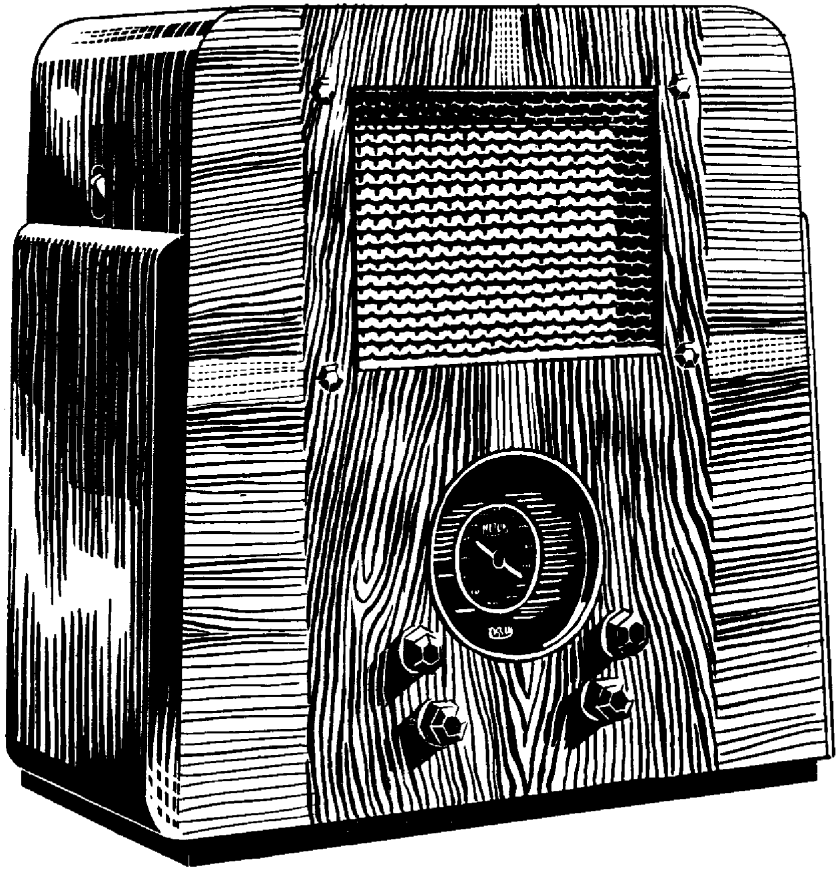
LISSEN

SERVICE MANUAL FOR UNIVERSAL MAINS SUPERHETERODYNE RECEIVER MODEL 8110



TECHNICAL SPECIFICATION

THE Lissen model "8110" is a universal A.C. or D.C. mains operated superheterodyne receiver, for operation with an external elevated aerial.

It has seven tuned stages: a two 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 input circuit feeds into the frequency changer stage for which a triode pentode 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). This in turn is coupled by the second I.F. transformer T2 to the diode signal rectifier which is incorporated in the duo-diode-pentode valve (V3). The other diode provides fully delayed quiet automatic volume control. Both V1 and V2 are controlled by the A.V.C. The pentode section of this valve functions as a power output amplifier, and is transformer coupled to the permanent magnet moving coil speaker, which 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 and fuses.

   (*b*) Mains leads, plugs and sockets.

   (*c*) Mains switch.

   (*d*) Receiver correctly adjusted for power supply.

In the case of a D.C. supply, if the pilot lamps light, but no signal is received, reverse the mains plug in its socket.

2. Valves :—

   (*a*) Check characteristics, or

   (*b*) Substitute known good valves.

3. Locate trouble to a particular stage :—

   (*a*) Check-valve operating condition, or

   (*b*) Test the L.F., I.F., and R.F. stages with an oscillator and check the alignment of the tuned circuits.

4. Locate faulty component by testing instrument, or if necessary, by substitution.

5. Check trimming, with the help of an oscillator, if not attended to under 3(*b*).

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

Voltage and current readings are given for A.C. and D.C. supplies. Higher or lower input voltages will give proportionately higher or lower voltage and current readings.

VALVE HEATER CIRCUIT

The indirectly heated valves used with the Lissen "8110" receiver are wired in series and require a heater current of 0.2 amps. The resistance R25 is variable, so that the current may be adjusted to this value if a new set of valves should be fitted.

OPERATING CONDITIONS OF THE VALVES

Valve	Circuit	Input : 230 volts D.C.	Input : 250 volts A.C.
F.C. valve, Mazda TP/2620 Metallized (V1).	F.C. anode voltage ..	190 volts	227 volts
	F.C. anode current ..	1.6 m.a.	2 m.a.
	F.C. screen voltage ..	80 volts	90 volts
	F.C. screen current ..	0.4 m.a.	1 m.a.
	Osc. anode voltage ..	Radio : 168 volts Gram : 172 volts	Radio : 200 volts Gram : 205 volts
	Osc. anode current ..	Radio : 3 m.a. Gram : 2.8 m.a.	Radio : 3.7 m.a. Gram : 3.2 m.a.
I.F. valve, Mazda VP/1321, Metallized (V2).	Anode voltage	200 volts	246 volts
	Anode current	8 m.a.	9.6 m.a.
	Screen voltage	155 volts	172 volts
	Screen current	2 m.a.	2.4 m.a.
Output valve, Mazda Pen/DD/4020 (V3).	Anode voltage	160 volts	192 volts
	Anode current	31 m.a.	38 m.a.
	Screen voltage	182 volts	223 volts
	Screen current	6 m.a.	8 m.a.
Power consumption ..		56 watts	70 watts
Undistorted output ..		1.75 watts	2.5 watts

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
F.C. valve (V1).	F.C. anode circuit ..	T1 primary. R9. C8, C21.
	F.C. screen circuit ..	R1, R2. C14.
	F.C. grid circuit ..	Screened cable. L4, L5. R3. C2, C5, C13. S2 and A.V.C. circuit.
	Oscillator anode circuit	L6, L7. R8, R10. C3, C6, C7, C22. S3, S4, S6, S7, S9.
	Oscillator grid circuit ..	R5. C18. S5. On gram.: R4. C15, C16, C17.
	Cathode circuit	L8. R6, R7. C19, C20.
I.F. valve (V2).	Anode circuit	Screened cable. T2 primary. C10, C26.
	Screen circuit	R12. C25.
	Grid circuit	T1 secondary. R11. C9, C23. A.V.C. circuit.
	Cathode circuit	R7, R13. C20, C24.
D.D. Pentode valve (V3).	Anode and auxiliary grid circuit	T3 primary. R23. C31. Screened cable.
	Rectifier diode circuit	Screened cable. T2 secondary. R14, R17. C11, C27, C28, C29.
	A.V.C. diode circuit ..	Screened cable. R21, R22. C26.
	Grid circuit	Screened cable. R15, R16.
	Cathode circuit ..	R18, R19, R20. C30.

SWITCH POSITIONS

Circuit Indication	Medium Waves	Long Waves	Gramophone
S1 ..	Closed	Open	Closed
S2 ..	Closed	Open	Closed
S3 ..	Open	Closed	Open
S4 ..	Closed	Open	Closed
S5 ..	Open	Open	Closed
S6 ..	Open	Open	Closed
S7 ..	Closed	Closed	Open
S8 ..	Closed	Closed	Closed
S9 ..	Open	Open	Closed

CONDENSERS

Circuit Indication	Specification	Location	Component Number
C1 ..	Primary circuit band pass tuning condenser	Fig. 4	80,002
C2 ..	Secondary circuit band pass tuning condenser	Fig. 4	80,002
C3 ..	Oscillator circuit tuning condenser	Fig. 4	80,002
C4 ..	M/W trimmer for band pass primary circuit	Fig. 4	80,002
C5 ..	M/W trimmer for band pass secondary circuit	Fig. 4	80,002
C6 ..	Oscillator circuit medium wave trimmer	Fig. 4	80,002
C7 ..	Oscillator circuit long wave trimmer	Fig. 4	78,005
C8 ..	I.F. transformer T1 primary tuning condenser	Fig. 4	77,003
C9 ..	I.F. transformer T1 secondary tuning condenser ..	Fig. 4	77,003
C10	I.F. transformer T2 primary tuning condenser	Fig. 4	77,015
C11	I.F. transformer T2 secondary tuning condenser ..	Fig. 4	77,015
C12	.002 mfd. mica, 350 volts D.C. working	Fig. 5	66,748
C13	0.25 mfd. tubular, 350 volts D.C. working	Fig. 5	68,012
C14	2 mfd. dry electrolytic, 300 volts D.C. working ..	Fig. 5	67,009
C15	0.1 mfd. tubular, 350 volts D.C. working	Fig. 5	68,020
C16	0.1 mfd. tubular, 350 volts D.C. working	Fig. 5	68,020
C17	0.1 mfd. tubular, 350 volts D.C. working	Fig. 5	68,020
C18	.0002 mfd. mica, 350 volts D.C. working	Fig. 5	66,967
C19	25 mfd. dry electrolytic, 25 volts D.C. working ..	Fig. 5	67,006
C20	.01 mfd. tubular, 450 volts D.C. working	Fig. 5	68,005
C21	0.1 mfd. tubular, 350 volts D.C. working	Fig. 5	68,020
C22	0.1 mfd. tubular, 350 volts D.C. working	Fig. 5	68,020
C23	0.1 mfd. tubular, 350 volts D.C. working	Fig. 5	68,020
C24	0.1 mfd. tubular, 350 volts D.C. working	Fig. 5	68,020
C25	0.1 mfd. tubular, 350 volts D.C. working	Fig. 5	68,020
C26	.0001 mfd. mica, 350 volts D.C. working	Fig. 5	66,966
C27	.0002 mfd. mica, 350 volts D.C. working	Fig. 4	66,967
C28	.0001 mfd. mica, 350 volts D.C. working	Fig. 5	66,966
C29	.01 mfd. tubular, 450 volts D.C. working	Fig. 5	68,005
C30	20 mfd. dry electrolytic, 50 volts D.C. working ..	Fig. 5	67,007
C31	.025 mfd. tubular, 350 volts D.C. working	Fig. 5	68,013
C32	.01 mfd. tubular, 450 volts D.C. working	Fig. 5	68,005
C33	16 mfd. dry electrolytic, 300 volts D.C. working .. }		
C34	8 mfd. dry electrolytic, 300 volts D.C. working .. }	Fig. 5	67,001
C35	0.1 mfd. tubular, 350 volts D.C. working	Fig. 5	68,020
C36	0.1 mfd. tubular, 350 volts D.C. working	Fig. 5	68,020
C37	0.25 mfd. tubular, 350 volts D.C. working	Fig. 5	68,012

INDUCTANCES & TRANSFORMERS

Circuit Indication	Specification	Location	Component Number
L1 ..	Aerial circuit coupling coil, 24 ohms	Fig. 4	78,000
L2 ..	Medium wave primary band pass coil, 2.3 ohms	Fig. 4	78,000
L2, L3	Long wave primary band pass coil, 17.3 ohms	Fig. 4	78,000
L4 ..	Medium wave secondary band pass coil, 2.3 ohms ..	Fig. 4	78,000
L4, L5	Long wave secondary band pass coil, 17.3 ohms ..	Fig. 4	78,000
L6 ..	Medium wave oscillator coil, 3.0 ohms	Fig. 4	78,005
L6, L7	Long wave oscillator coil, 6.0 ohms	Fig. 4	78,005
L8 ..	Oscillator circuit reaction coil, 37.5 ohms	Fig. 4	78,005
L9 ..	Speaker speech coil 1.2 ohms		85,008
L10	Smoothing choke, 220 ohms	Fig. 4	79,003
L11	Filter choke, 1 ohm ..	Fig. 5	79,004
L12	Filter choke, 1 ohm ..	Fig. 5	79,004
T1 ..	First I.F. transformer, primary, 93 ohms ; secondary, 93 ohms	Fig. 4	77,003
T2 ..	Second I.F. transformer, primary, 43 ohms ; secondary, 43 ohms	Fig. 4	77,015
T3 ..	Output transformer, primary 690 ohms ; secondary, 0.3 ohms	Fig. 5	77,014
B27	Metal rectifier	Fig. 4	B.27

RESISTANCES

Circuit Indication	Resistance Value	Colour Code: Body	Tip	Dot	Location	Component Number
R1	50,000 ohms (½ watt) ..	G.	Bl.	O.	Fig. 5	71,971
R2	40,000 ohms (½ watt) ..	Y.	Bl.	O.	Fig. 5	71,955
R3	510,000 ohms (¼ watt) ..	G.	Br.	Y.	Fig. 5	71,944
R4	110,000 ohms (¼ watt) ..	Br.	Br.	Y.	Fig. 5	71,962
R5	110,000 ohms (¼ watt) ..	Br.	Br.	Y.	Fig. 5	71,962
R6	1,400 ohms (¼ watt) ..	Br.	Y.	Red	Fig. 5	71,970
R7	2,000 ohms, sensitivity control ..	—	—	—	Fig. 5	82,000
R8	10,000 ohms (¼ watt) ..	Br.	Bl.	O.	Fig. 5	71,923
R9	5,000 ohms (¼ watt) ..	G.	Bl.	Red	Fig. 5	71,922
R10	16,000 ohms (¼ watt) ..	Br.	Blue	O.	Fig. 4	71,966
R11	510,000 ohms (¼ watt) ..	G.	Br.	Y.	Fig. 5	71,944
R12	25,000 ohms (¼ watt) ..	Red	G.	O.	Fig. 5	71,908
R13	100 ohms (¼ watt) ..	Br.	Bl.	Br.	Fig. 5	71,957
R14	26,000 ohms (¼ watt) ..	Red	Blue	O.	Fig. 4	71,974
R15	26,000 ohms (¼ watt) ..	Red	Blue	O.	Fig. 4	71,974
R16	500,000 ohms volume control ..	—	—	—	Fig. 4	81,006
R17	260,000 ohms (¼ watt) ..	Red	Blue	Y.	Fig. 5	71,945
R18	100 ohms (¼ watt) ..	Br.	Bl.	Br.	Fig. 5	71,957
R19	50 ohms (¼ watt) ..	G.	Bl.	Bl.	Fig. 5	71,959
R20	500 ohms (1 watt) ..	G.	Bl.	Br.	Fig. 5	71,941
R21	510,000 ohms (¼ watt) ..	G.	Br.	Y.	Fig. 5	71,944
R22	510,000 ohms (¼ watt) ..	G.	Br.	Y.	Fig. 5	71,944
R23	25,000 ohms tone control	—	—	—	Fig. 5	81,005
R24	785 ohms tapped ..	—	—	—	Fig. 4	71,090
R25	100 ohms variable ..	—	—	—	Fig. 4	89,000

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

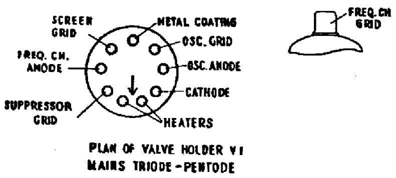


Fig. 1

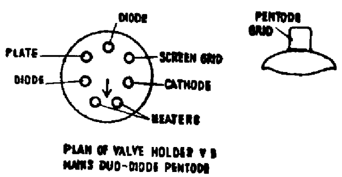


Fig. 2

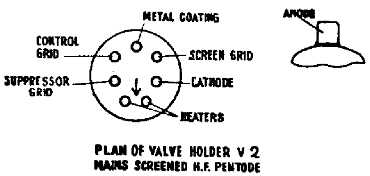


Fig. 3

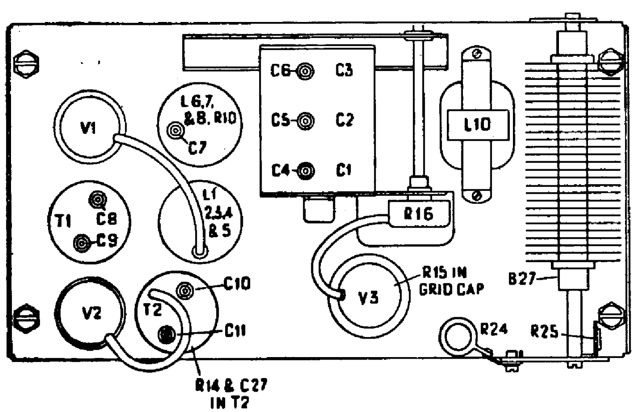


Fig. 4

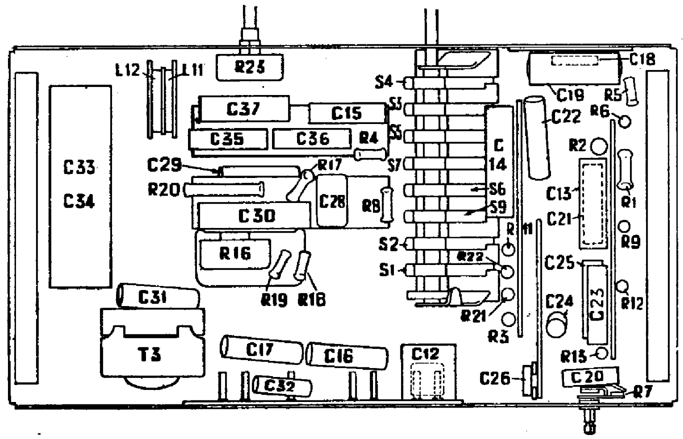
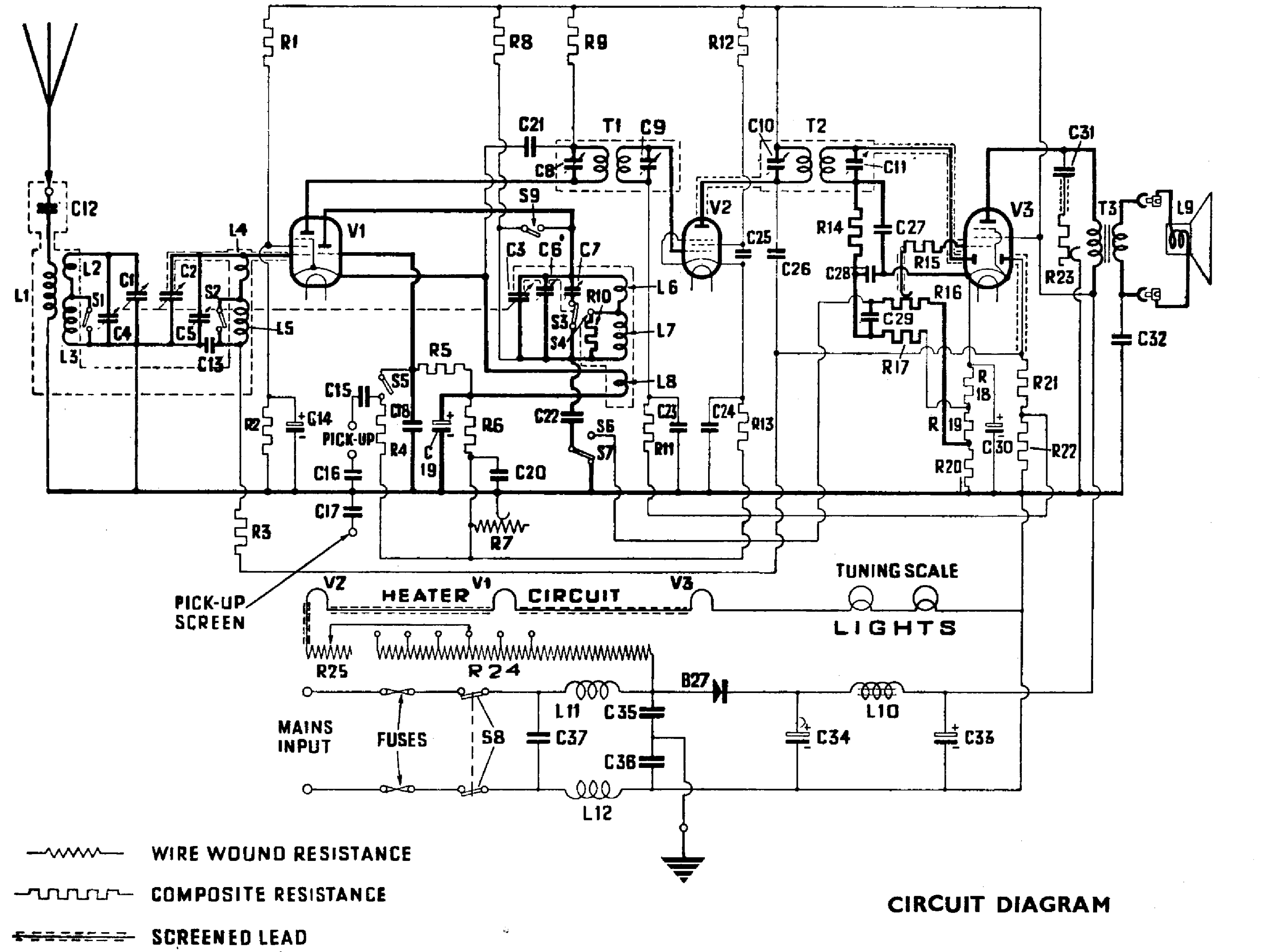


Fig. 5



CIRCUIT DIAGRAM

REMOVING THE CHASSIS FROM THE CABINET

The knobs must first be removed by a direct forward pull.

Next the four fixing bolts at the underside of the cabinet should be removed.

The speaker plugs are pulled from their sockets and the field leads disconnected at the speaker end by removing two screws, and the chassis withdrawn from the cabinet.

The loudspeaker may also be removed by taking out its four fixing bolts.

It should be noted that to get access to the underside of the chassis it is only necessary to remove the cabinet bottom board; the chassis need not be removed from the cabinet.

REMOVING THE I.F. TRANSFORMERS

Unsolder the leads from the contacts at the base of the transformers, 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 may now be removed.

REMOVING THE BAND PASS COIL AND THE OSCILLATOR COIL

The coil screens are held in position by 4 B.A. nuts, remove these. Unsolder from the gang the leads from the top of the screens, release the screened cable earthing clips and carefully withdraw the screens.

To remove the coils complete, unsolder the lead-out wires from the underside of the chassis. The coils are held in position by single screws, accessible from the underside of the chassis and located between switches S1 and S2 for the band pass coil, and between switches S5 and S7 for the oscillator coil.

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 and oscillator circuit.

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. 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

Rotate the gang till the pointer is at the higher wavelength end 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 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 the medium waves, the gang being rotated till the pointer is at the lower wavelength end of the scale.

Adjust the trimmers for 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.

TESTING ELECTROLYTIC CONDENSERS

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 opposite 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	Maximum leakage when fully charged
C14, 2 mfd. ..	300 volts	0.2 m.a.
C19, 25 mfd. ..	25 ,,	2.75 ,,
C30, 20 mfd. ..	50 ,,	2.2 ,,
C33, 16 mfd. ..	300 ,,	1.76 ,,
C34, 8 mfd. ..	300 ,,	0.88 ,,

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.

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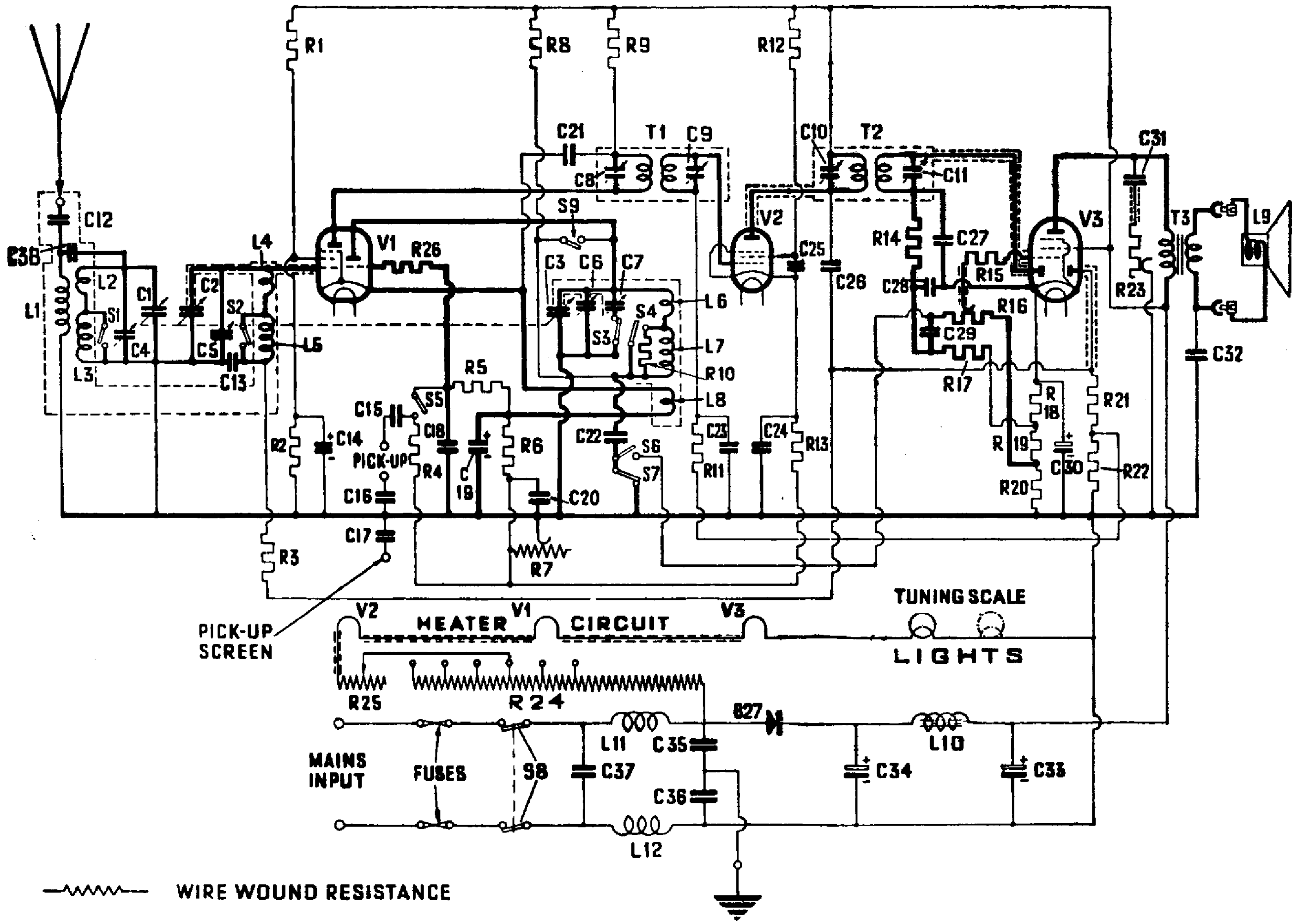
MODIFICATIONS TO THE UNIVERSAL MAINS SUPERHETERODYNE RECEIVER MODEL 8110

An error has occurred in the original circuit diagram of the Model "8110" receiver. A corrected diagram is printed on the right. In addition, two modifications have been incorporated. The first is to the resistance R8, which is now 30,000 ohms, component number 71,949.

The second is the inclusion of a new resistance R26 in the grid lead to the triode section of the frequency changer valve V1.



WIRE WOUND RESISTANCE

COMPOSITE RESISTANCE

SCREENED LEAD

ALL SCREENED LEADS ARE EARTHED TO CHASSIS

MODIFIED CIRCUIT DIAGRAM

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