LISSEN

SERVICE MANUAL FOR RADIOGRAMOPHONE and LN 3111

MODELS 8108 and 8121

TECHNICAL SPECIFICATION

THE models 8108 and 8121 Radiogramophones are for A.C. mains operation.

A single record, mains driven gramophone unit is incorporated. The radio receiver is a superheterodyne for use with an external elevated aerial.

The selectivity is of a high order, a band pass input (two tuned stages), a tuned oscillator, and four tuned intermediate frequency circuits being employed.

The aerial is inductively coupled to the band pass filter, the two tuned 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 kilocycles (2,360.6 metres).

The band pass input circuit feeds into the frequency changer stage, for which an octode valve (V1) is employed. This functions as a true electron coupled frequency changer.

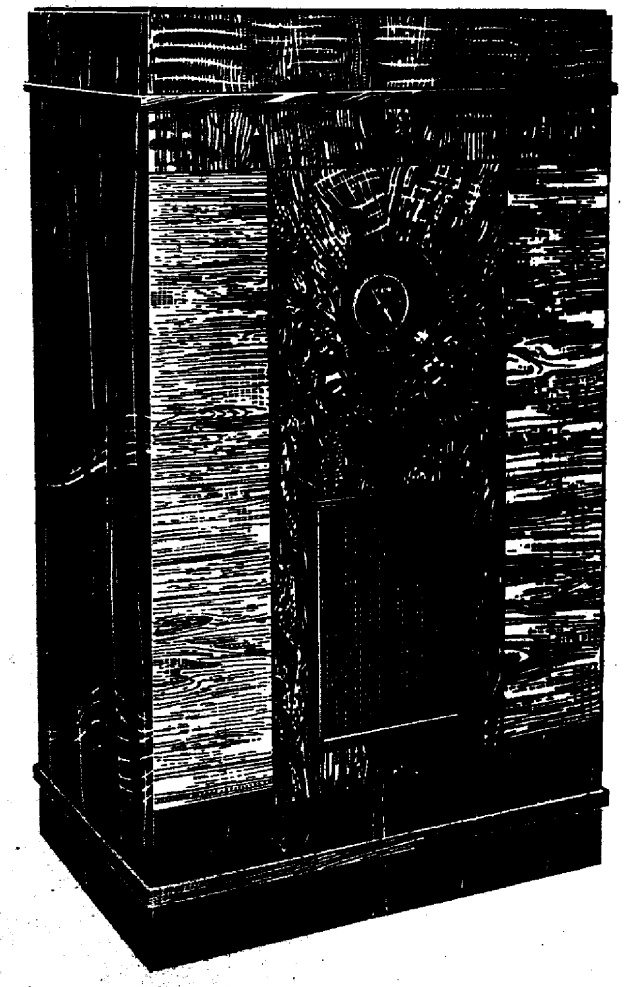
The amplifier section has variable mu characteristics and is controlled by the A.V.C.

The frequency changer stage is coupled by an I.F. transformer to the I.F. amplifier, a R.F. variable mu pentode valve (V2) which is also A.V.C. controlled.

Another I.F. transformer couples this valve to a diode signal rectifier which is incorporated in the duo-diode valve (V3).

The other diode provides fully delayed quiet automatic volume control.

The signal rectifier stage is resistance-capacity coupled to the output stage, where a high magnification L.F. pentode (V4) is employed, which in turn is transformer coupled to the mains energised moving coil speaker. This speaker has a low impedance voice coil.



GENERAL REMARKS

In the event of trouble, check the following details :—

1. Power supply; if the pilot lamp lights it is certain that the power supply is not at fault, otherwise check :
   - (*a*) Pilot bulb.
   - (*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 oscillators L.F., I.F. and R.F. stages, including the alignment of the tuned circuits.
4. Locate faulty component by testing with voltmeter, ammeter, ohmmeter, etc., or by substitution, as the case may be.
5. Check trimming with the help of oscillator if not attended to under 3(*b*).

The charts overleaf 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.

SERVICE DATA FOR A.C. MAINS RECEIVERS Nos. 8108 and 8121

The underside of the chassis is accessible by simply removing the bottom of the cabinet.

POWER SUPPLY CIRCUIT

Mains Transformer	Output
V1, V2, V3, V4 heater winding	4 volts R.M.S.
V5 heater winding	4 volts R.M.S.
Dial lamp winding	2 volts R.M.S.
H.T. winding	700 volts R.M.S.
Rectifier	**Output**
Unsmoothed	430 volts
Smoothed	280 volts

OPERATING CONDITIONS OF THE VALVES

Note.—All readings are with sensitivity control at minimum, and with no signal being received. Voltages measured from the chassis.

Valve	Circuit	Operating Conditions
F.C. and Osc. valve (V1). Ever Ready A80A (Metallised).	Anode voltage ..	275 volts
	Anode current ..	1.2 m.a.
	Screen voltage ..	72 volts
	Screen current ..	4 m.a.
	Oscillator plate voltage	77 volts
	Oscillator plate current	2.2 m.a.
I.F. valve (V2). Ever Ready A50N (Metallised).	Anode voltage ..	275 volts
	Anode current ..	6 m.a.
	Screen voltage ..	105 volts
	Screen current ..	2.5 m.a.
Output valve V4. Ever Ready A70C	Anode voltage ..	258 volts
	Anode current ..	27 m.a.
	Screen voltage ..	275 volts
	Screen current ..	3.1 m.a.
Duo-Diode valve (V3), Ever Ready A20B (Metallised).		Rectifier valve (V5), Ever Ready A11B.

If a particular reading should differ considerably from the above table, all components associated with that particular valve should be tested. The following tables will facilitate systematic testing of the components concerned.

WIRING COLOUR CODE

Valve	Grid Circuit	Anode Circuit
F.C. and Osc. valve (V1)	Frequency changer, screened lead	Osc.: Brown & Yellow F.C.: Blue & Yellow
I.F. valve (V2)	Green	Screened lead
Duo-diode valve (V3)	—	Screened leads
Output valve (V4)	—	Brown and Yellow
Rectifier valve (V5)	Cathode: Red	Anodes: Yellow

H.T. and Screen wiring .. Red.
A.V.C. circuit .. .. .. Black with Red tracer.

SWITCH POSITIONS

	Medium Waves	Long Waves	Gramophone
S1 ..	Closed	Open	Closed
S3 ..	Closed	Open	Closed
S4 ..	Open	Open	Closed
S5 ..	Closed	Closed	Open
S6 ..	Open	Open	Closed
S7 ..	Open	Closed	Open
S8 ..	Closed	Open	Closed

CIRCUIT ANALYSIS

Valve	Circuit	Associated Components
F.C. and Osc. valve (V1)	Anode circuit	T1 primary. Condensers C8 and C19.
	Screen circuit	Resistances R6, R5. Condenser C15.
	Control grid circuit ..	Screened cable. Coils L4 and L5. Condensers C2, C5, C14 and Switch S3. Resistance R13 and A.V.C. circuit.
	Oscillator plate circuit ..	Coil L8. Resistance R7. Condenser C18, and Switches S5 and S6.
	Oscillator grid circuit ..	Resistances R3, R4. Screened cable. Switch S4. Condenser C17 and tuned circuit comprising L6, L7, C3, C6, C7 and Switches S7, S8.
	Cathode circuit	Resistances R1, R2. Condenser C16.
I.F. valve (V2) ..	Anode circuit	Screened cable. T2 primary. Condensers C10, C23.
	Screen circuit	Resistance R8. Condenser C20.
	Grid circuit ..	T1 secondary. Condensers C9, C21. Resistance R10 and A.V.C. circuit.
	Cathode circuit	Resistance R9 and Condenser C22.
Duo-diode valve (V3)	Rectifier diode circuit ..	Screened cable. T2 secondary. Resistances R15, R16, R19. Condensers C11, C24, C25, C26, C12.
	diode circuit ..	Resistances R11, R12, R19, R20. Condensers C23, C29, Screened cable.
Pentode output valve (V4) ..	Anode and auxiliary grid circuit ..	T3 primary. Resistance R21. Condenser C30.
	Grid circuit ..	Resistances R18, R17. Condenser C25.
	Cathode circuit	Resistances R19, R20, R22. Condenser C29.

INDUCTANCES & TRANSFORMERS

Circuit Indication	Resistance	Location	Component Number
L1 ..	Aerial circuit coupling coil, 24 ohms	Fig. 6	78000
L2 ..	Medium wave primary band pass coil, 2.8 ohms	,,	,,
L2, L3	Long wave primary band pass coil, 17.3 ohms ..	,,	,,
L4 ..	Medium wave secondary band pass coil, 2.3 ohms	,,	,,

COMPONENT SPECIFICATION

INDUCTANCES & TRANSFORMERS *Continued*

Circuit Indication	Resistance	Location	Component Number
L4, L5	Long wave secondary band pass coil, 17.3 ohms	Fig. 6	78000
L6 ..	Oscillator grid coil, medium wave, 1.74 ohms	,,	78001
L6, L7	Oscillator grid coil, long wave, 3.26 ohms ..	,,	,,
L8 ..	Oscillator anode coil, 45 ohms	,,	,,
L9 ..	Speaker speech coil, 1.5 ohms	—	85006
L10 ..	Speaker energising coil, 3,000 ohms	—	,,
L11 ..	Speaker hum balancing coil, 0.3 ohms	—	,,
T1 ..	1st I.F. transformer, primary 93 ohms; secondary, 93 ohms ..	Fig. 6	77003
T2 ..	2nd I.F. transformer, primary 42 ohms; secondary, 42 ohms ..	Fig. 6	77020
T3 ..	Output transformer, primary, 700 ohms; secondary, 0.32 ohms	Fig. 7	77515
T4 ..	Mains transformer, primary, 37 + 3 + 3 ohms	Fig. 6	77001
	H.T. secondary, 160 + 180 ohms	,,	,,
	V1, V2, V3 and V4 heater winding, 0.07 ohms	,,	,,
	V5 heater winding, 0.13 ohms	,,	,,
	Winding for dial lights, 0.35 ohms	,,	,,

CONDENSERS

Circuit Indication	Condenser Specification	Location	Component Number
C1 ..	Primary circuit band pass tuning condenser ..	Fig. 6	80002
C2 ..	Secondary circuit band pass tuning condenser	,,	,,
C3 ..	Oscillator circuit tuning condenser	,,	,,
C4 ..	M/W trimmer for primary circuit of band pass	,,	,,
C5 ..	M/W trimmer for secondary circuit of band pass	,,	,,
C6 ..	Oscillator circuit, medium wave trimmer	,,	,,
C7 ..	Oscillator circuit, long wave trimmer	Fig. 6	78001
C8 ..	I.F. transformer T1 primary tuning condenser	Fig. 6	77003
C9 ..	I.F. transformer T1 secondary tuning condenser	,,	,,
C10 ..	I.F. transformer T2 primary tuning condenser	Fig. 6	77004
C11 ..	I.F. transformer T2 secondary tuning condenser	,,	,,
C12 ..	Tone control	Fig. 7	80003
C13 ..	.000015 mfd. mica (350 volt D.C. working) ..	Fig. 7	66750
C14 ..	0.25 mfd. tubular (350 volt D.C. working) ..	Fig. 7	68012
C15 ..	2 mfd. electrolytic (300 volt D.C. working) ..	Fig. 7	67009
C16 ..	0.1 mfd. tubular (350 volt D.C. working) ..	Fig. 7	68020
C17 ..	0.001 mfd. mica (350 volt D.C. working)	Fig. 7	66970
C18 ..	0.1 mfd. tubular (350 volt D.C. working) ..	,,	68020

CONDENSERS *Continued*

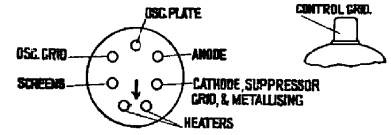
Circuit Indication	Condenser Specification	Location	Component Number
C19 ..	0.1 mfd. tubular (350 volt D.C. working) ..	Fig. 7	8020
C20 ..	0.1 mfd. tubular (350 volt D.C. working) ..	,,	,,
C21 ..	0.1 mfd. tubular (350 volt D.C. working) ..	,,	,,
C22 ..	0.1 mfd. tubular (350 volt D.C. working) ..	,,	,,
C23 ..	.0001 mfd. mica (350 volt D.C. working) ..	Fig. 7	66966
C24 ..	.0001 mfd. mica (350 volt D.C. working)	Fig. 6	,,
C25 ..	0.05 mfd. tubular (350 volt D.C. working) ..	Fig. 7	68014
C26 ..	.0001 mfd. mica (350 volt D.C. working)	Fig. 7	66966
C27, C28	8 mfd. + 8 mfd. electrolytic (450 volt D.C. working)	Fig. 7	67000
C29 ..	20 mfd. electrolytic (30 volt D.C. working) ..	Fig. 7	67008
C30 ..	0.01 mfd. tubular (450 volt D.C. working) ..	Fig. 7	68005
C31 ..	.000005 mfd. mica		

RESISTANCES

Circuit Indication	Resistance Value	Colour Code: Body	Tip	Dot	Location	Component Number
R1	150 ohms (½ watt) ..	Br.	G.	Br.	Fig. 7	71969
R2	Sensitivity control 2,000 ohms ..	—	—	—	Fig. 7	82000
R3	1,000 ohms (½ watt) ..	Br.	Bl.	R.	Fig. 7	71914
R4	100,000 ohms (½ watt) ..	Br.	Bl.	Y.	Fig. 7	71910
R5	40,000 ohms (½ watt) ..	Y.	Bl.	O.	Fig. 7	71955
R6	40,000 ohms (1 watt) ..	Y.	Bl.	O.	Fig. 7	71940
R7	100,000 ohms (½ watt) ..	Br.	Bl.	Y.	Fig. 7	71913
R8	80,000 ohms (½ watt) ..	Gr.	Bl.	O.	Fig. 7	71939
R9	200 ohms (½ watt) ..	R.	Bl.	Br.	Fig. 7	71943
R10	510,000 ohms (½ watt) ..	G.	Br.	Y.	Fig. 7	71944
R11	510,000 ohms (½ watt) ..	G.	Br.	Y.	Fig. 7	71944
R12	510,000 ohms (½ watt) ..	G.	Br.	Y.	Fig. 7	71944
R13	510,000 ohms (½ watt) ..	G.	Br.	Y.	Fig. 7	71944
R14	100,000 ohms (½ watt) ..	Br.	Bl.	Y.	Fig. 7	71910
R15	100,000 ohms (½ watt) ..	Br.	Bl.	Y.	Fig. 6	71910
R16	250,000 ohms (½ watt) ..	R.	Blue	Y.	Fig. 7	71945
R17	Volume control 500,000 ohms ..	—	—	—	Fig. 6	81001
R18	25,000 ohms (½ watt) ..	R.	G.	O.	Fig. 7	71908
R19	50 ohms (½ watt) ..	G.	Bl.	Bl.	Fig. 7	71959
R20	500 ohms (1 watt) ..	G.	Bl.	Br.	Fig. 7	71941
R21	10,000 ohms (½ watt) ..	Br.	Bl.	O.	Fig. 7	71923
R22	100 ohms (½ watt) ..	Br.	Bl.	Br.	Fig. 7	71957

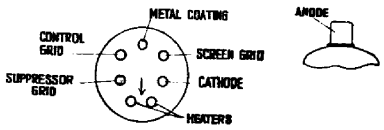
COLOUR CODE:—Br. = Brown; Bl. = Black; G. = Green; Gr. = Grey; O. = Orange Y. = Yellow.

Fig. 1



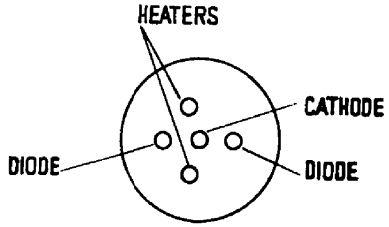
PLAN OF VALVE HOLDER V1
I.H. MAINS OCTODE FREQUENCY CHANGER

Fig. 2



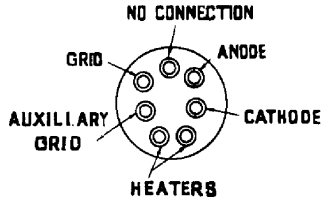
PLAN OF VALVE HOLDER V2
MAINS SCREENED H.F PENTODE

Fig. 3



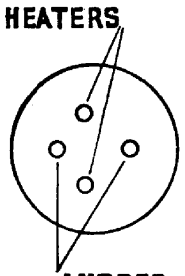
PLAN OF VALVE HOLDER V3
I.H. MAINS DUO DIODE

Fig. 4



PLAN OF VALVE HOLDER V4
L.F. PENTODE

Fig. 5



PLAN OF VALVE HOLDER V5
RECTIFIER VALVE

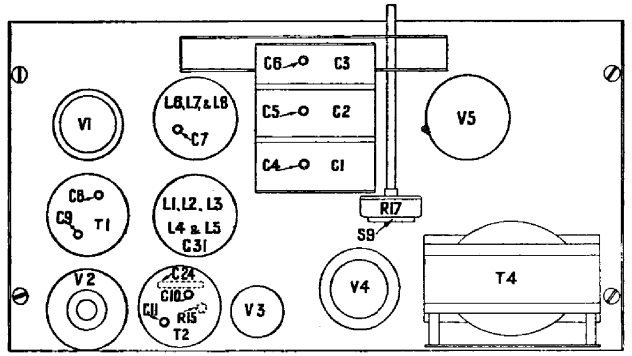


Fig. 6

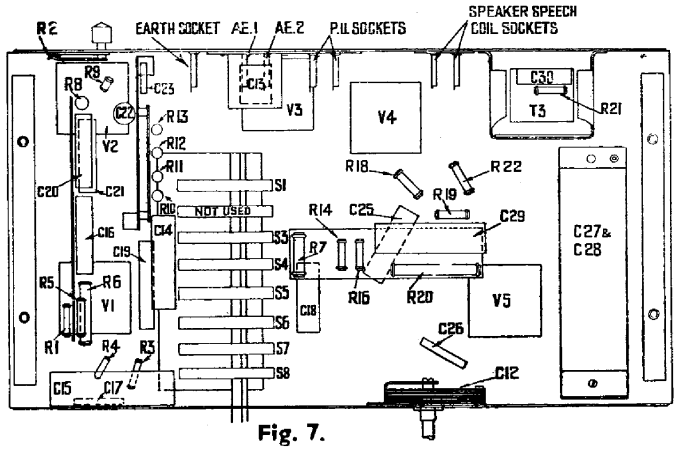
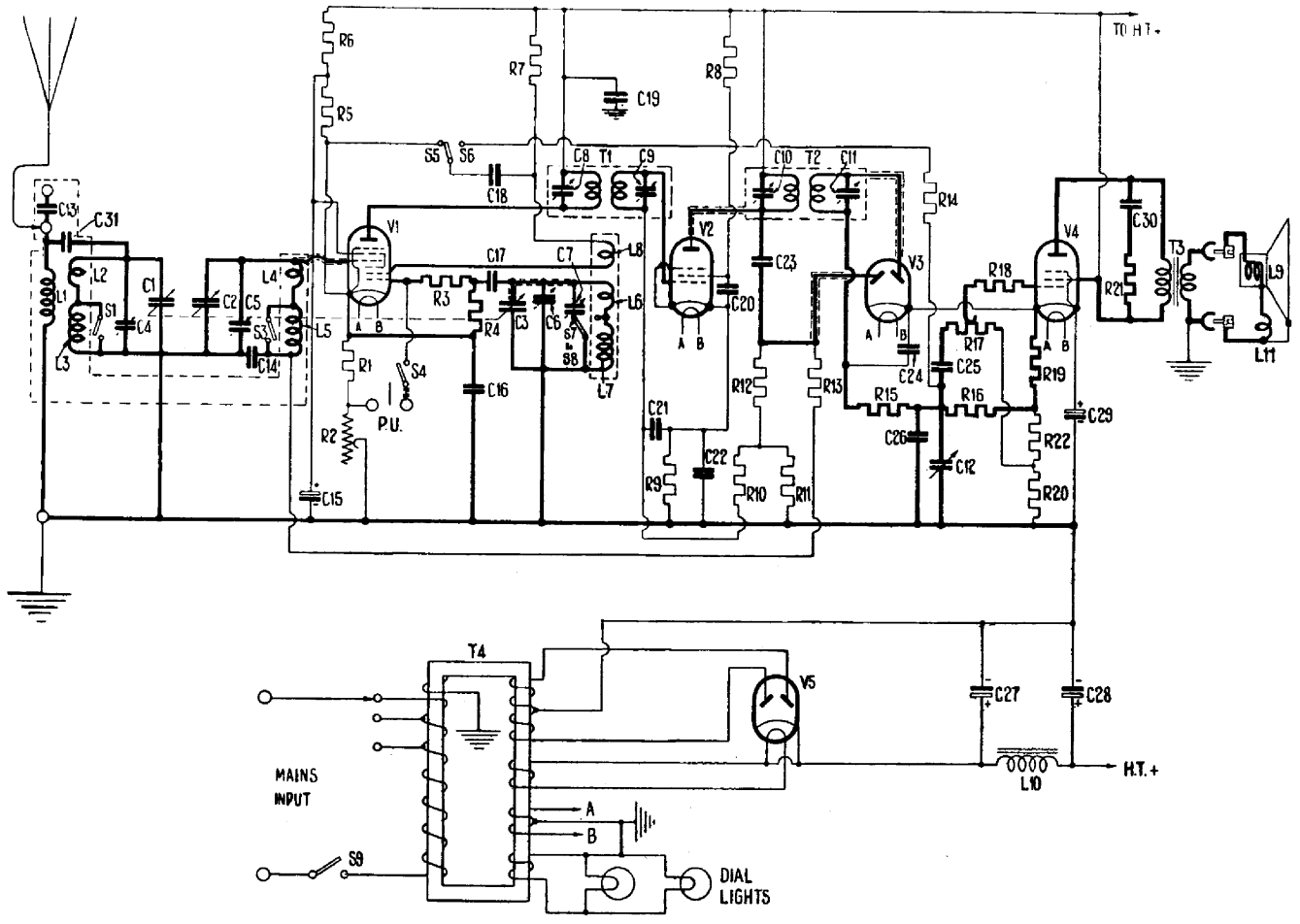


Fig. 7.



CIRCUIT DIAGRAM

REMOVING THE CHASSIS FROM THE CABINET

The knobs are first removed, by a direct forward pull.

Next the four chassis fixing bolts at the underside of the cabinet cross members are taken out.

The speaker voice coil plugs are pulled from their sockets and the field leads disconnected at the speaker end by removing two screws.

The pick-up plugs are taken from the chassis and the leads disconnected from the gramophone motor.

The chassis is now taken from the cabinet.

The loudspeaker may be removed by removing the four fixing nuts.

REPLACING THE I.F. TRANSFORMERS

The I.F. transformers T1 and T2 are easily removed from the chassis. Unsolder the leads from the contacts at the base of the transformer, in the case of T2 there are also two lead out wires.

Remove the two 4 B.A. nuts on the underside of the chassis and the transformer is taken away from the chassis.

REPLACING THE BAND PASS COIL

The coil screen is first removed, it is held in position by two 4 B.A. nuts, accessible from the underside of the chassis. Remove these.

Two leads from the top of the coil screen go to the gang condenser, unsolder these.

Release the two screened cable earthing clips and carefully lift up the coil screen. If it is necessary to remove the coil complete, unsolder the lead out wires from the underside of the chassis. The coil is held in position by a single screw, accessible from the underside of the chassis and located between switches S1 and S2.

REPLACING THE OSCILLATOR COIL

The coil screen is first removed, it is held in position by two 4 B.A. nuts, accessible from the underside of the chassis. Remove these. A screened lead from the top of the oscillator coil is unsoldered from the gang condenser. The earthing clip of this lead is released and the screen carefully lifted up. If it is necessary to remove the coil complete unsolder the lead out wires from the underside of the chassis. The coil is held in position by a single screw, accessible from the underside of the chassis, and located between switches S5 and S6.

ADJUSTING THE TUNED CIRCUITS

Tuned circuits

(*a*) Tuned primary and secondary 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 or oscillator circuits.

A modulated signal of 127 kcs. is applied between the frequency changer control grid and the chassis. A 2 mfd. condenser is connected between the oscillator plate and chassis.

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 this 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

Rotate the condenser drive so that the gang is at the stop at the minimum capacity position.

If the pointer does not coincide with the two index marks at the top and bottom of the scale, release the centre fixing screw and move the pointer into this position.

Apply a modulated signal of 196 metres to the aerial terminal, switch the receiver to medium waves, the gang being rotated as above.

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

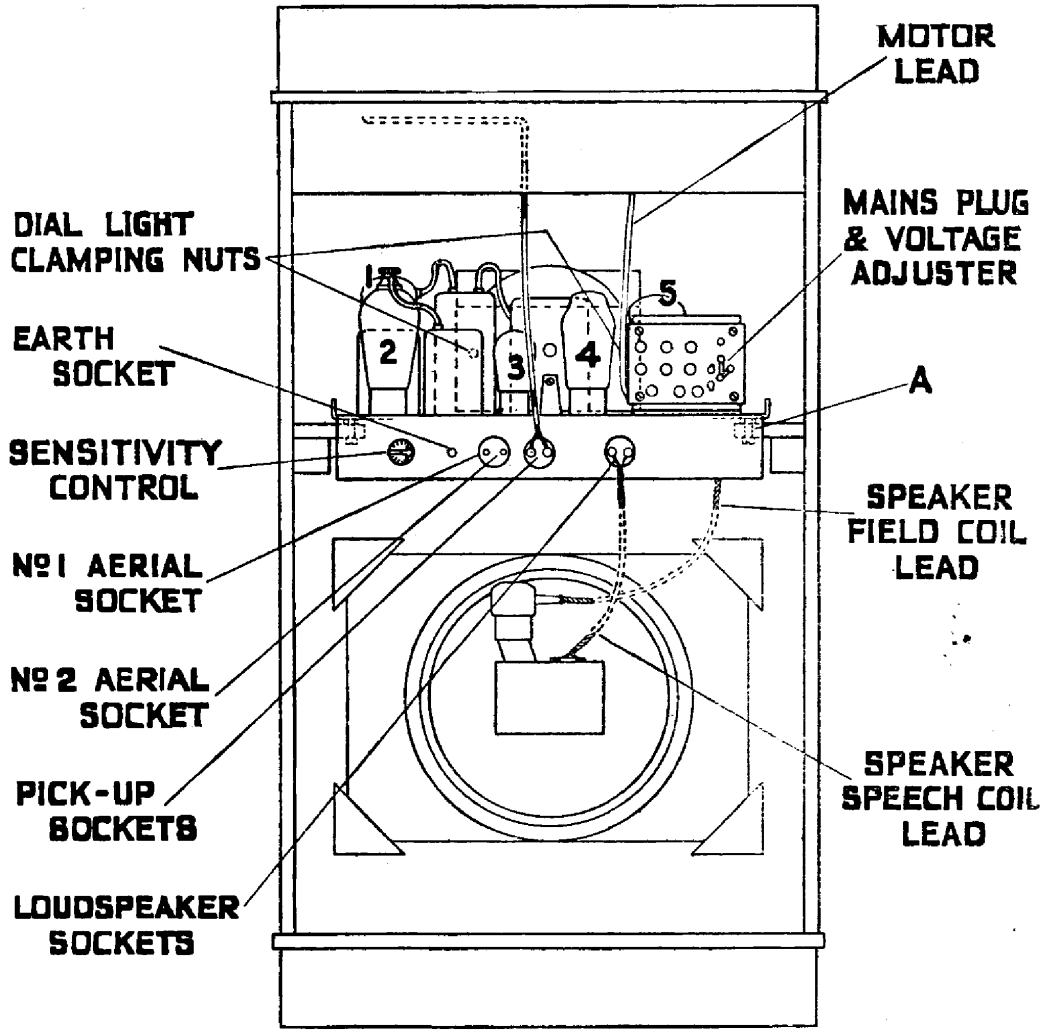


Fig. 8

TESTING CONDENSERS

Paper and Mica Dielectric

Condensers of this type should be checked for insulation with an ohmmeter or other device. If an open circuit is suspected substitution is the best procedure.

Electrolytic

The leakage of an electrolytic condenser should be tested with an H.T. battery, a milliammeter and a safety resistance of 10,000 ohms. The milliammeter, safety resistance, H.T. battery and the condenser to be tested should be connected in series. The polarity of the condenser must be observed, by connecting the positive and negative condenser terminals in the circuit to the corresponding battery terminals.

The table below gives the H.T. voltage and the maximum steady leakage currents for the various electrolytic condensers. The current is measured after the condenser is fully charged and the safety resistance is short-circuited with a switch. Condensers with a larger leakage current should be replaced.

Condenser	H.T. voltage applied	Maximum leakage current when condenser is fully charged
C15, 2 mfd. ..	270 volts	.2 m.a.
C27 and C28, 8 mfd.	400 volts	1 m.a.
C29, 20 mfd. ..	25 volts	2 m.a.

LISSEN

MODIFICATIONS TO SUPERHETERODYNE RECEIVERS
MODELS 8108 and 8121

The circuit to the octode screen is now completed directly, and *not* through the switch S2.

The switch S2 is now connected across an additional resistance R23 of 300 ohms, component number 71,942, which is inserted between the slider of the sensitivity control and chassis, and serves to increase the bias on V1, when the oscillator section is being used as an A.F. amplifier for gramophone reproduction.

R4 is now 51,000 ohms, component number 71,968.

When the set is being used for reproducing gramophone records the sensitivity control should be turned to minimum sensitivity.

The capacities of the smoothing condensers C27 and C28 are now 8 mfds. and 16 mfds., respectively, the new component number being 67,007.

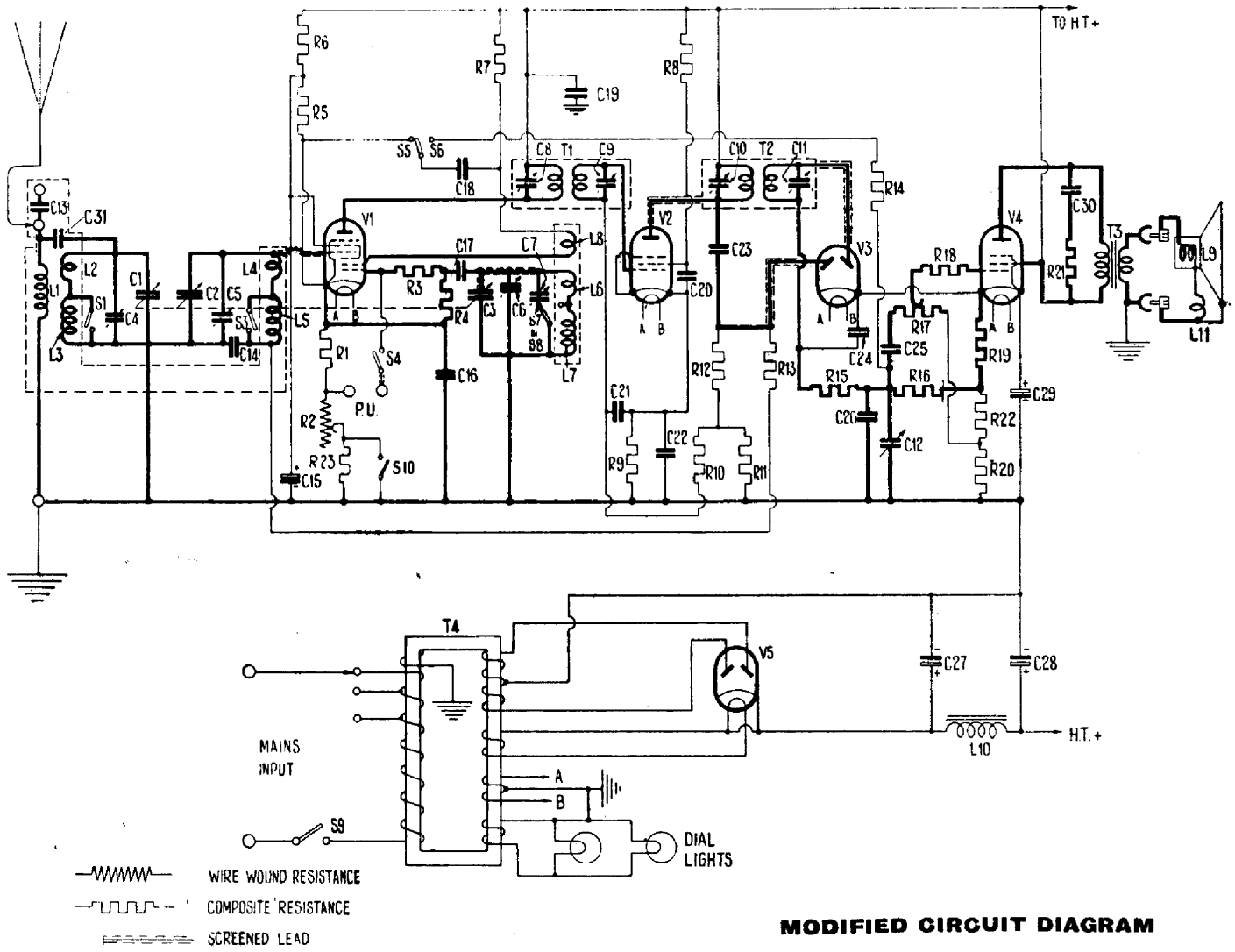
R1 is now 150 ohms, component number 71,969.

R19 is now 50 ohms, component number 71,959.

An additional resistance, R22, 100 ohms, component number 71,957, is connected in series between R19 and R20. The end of the volume control is returned to the junction of R22 and R20.

An additional condenser C31, .000005 mfd., component number 66,000 is connected between the top of L1 and the top of L2.

The component number of T2 is now 77,020. The transformer is electrically unchanged.



MODIFIED CIRCUIT DIAGRAM

LISSEN

MODIFICATIONS TO SUPERHETERODYNE RECEIVERS
MODELS 8111, 8116 and 8117

The circuit to the octode screen is now completed directly, and *not* through the switch S2.

The switch S2 is now connected across an additional resistance R23 of 300 ohms, component number 71,942, which is inserted between the slider of the sensitivity control and chassis, and serves to increase the bias on V1, when the oscillator section is being used as an A.F. amplifier for gramophone reproduction.

R4 is now 51,000 ohms, component number 71,968. When the set is being used for reproducing gramophone records the sensitivity control should be turned to minimum sensitivity.

The capacities of the smoothing condensers C27 and C28 are now 8 mfds. and 16 mfds. respectively, the new component number being 67,007.

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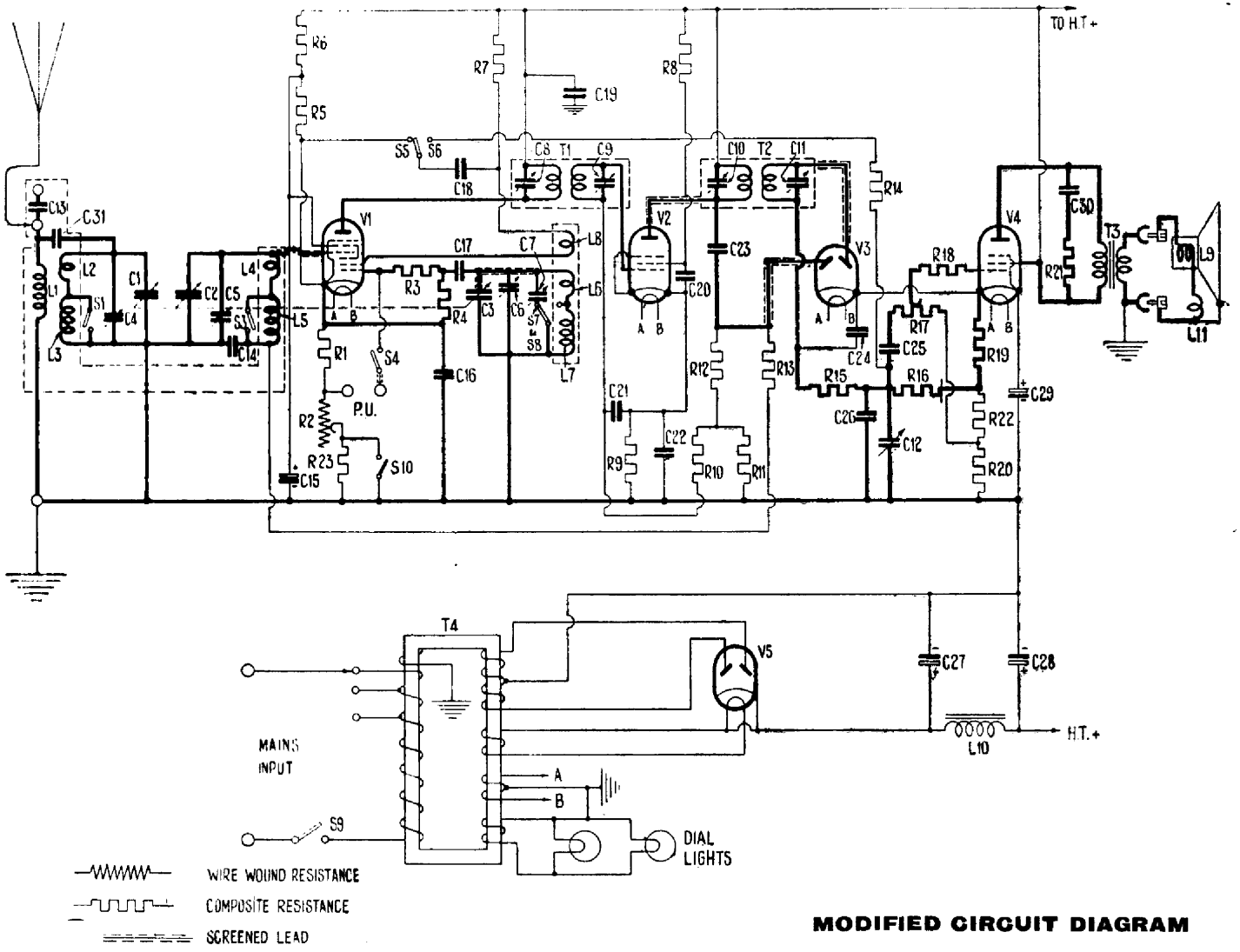
An additional condenser C31, .000005 mfds., component number 66,000 is connected between the top of L1 and the top of L2.

The component number of T2 is now 77,020. The transformer is electrically unchanged.



MODIFIED CIRCUIT DIAGRAM