LOUDSPEAKER AMPLIFIER AM8/1

General Description

Loudspeaker Amplifier AM8/1 forms part of O.B. Loudspeaker LS3/1 (Instruction S.8) but for ease of transport is kept as a separate self-contained unit instead of being mounted in the loudspeaker cabinet.

Its performance and certain other features are specified by the BBC but otherwise its design and construction are left to the manufacturer. Models supplied at different times by the same or different manufacturers are interchangeable but may differ slightly in design and construction.

It is approximately 14 in. long, 7 in. wide and 7 in. high and weighs under 22 lb. A protective cover, secured to the chassis by screws, is fitted.

The amplifier is mains-operated and gives an output of approximately 15 watts into 25 ohms for an input of less than 0·5 volt r.m.s. It has very low distortion at this output over the frequency range of 30 c/s to 15 kc/s.

A gain control is fitted, and plugs and sockets are provided for mains input and loudspeaker output connections. A signal input jack is fitted to take P.O. plug No. 316.

AM8/1: SERIAL NOS. 101 TO 150

Circuit Description (Fig. 56)

The circuit of amplifiers with serial numbers 101 to 150 inclusive is shown in Fig. 56. It is basically the same circuit as that used in Loudspeaker Amplifiers LSM/8 and LSM/10 and described in Instruction S.8 Section 1, but differs somewhat in certain respects. The biasing arrangements for the cathode-coupled phase-splitting stage (V2) are different as the valve is direct coupled to the first stage and the two grids are maintained at the same d.c. potential as the anode of V1; the value of the common cathode resistor R10 is arranged to maintain the potential of the two cathodes at the correct value relative to the grid potential.

In the LSM/8 and LSM/10 the pentode valves in the push-pull output stage are operated as triodes by connecting the screen grid to the anode. In the AM8/1, however, the output stage is of the so-called *ultra linear* or distributed load type in which the screen grid of each valve is connected to a tapping on the corresponding half of the primary winding of the output transformer. This gives negative feedback in the output stage itself and the operating characteristic of each valve lies between those of the valve when used as a pentode and as a triode. If the tapping is taken to the anode end of the half-winding the valve operates as a triode, and if it is taken to the mid-point of the whole primary winding it operates as a pentode. By suitable choice of a tapping point between these two extremes a useful compromise can be obtained between the greater power-handling capacity and efficiency of a pentode and the lower distortion of a triode; in addition the output impedance approaches the lower value obtained from a triode.

The output stage of the AM8/1 is suitable for only one load impedance, viz. 25 ohms, instead of two as in the LSM/8 and LSM/10. Another difference is the omission of a smoothing choke.

General Data

Mains Power Supply

Voltage: 200 to 250 V a.c.
Frequency: 45 to 55 c/s.

Impedances

Specified input impedance:	At least 10 kΩ over the range 50 c/s to 15 kc/s at any input level below 0·5 V r.m.s.
Measured input impedance:	30 kΩ at 1 kc/s
Specified output impedance:	Not greater than 2·5 Ω over the range 50 c/s to 6 kc/s Not greater than 5 Ω over the range 6 kc/s to 15 kc/s
Measured output impedance:	0·5 Ω at 50 c/s to 6 kc/s 1 Ω at 6 kc/s to 15 kc/s

Load impedance: 25 Ω nominal

Stability

No observable self-oscillation when either an impulsive or a steady signal from zero to maximum input is applied to the input under any conditions of source impedance and setting of gain control, and with open-circuit output, 25-Ω resistive load, load of 0 to 1,000 pF, either of the two push-pull output valves removed from its socket.

Sensitivity and Power Output

At least 15 watts output power into a resistive load of 25 Ω with a sinusoidal input of 0·5 V r.m.s. at 1 kc/s.

Harmonic Distortion

(a) Without Input Transformer

Percentage harmonic distortion for an output of 12 watts into 25 Ω does not exceed the following:

	60 c/s	*1 kc/s*	*4 kc/s*
2nd harmonic	0·5	0·5	0·5
3rd harmonic	0·3	0·15	0·15
r.m.s. sum of all higher harmonics up to 16 kc/s	0·1	0·1	0·1

(b) With Input Transformer

With a sinusoidal input of 3 V r.m.s. at 60 c/s upwards from a 600-Ω source, the output up to 15 watts into 25 Ω does not have a total harmonic content which exceeds by 0·5% the amount present for the same output level with the input signal applied directly without the transformer.

Typical measured values of total harmonics for an output of 15 watts into 25 Ω are:

60 c/s	<1%
1 kc/s	<0·8%
4 kc/s	<1%

Frequency Response

With a 600-Ω source and a 25-Ω resistive load, and any setting of the gain control, the response relative to that at 1 kc/s is within the following limits:

50 c/s to 10 kc/s: +0·2 dB to −0·5 dB
30 c/s to 15 kc/s: +0·2 dB to −1·0 dB

Noise

With the input terminated by a 600-Ω resistor, the total noise output level across a load resistor of 25 Ω with the gain control at maximum gain, does not exceed −50 dB (reference 0·775 V r.m.s.).

Valve Data

Stage	*Type*	*Bias Resistor*	*Volts Across Bias Resistor*	*Heater Volts*	*Heater Amps*
V1	CV2901	R3	1·6	6·3	0·2
V2	CV492	R10	75	6·3	0·3
V3	EL34	R17	27	6·3	1·5
V4	EL34	R16	27	6·3	1·5
V5	GZ34			5	1·9

Voltages measured with Avometer Model 8.

AM8/1: SERIAL NOS. 151 TO 156

Amplifiers with serial numbers 151 to 156 are a small batch of a different make from those with earlier serial numbers and were supplied to Specialist Departments.

AM8/1: SERIAL NOS. 157 TO 186

Circuit Description (Fig. 56A)

The circuit of amplifiers with serial numbers 157 to 186 is shown in Fig. 56A. It is basically the same as that shown in Fig. 56, but a.c. coupling instead of d.c. coupling is employed between the first two stages and the biasing and decoupling arrangements are somewhat different. The amplifiers have a similar performance to those with serial numbers 101 to 150.

Valve Data

Stage	*Type*	*Bias Resistors*	*Volts Across Bias Resistors*	*Heater Volts*	*Heater Amps*
V1	EF86	R1 + R2	0·75	6·3	0·2
V2	ECC81	R6 + R8	30	6·3	0·3
V3	EL34	R18/R19	25	6·3	1·5
V4	EL34			6·3	1·5
V5	GZ34			5	1·9

Voltages measured with Avometer Model 8.

FIG. 56
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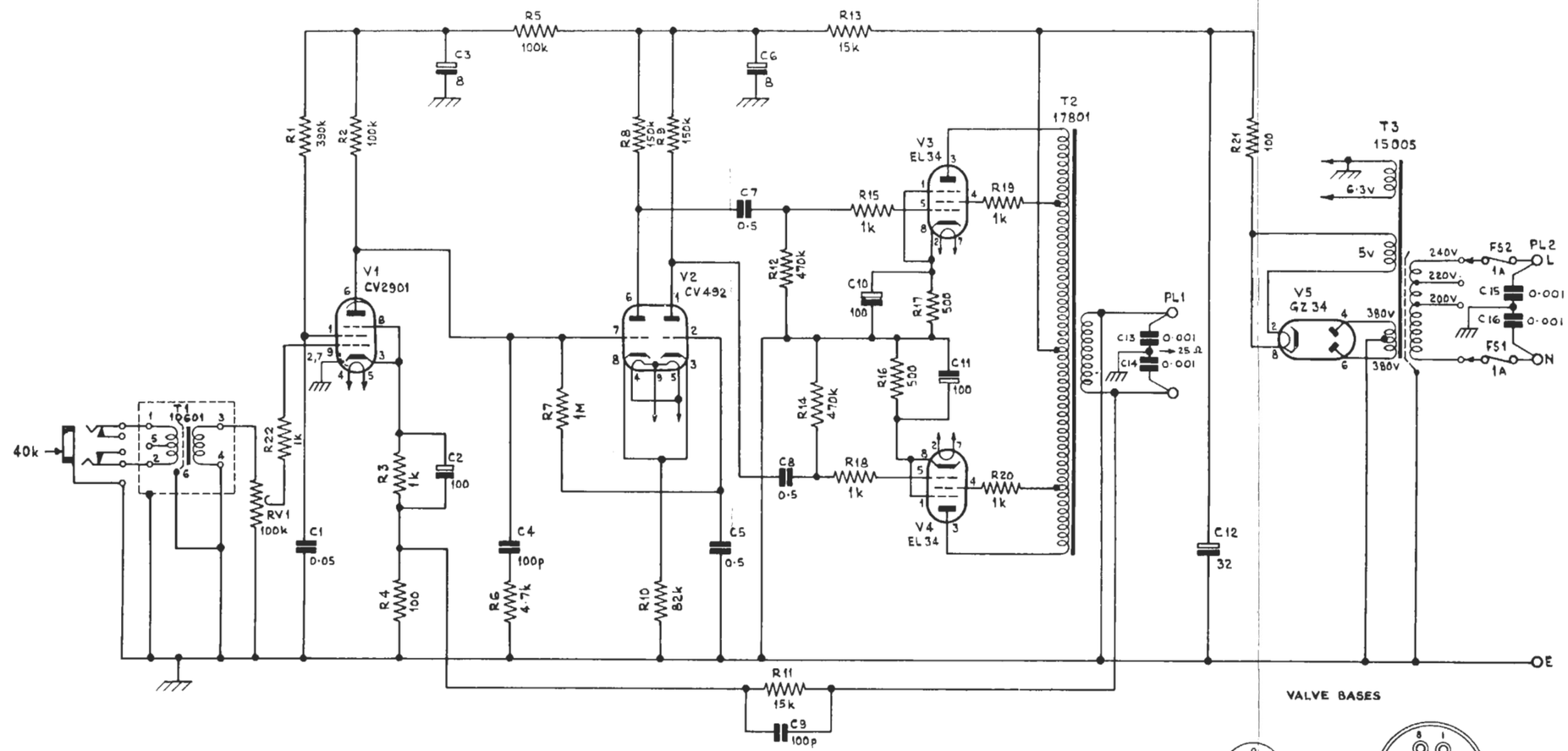

LOUDSPEAKER AMPLIFIER AM8/1 : SERIAL Nos. 101–150 : CIRCUIT DIAGRAM

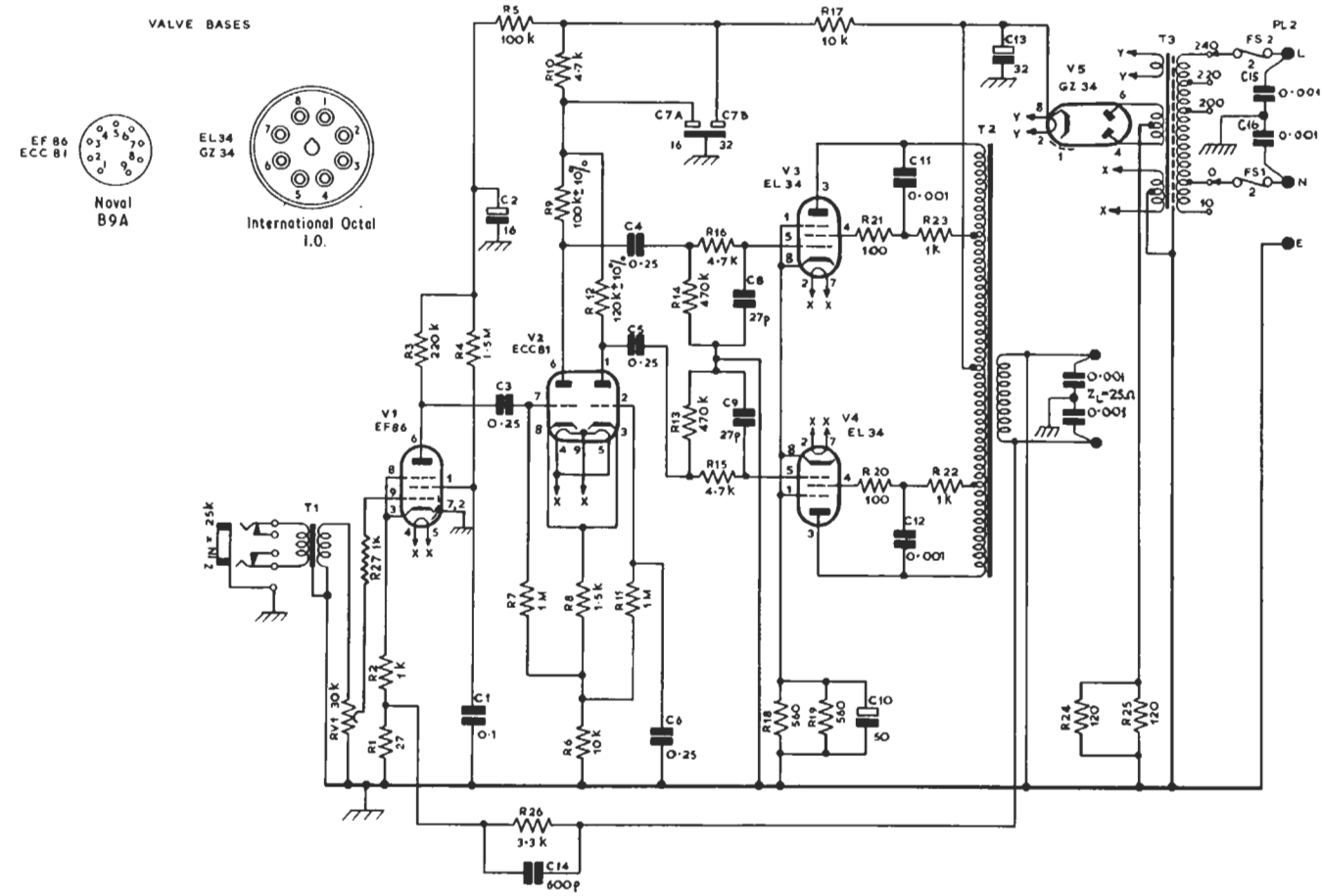

FIG. 56 A
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LOUDSPEAKER AMPLIFIER AM8/1: SERIAL Nos. 157-186: CIRCUIT DIAGRAM