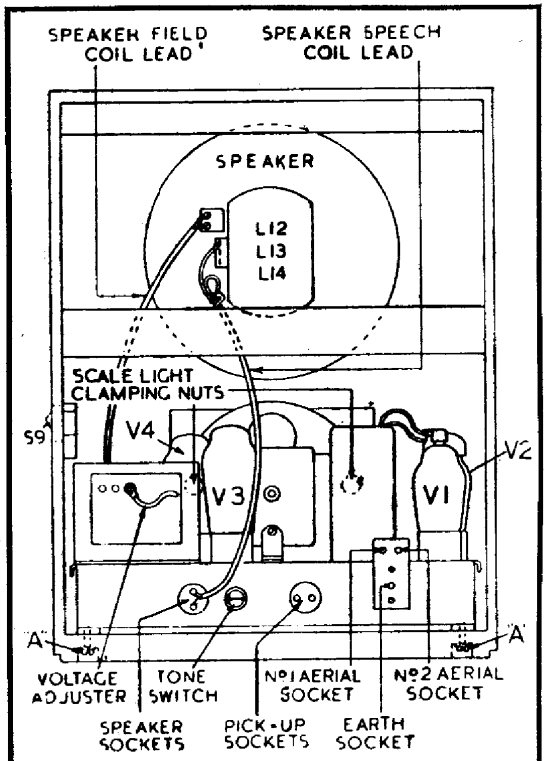


FIG. 8

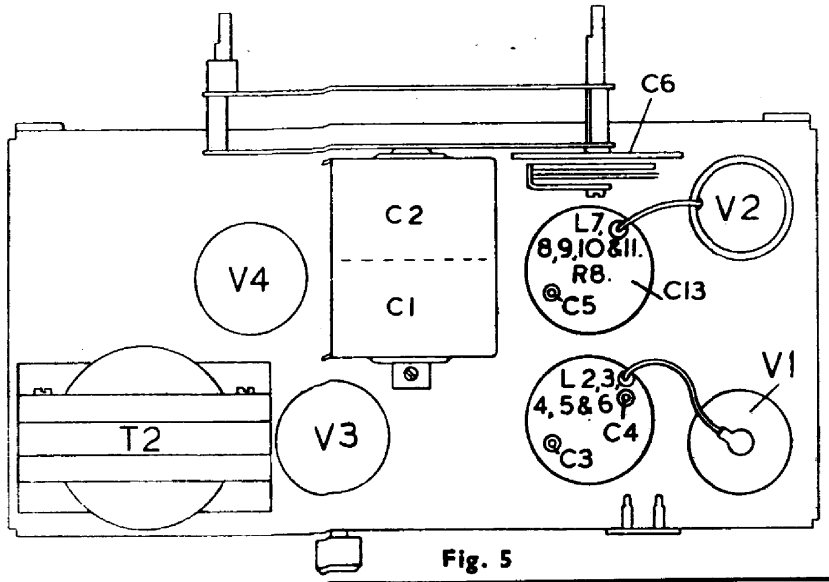


Fig. 5

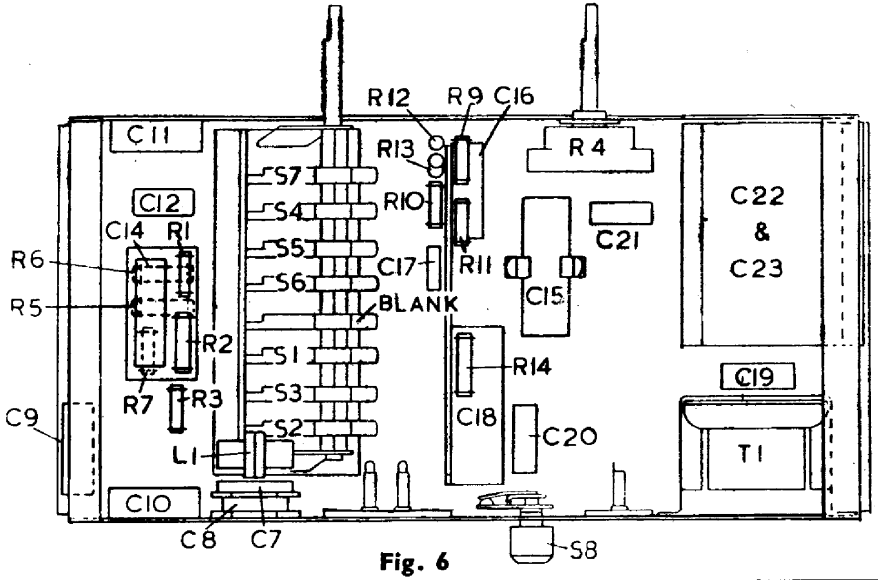
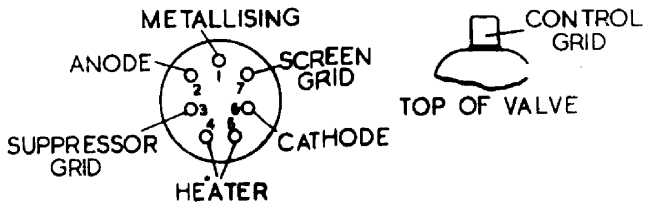
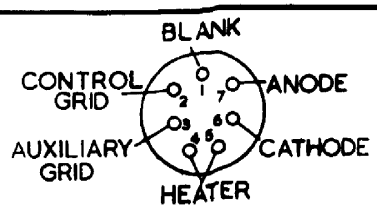


Fig. 6



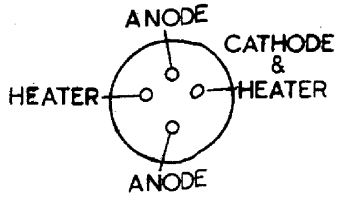
V1 & 2
TOP SIDE OF VALVE HOLDER
1H. RF PENTODE

Fig. 2



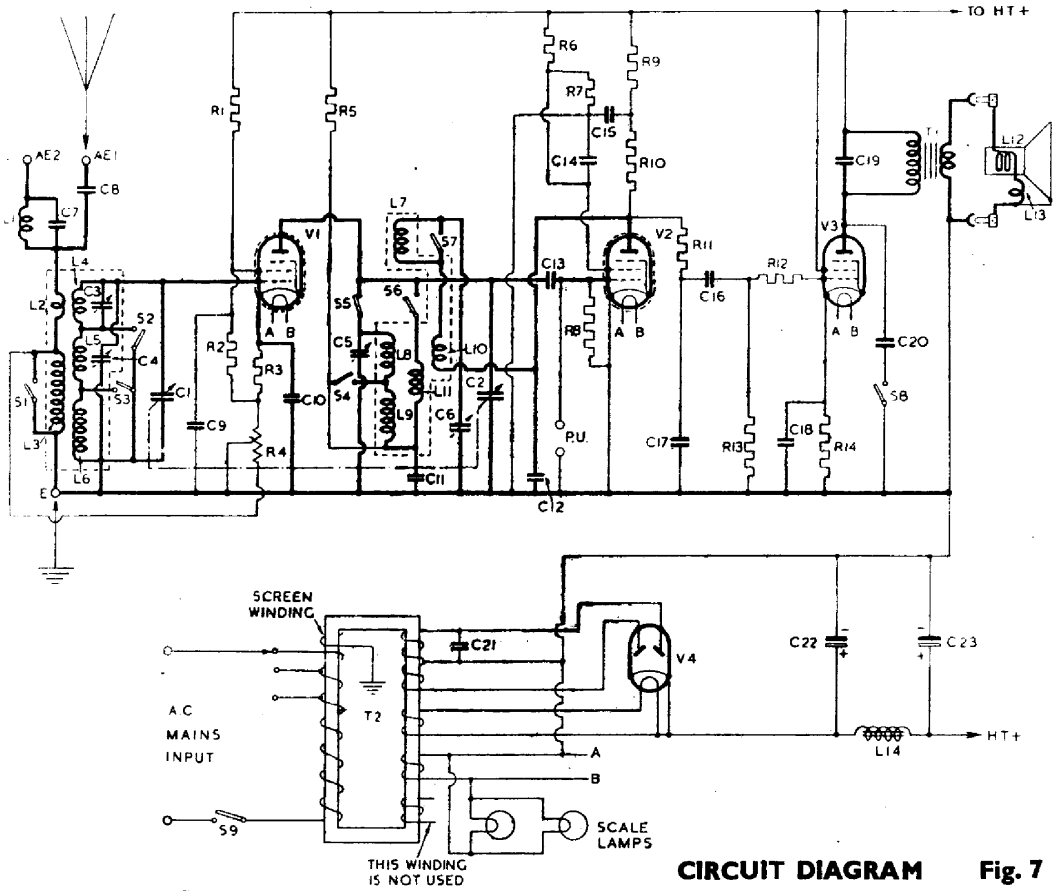
V3
TOP SIDE OF VALVE HOLDER
1H OUTPUT PENTODE

Fig. 3



V4
TOP SIDE OF VALVE HOLDER
1H RECTIFIER

Fig. 4



CIRCUIT DIAGRAM Fig. 7

REMOVING THE CHASSIS FROM THE CABINET

The knobs must first be removed by a direct forward pull. Next the speaker plugs are pulled from their sockets and the field leads disconnected at the speaker end.

The on-off switch must be unscrewed from the cabinet.

The four fixing bolts A (Fig. 8) accessible from the underside of the cabinet should now be removed, and the chassis withdrawn from the cabinet. The speaker may also be removed by taking out the four cheese-headed screws which secure it to the baffle board.

It should be noted that to get access to the underside of the cabinet, it is only necessary to remove the card base plate which is held in place by four wood screws.

REPLACING THE DIAL LIGHTS

To replace the dial lights, remove valve V3 and undo the clamping nuts shown in Fig. 8.

The brackets holding the bulbs may now be withdrawn sufficiently to replace the bulbs. Replacements should be of the 6.2 volt, 0.3 amp. type.

ADJUSTING THE GANGED CONDENSER AND DIAL POINTER

Rotate the gang till the pointers are at the higher wavelength ends of the scales. Push a flat ended rod against the vanes which are accessible from the open side of the gang, at the same time rocking the vanes by means of the rotor drive until they are fully in mesh. If the pointers do not coincide with the horizontal line dividing the scale, release the centre fixing screw and adjust them to this position.

ADJUSTING THE RADIO FREQUENCY CIRCUITS

Rotate the gang till the pointers are at the lower wavelengths ends of the scales, and switch the receiver to the medium waveband. The volume control should be turned to "maximum" and the reaction control to minimum. Set pointer to minimum wavelength.

Apply a modulated signal of 202 metres to the aerial socket, and adjust the trimming condensers C4 and C5 in turn for maximum output.

Now switch the receiver to the short waveband. Set pointer to 16 Mc/s mark and apply a modulated signal of 16 Mc/s to the aerial socket. Next adjust the reaction condenser until the receiver is just below the point of oscillation, still leaving the volume control at maximum.

Now adjust the aerial coil trimmer C3 and the gang condenser simultaneously, for maximum output, and if necessary re-adjust the reaction condenser to keep the receiver just below the oscillation point.

NOTES

This space is reserved for recording any further information you may find useful. If advice is required at any time the Lissen Service Dept. will be pleased to help you.