LISSEN

SERVICE MANUAL FOR BATTERY OPERATED SUPERHETERODYNE RECEIVER MODEL 8169

TECHNICAL SPECIFICATION

THE model 8169 superheterodyne receiver is for use with an external aerial and is for battery operation.

The wavebands covered are 196–560 and 850–1,950 metres. It has seven tuned circuits: a two stage band pass input circuit, a tuned oscillator and four tuned intermediate frequency circuits.

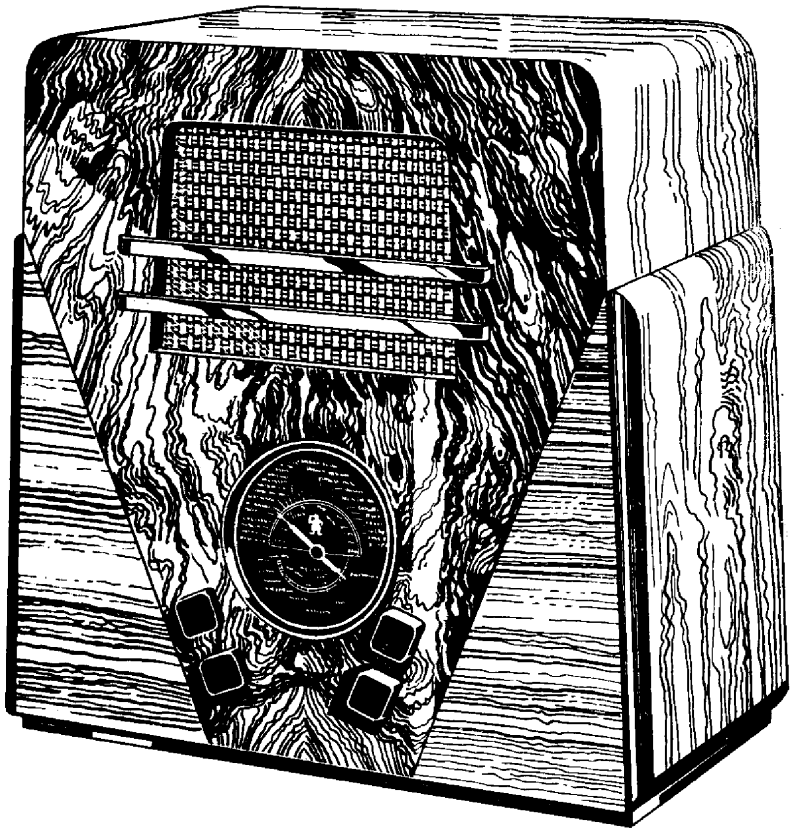
The aerial is inductively coupled to the band pass filter the two stages of which are also inductively coupled.

The oscillator circuit is tuned by a section of the gang condenser with specially shaped vanes.

The intermediate frequency transformers are tuned to a frequency of 127 Kcs. (2,360.6 metres).

The band pass filter circuit feeds into the grid of the frequency changer stage for which an octode valve (V1) is employed.

This stage is coupled by the I.F. transformer T1 to the I.F. amplifier,



a variable mu R.F. pentode (V2), which in turn is coupled by the second I.F. transformer T2 to the diode signal rectifier incorporated in the duo-diode-triode valve (V3). A small bias applied to this diode provides the "quieting."

The other diode incorporated in the duo-diode-triode valve provides delayed automatic volume control, the controlled valves being V1 and V2. The triode section functions as an A.F. amplifier and is resistance capacity coupled to the pentode output valve (V4) which is of the high amplification type.

This valve is transformer coupled to the permanent magnet moving coil speaker which has a low impedance voice coil.

A three position tone control switch is incorporated by means of which high note response can be attenuated. A noise suppressor switch is also provided by means of which the full sensitivity of the set can be utilised, by removing the quieting bias from the signal rectifier diode.

SERVICE DATA FOR BATTERY OPERATED SUPERHETERODYNE RECEIVER MODEL 8169

GENERAL REMARKS

In the event of trouble check the following details :—

1. Batteries : L.T. and H.T., and confirm that the leads are correctly connected.
2. Valves : (*a*) check characteristics, or (*b*) substitute valves known to be good.
3. Locate trouble to a particular stage by : (*a*) checking valve operating conditions, or (*b*) stage by stage test with oscillator, i.e., A.F., I.F. and R.F. stages.
4. Locate faulty component by testing with a suitable meter or by substitution as the case may be.

The following charts are given in the order they will usually be required.

Those readings given in columns A and B (Operating Conditions of the Valves) are obtained with new (136½ volts) and partially discharged (100 volts) H.T. batteries respectively.

The position of the battery plugs should give voltage readings as follows :—

Battery Leads	Battery Sockets
Red lead (H.T.+)	136.5 volts
Brown lead (G.B.—)	0 volts
Black lead (H.T.—)	4½ volts
Yellow lead (H.T.+)	See notes below

POSITION OF YELLOW BATTERY PLUG

The anode current of a pentode is controlled by the auxiliary grid voltage which is applied in this case by means of the Yellow battery lead. The auxiliary grid voltage required for the correct anode current will vary with individual valves.

For this reason the A.F. pentode valve is marked with a letter either A, B, C or D, and this letter represents a certain H.T.+ tapping.

The letter A indicates 135 volts.
" B " 127½ "
" C " 120 "
" D " 112½ "

The Yellow battery plug should be inserted into the appropriate socket as indicated by the above table.

If at any time it is necessary to replace the output valve by one that is not lettered, the correct position for the Yellow plug may be found as follows : remove all the valves but the pentode from the set and insert a milliammeter in the Red H.T. lead. Now switch on the set and adjust the position of the Yellow plug until the milliammeter measures 4.5 milliamps. A new H.T. of 136½ volts should be used for the adjustment.

OPERATING CONDITIONS OF THE VALVES

All readings are taken with the volume control at maximum, and the noise suppressor switch at " on." (All voltages are measured from chassis.)

Valve	Circuit	Column A (New H.T.)	Column B (Partially discharged H.T.)
F.C. and Osc. valve, Ever Ready K80A (Metallized), (V1).	Anode voltage	132 volts	100 volts
	Anode current	0.3 m.a.	0.2 m.a.
	Screen voltage	55 volts	41 volts
	Screen current	0.6 m.a.	0.4 m.a.
	Oscillator plate voltage ..	132 volts	100 volts
	Oscillator plate current ..	1.0 m.a.	0.8 m.a.
I.F. valve, Ever Ready K50M (Metallized), V2.	Anode voltage	132 volts	100 volts
	Anode current	1.0 m.a.	0.8 m.a.
	Screen voltage	95 volts	72 volts
	Screen current	0.3 m.a.	0.2 m.a.
D.D. triode valve, Ever Ready K23B (Metallized), V3.	Anode voltage	92 volts	70 volts
	Anode current	0.8 m.a.	0.6 m.a.
Pentode valve, Ever Ready K70B (Clear), V4.	Anode voltage	132 volts	100 volts
	Anode current	4 m.a.	3 m.a.
	Screen voltage	Same as Yellow battery plug	
	Screen current	1.2 m.a.	0.9 m.a.

CIRCUIT ANALYSIS

Valve	Circuit	Associated Components
F.C. valve (V1), Ever Ready K80A (Metallized).	F.C. anode circuit	Primary T1. C8, C16. Red H.T. lead and plug.
	F.C. screen circuit	R1. C15, C16. Red H.T. lead and plug.
	F.C. grid circuit ..	Screened cable. L4, L5. C2, C5, C14, C13. S2 and A.V.C. circuit.
	Oscillator anode circuit	L8. C16. Red H.T. lead and plug.
	Oscillatorg rid circuit	R2, R3. C3, C6, C7, C17. L6, L7.
I.F. valve (V2), Ever Ready K50M (Metallized).	Anode circuit ..	Screened cable, Primary T2. C10, C16, C20. Red H.T. lead and plug.
	Screen circuit ..	C19, C16. R5. H.T. lead and plug.
	Grid circuit ..	Secondary T1. C9. A.V.C. circuit.
Duo-diode-triode valve (V3), Ever Ready K23B (Metallized).	Anode circuit ..	R11. C16, C24, C25. Red H.T. lead and plug.
	Grid circuit ..	R10, R12, R13, R14. C23. S5. Brown G.B. lead and plug. P.U. sockets.
	Demodulator diode circuit ..	Secondary T2. C11, C21, C22, C23. R8. S8. G.B. potentiometer. Brown G.B. lead and plug.
	A.V.C. diode circuit	C20, C18. R9, R6, R4.
A.F. pentode valve (V4), Ever Ready K70B (Clear).	Anode circuit ..	Primary T3. C16, C26, C27. R16. S9. Red H.T. lead and plug.
	Aux. grid circuit	Yellow lead and plug.
	Grid circuit ..	C24. R15. Brown G.B. lead and plug.

INDUCTANCES AND TRANSFORMERS

Circuit Indication	Specification	Location	Component Number
L1 ..	Aerial circuit coupling coil, 24 ohms	Fig. 5	78,040
L2 ..	Medium wave primary band pass coil, 2.3 ohms ..		
L2, L3	Long wave primary band pass coil, 17.3 ohms ..		
L4 ..	Medium wave secondary band pass coil, 2.3 ohms		
L4, L5	Long wave secondary band pass coil, 17.3 ohms ..		
L6 ..	Oscillator grid coil medium waves, 2.9 ohms	Fig. 5	78,039
L6, L7	Oscillator grid coil long waves, 6.2 ohms		
L8 ..	Oscillator anode coil, 45 ohms		
L9 ..	Speaker speech coil, 1.2 ohms	Fig. 7	85,004
T1 ..	First I.F. transformer : primary 93 ohms ; secondary, 93 ohms	Fig. 5	77,003
T2 ..	Second I.F. transformer : primary, 42 ohms ; secondary, 42 ohms	Fig. 5	77,020
T3 ..	Output transformer : primary, 850 ohms ; secondary, 0.3 ohms	Fig. 6	77,058

CONDENSERS

Circuit Indication	Specification	Location	Component Number
C1 ..	Primary circuit band pass tuning	Fig. 5	80,002
C2 ..	Secondary circuit band pass tuning		
C3 ..	Oscillator circuit tuning ..		
C4 ..	M.W. trimmer for primary circuit of band pass ..		
C5 ..	M.W. trimmer for secondary circuit of band pass ..		
C6 ..	M.W. trimmer for oscillator circuit		
C7 ..	L.W. trimmer for oscillator circuit	Fig. 5	80,001
C8 ..	First I.F. transformer T1 primary tuning	Fig. 5	80,000
C9 ..	First I.F. transformer T1 secondary tuning ..	Fig. 5	80,000
C10	Second I.F. transformer T2 primary tuning	Fig. 5	80,001
C11	Second I.F. transformer T2 secondary tuning ..	Fig. 5	80,001
C12	Top coupling	Fig. 5	66,000
C13	Second channel	Fig. 5	75,133
C14	0.1 mfd. tubular, 350 volts D.C. working	Fig. 6	68,020
C15	0.1 mfd. tubular, 350 volts D.C. working	Fig. 6	68,020
C16	0.25 mfd. tubular, 350 volts D.C. working	Fig. 6	68,012
C17	.0001 mfd. mica type ..	Fig. 6	66,966
C18	0.1 mfd. tubular, 350 volts D.C. working	Fig. 6	68,020
C19	0.1 mfd. tubular, 350 volts D.C. working	Fig. 6	68,020
C20	.0001 mfd. mica type ..	Fig. 6	66,966
C21	.0001 mfd. mica type ..	Fig. 5	66,966
C22	.0001 mfd. mica type ..	Fig. 6	66,966
C23	.01 mfd. tubular, 450 volts D.C. working	Fig. 6	68,005
C24	.01 mfd. tubular, 450 volts D.C. working	Fig. 6	68,005
C25	.0005 mfd. mica type ..	Fig. 6	66,969
C26	.001 mfd. tubular, 450 volts D.C. working	Fig. 6	68,000
C27	.01 mfd. tubular, 450 volts D.C. working	Fig. 6	68,005

SWITCH POSITIONS

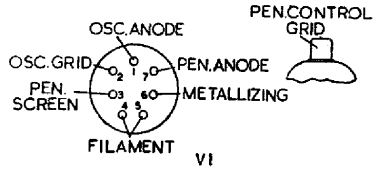
Switch	Medium Waves	Long Waves
S1	Closed	Open
S2	Closed	Open
S3	Open	Closed
S4	Closed	Open
S5	" On-off " switch (G.B.)	
S6	" On-off " switch (L.T.)	
S7	" On-off " switch (H.T.)	
S8	Noise suppressor switch	
S9	Tone control switch	

RESISTANCES

Circuit Indication	Resistance Value	Colour Code Body	Tip	Dot	Location	Component Number
R1	110,000 ohms (½ watt) ..	Brn.	Brn.	Yel.	Fig. 6	71,962
R2	1,100 ohms (½ watt) ..	Brn.	Brn.	Red	Fig. 6	71,967
R3	110,000 ohms (½ watt) ..	Brn.	Brn.	Yel.	Fig. 6	71,962
R4	66,000 ohms (½ watt) ..	Blue	Blue	Org.	Fig. 6	71,964
R5	110,000 ohms (½ watt) ..	Brn.	Brn.	Yel.	Fig. 6	71,962
R6	1.1 megohm (½ watt) ..	Brn.	Brn.	Grn.	Fig. 6	71,900
R7	100,000 ohms (½ watt) ..	Brn.	Blk.	Yel.	Fig. 5	71,910
R8	Volume control, 0.5 megohms ..	—	—	—	Fig. 5	81,006
R9	1.1 megohm (½ watt) ..	Brn.	Brn.	Grn.	Fig. 6	71,900
R10	1.1 megohm (½ watt) ..	Brn.	Brn.	Grn.	Fig. 6	71,900
R11	51,000 ohms (½ watt) ..	Grn.	Brn.	Org.	Fig. 6	71,968
R12	100 ohms wire wound (½ watt) ..	—	—	—	Fig. 6	71,801
R13	150 ohms wire wound (½ watt) ..	—	—	—	Fig. 6	71,802
R14	250 ohms wire wound (½ watt) ..	—	—	—	Fig. 6	71,803
R15	510,000 ohms (½ watt) ..	Grn.	Brn.	Yel.	Fig. 6	71,944
R16	21,000 ohms (½ watt) ..	Red	Brn.	Org.	Fig. 6	71,978

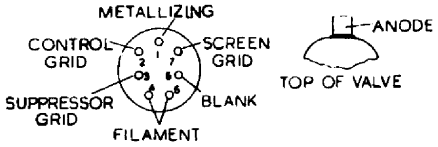
ADJUSTING THE GANGED CONDENSER AND DIAL POINTER

Rotate the gang till the ends of the pointer are at the higher wavelength ends of the scale. Push a flat-ended rod through the hole in the side of the gang cover and against the vanes. Now rock the vanes by means of the rotor drive until it is felt that the rotors are fully in mesh. If the ends of the pointer do not coincide with the index marks at the top and bottom of the scale, release the centre fixing screw and adjust the pointer to this position.



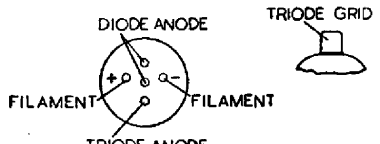
V1
TOP SIDE OF VALVE HOLDER
BATTERY FREQ. CHANGER & OSCILLATOR

Fig. 1



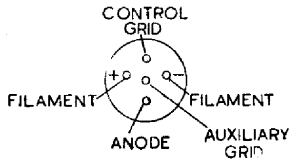
V2
TOP SIDE OF VALVE HOLDER
BATTERY R.F. PENTODE

Fig. 2



V3
TOP SIDE OF VALVE HOLDER
BATTERY DUO-DIODE-TRIODE

Fig. 3



V4
TOP SIDE OF VALVE HOLDER
BATTERY OUTPUT PENTODE

Fig. 4

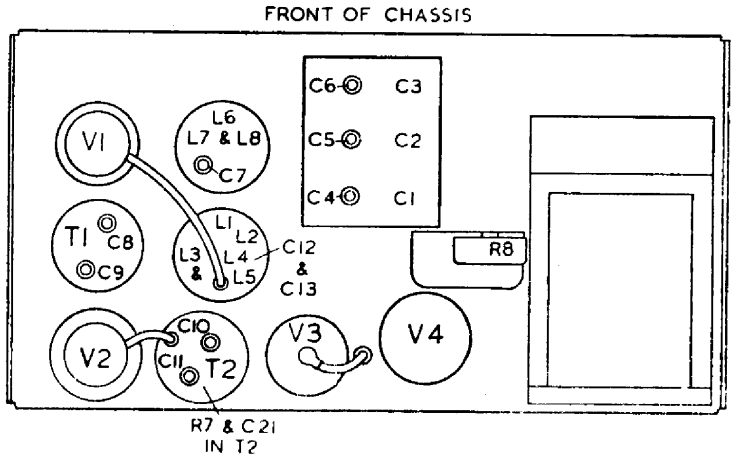


Fig. 5

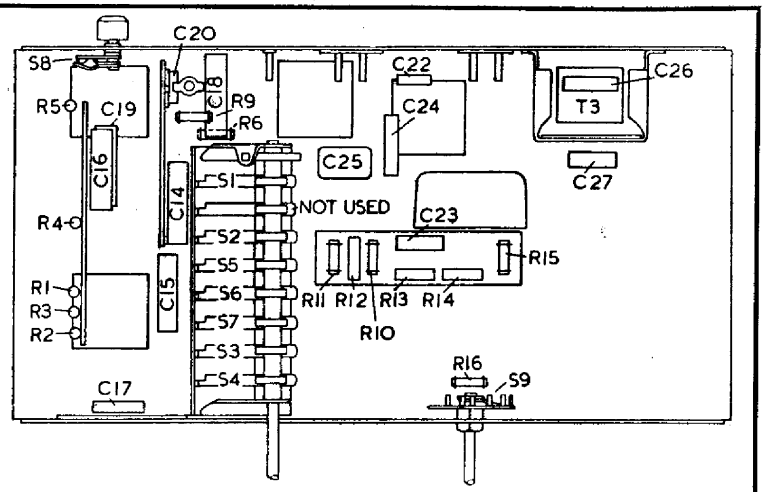
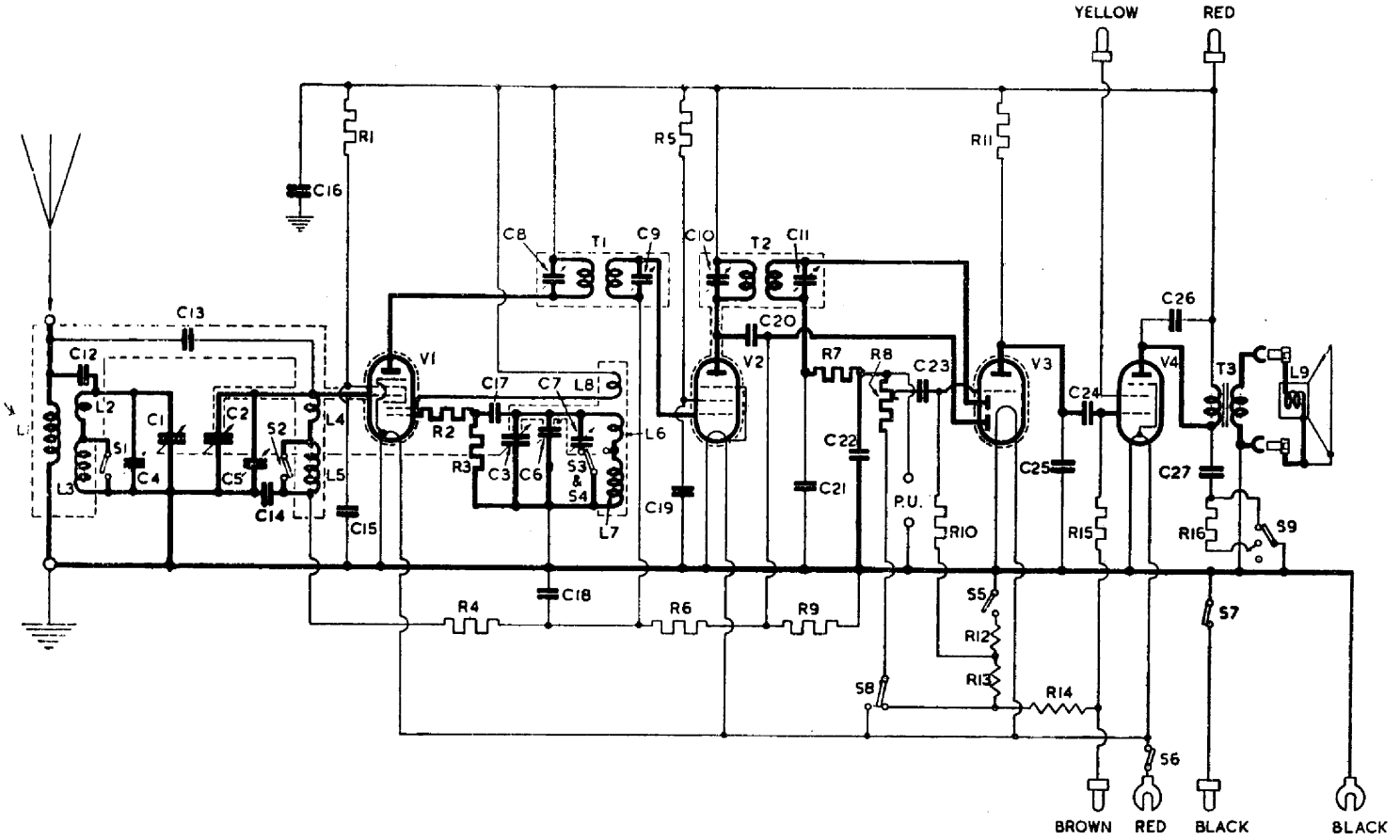


Fig. 6



CIRCUIT DIAGRAM

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 all battery leads disconnected and the batteries removed.

The four fixing bolts (A in Fig. 7) accessible from the underside of the cabinet should now be removed, and the chassis withdrawn from the cabinet.

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

This plate forms part of the electrical screening and care should be taken when replacing it, that good electrical contact is made, through the copper strip at one corner of the cabinet base.

To ensure this, the base plate is slightly "warped," so that when screwed home the corner will be tightly pressed against the copper strip. Care must be taken that the side with the bare metal corners is uppermost.

ADJUSTING THE TUNED CIRCUITS

Tuned Circuits

(*a*) Tuned primaries and secondaries of I.F. transformers T1 and T2.
(*b*) Tuned oscillator circuit.
(*c*) Band pass input (two tuned circuits).

I.F. Circuits (127 Kcs., 2,360.6 metres)

The I.F. transformers should be adjusted before the band pass and oscillator circuits.

A modulated signal of 127 Kcs. is applied between the frequency changer control grid and the chassis via a .002 mfd. condenser. The lead to the control grid terminal is removed and a 0.5 megohm resistance is connected between this valve terminal and the chassis. A 2 mfd. condenser should be connected from the oscillator anode to chassis, to stop the valve from oscillating. An output meter is connected across the primary of the output transformer.

When adjusting the primary trimmer of either transformer a 50,000 ohms resistance is connected across the secondary and when adjusting the secondary it is connected across the primary.

Adjust the trimmers in the following order for a maximum reading on the output meter.

(*a*) T2 secondary trimmer C11 (resistance across primary).
(*b*) T2 primary trimmer C10 (resistance across secondary).
(*c*) T1 secondary trimmer C9 (resistance across primary).
(*d*) T1 primary trimmer C8 (resistance across secondary).

Band Pass Input and Oscillator Circuits

Switch the receiver to the medium waveband and set the medium wave pointer at 196 metres. Apply a modulated signal of this frequency (1,530 kcs.) to the aerial terminal, and adjust the trimmers for a maximum reading on the output meter, in the following order :—

(*a*) C6. (*b*) C5. (*c*) C4.

Switch the receiver to the long waveband and rotate the condenser drive so that the long wave pointer registers 1,300 metres. Apply a signal of this wavelength and then adjust trimmer C7 for maximum output.

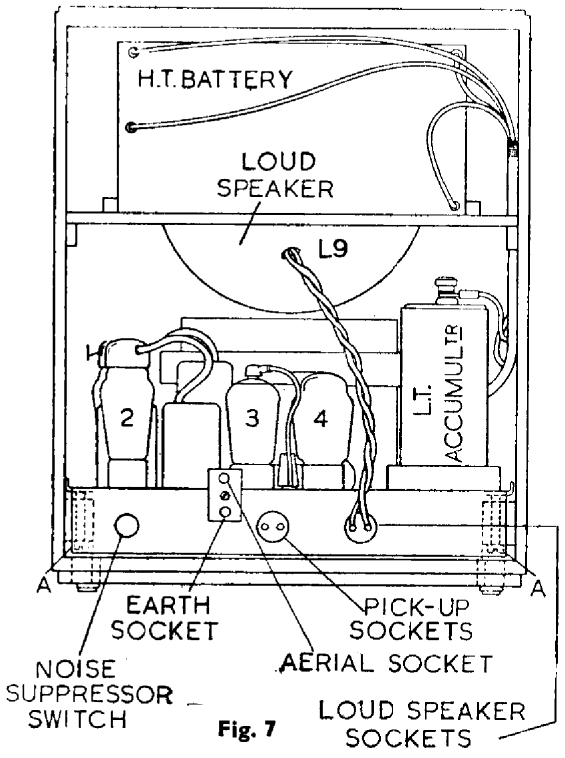


Fig. 7

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.