

## LOUDSPEAKER AMPLIFIERS AM8/4, AM8/4A SERIAL NOS. 101 TO 205

### General Description

#### *Amplifier AM8/4*

Loudspeaker Amplifier AM8/4 forms part of Studio Loudspeaker LS5/1 (Instruction S.8) and is mounted in the pedestal compartment of the loudspeaker cabinet. It is fitted with a protective cover and lifting handle so that it can be used as a separate unit for other purposes if desired.

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 12 in. long by 7 in. wide and 7 in. high and weighs 16 lb.

The amplifier is mains operated and gives an output of approximately 15 watts into a resistive load of 25 ohms for an input of less than 0.15 volt r.m.s. It has very low distortion at this output over the frequency range of 30 c/s to 15 kc/s.

The amplifier has a sensibly flat response over the above-mentioned frequency range, but an equaliser giving a slightly rising characteristic is provided for use when the AM8/4 forms part of an LS5/1.

A gain control, mains switch and fuses are fitted, and plugs and sockets are provided for mains supply and for input and output connections. A signal input jack to take a P.O. plug No. 316 is fitted and wired in parallel with the input socket.

#### *Amplifier AM8/4A*

Loudspeaker Amplifier AM8/4A forms part of General Purpose Loudspeaker LS1/2. The AM8/4A is the same as the AM8/4 but has a different equaliser, for use with the LS1/2. This equaliser, shown inset in Fig. 62, can be taken out of circuit by physical reorientation, as can that of the AM8/4.

### Circuit Description (Fig. 62)

The circuit (Fig. 62) is almost identical with that of the later version of Loudspeaker Amplifier AM8/1 with serial numbers 157 to 186 (Fig. 56A), the main difference being the inclusion of the equaliser in the input circuit to the first valve. The equaliser gives a rise in response of about 4 dB at 10 kc/s to compensate for the falling characteristic of the high-frequency loudspeaker system used in the LS5/1. When the amplifier is used for other purposes where this correction is not required a

flat frequency characteristic is obtained by removing the four screws which hold the equaliser in position, turning the equaliser round and re-fixing it in this position.

Decoupling capacitors are connected across the signal input and output of the amplifier and across the mains input to reduce radio-frequency pick-up.

### General Data

The data below apply in general to the amplifier with the equaliser out of circuit.

#### *Mains Power Supply*

Voltage: 200 to 250 V a.c.

Frequency: 45 to 55 c/s.

#### *Impedances*

Specified input impedance: Resistive component of at least 20 k $\Omega$  from 200 c/s to 15 kc/s and at least 15 k $\Omega$  from 50 c/s to 200 c/s, in parallel with reactive component of not less than 2.5 k $\Omega$  from 50 c/s to 15 kc/s, at any input level below 0.5 V r.m.s.

Measured input impedance: 15 k $\Omega$  at 50 c/s  
30 k $\Omega$  at 1 kc/s  
10 k $\Omega$  at 10 kc/s

Specified output impedance: Not greater than 2.5  $\Omega$  over the range 50 c/s to 6 kc/s. Not greater than 5  $\Omega$  over the range 6 kc/s to 15 kc/s.

Measured output impedance: 1  $\Omega$  approx. from 50 c/s to 15 kc/s.

Load impedance: 25  $\Omega$  nominal.

#### *Stability*

No observable self-oscillation when either an impulsive or a steady signal from zero to maximum input is applied to the input terminals under any conditions of source impedance and setting of gain control, and with open-circuit output, 25- $\Omega$  resistive load, load of 0 to 1,000 pF, either of the

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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 0.15V r.m.s. at 1 kc/s.

#### Harmonic Distortion

##### (a) Without Input Transformer

Percentage harmonic distortion for an output of 15 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. The total harmonic content measured as above is not increased if the gain control is set to 6 dB below maximum gain, and the amplifier input re-adjusted to give the same output as before.

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

60 c/s	0.8%
1 kc/s	0.3%
4 kc/s	0.3%

#### Frequency Response

##### (a) Amplifier (without equaliser)

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

##### (b) Equaliser

When the equaliser is connected in circuit the frequency response of the amplifier under the same conditions as for (a) is changed as follows:

50 c/s to 2 kc/s	0 dB
5 kc/s	+1.5 dB ±0.25 dB
10 kc/s	+4 dB ±0.25 dB
14 kc/s	+3 dB ±0.25 dB

#### Noise

With the input terminated by a 600-Ω resistor the total noise output level across a load resistance of 25 Ω with the gain control at maximum gain does not exceed -50 dB (reference 0.775 V r.m.s.) with the mains earth connected.

#### Valve Data

Valve	Bias Resistor	Volts Across Bias Resistor	Heater Volts	Heater Amps
V1 EF86	1,000 Ω	0.85	6.3	0.2
V2 ECC81	1.5 kΩ	3.2*	6.3	0.3
V3 EL34	560 Ω	27	6.3	1.5
V4 EL34	560 Ω	27	6.3	1.5
V5 GZ34	—	—	5	1.9

\*Cathode to earth 23 V  
Voltages measured with Avometer Model 8

#### Maintenance

It should be noted that if crackles are experienced when operating the gain control they are often caused by a faulty first valve and not by a faulty gain control.

Access to the valves is obtained by removing the valve shield, which is done by removing the rear fixing screw only and slackening the front screw, the front fixing hole being slotted.

#### AM8/4, AM8/4A: SERIAL NOS. 206 ON

##### General Description

These closely resemble the amplifiers serial-numbered 101 to 205, with the addition of an external means of adjustment to accept different mains-supply voltages.

##### Circuit Description (Fig. 62A)

The circuit differs in detail from that already described, and also in the type of phase-splitting arrangement employed to feed the push-pull output stage.

V4 is driven by one of the two sections of V2, which in turn is driven by V1 in a conventional manner. V3 is driven by the remaining section of V2, to which is applied the signal potential developed across R17, a resistor shared by the grid circuits of V3 and V4. The presence of any signal potential across R17 implies that the signal potentials at the grids of V3 and V4 are unequal; thus the push-pull portion of the circuit is not truly balanced in operation. The circuit is self-stabilising to a condition in which the outputs from the two sections of V2 differ from one another just sufficiently to provide the input signal to the second section appropriate to maintain this condition. Because the circuit of each section of V2 has a fairly high gain (of the order of 50), the unbalance is acceptably small.

#### General Data

The specified performance is the same as for the earlier series of amplifiers; data of measured performance are as follows:

Input impedance: 15 kilohms at 50 Hz  
 20 kilohms at 1 kHz

Output impedance: about 2 ohms from 1 kHz  
 to 10 kHz

Total harmonic content of output  
 (15 watts in 25 ohms)

0.5 per cent at 60 Hz  
 0.3 per cent at 1 kHz  
 0.5 per cent at 4 kHz

#### Valve Data

Voltages measured with Avometer Model 8 on lowest practicable range.

Valve	Bias Resistor	Volts Across Bias Resistor	Heater Volts	Heater Amps
V1 EF86	1,000 $\Omega$	1.7*	6.3	0.2
V2 ECC83	470 $\Omega$	1.7	6.3	0.3
V3 EL34	470 $\Omega$	28	6.3	1.5
V4 EL34	470 $\Omega$	28	6.3	1.5
V5 GZ34	—	—	5	1.9

\*Cathode to chassis, 1.8 volts.

#### Maintenance: Removal of Valve Shield

The valve shield is secured by four screws tapped into the ends of the chassis/case of the amplifier through slots pierced in the end edges of the shield. Thus the shield can be removed by withdrawing the pair of screws at one end and slackening those at the other.

W.G. 1/62  
 D.E.H. 11/66

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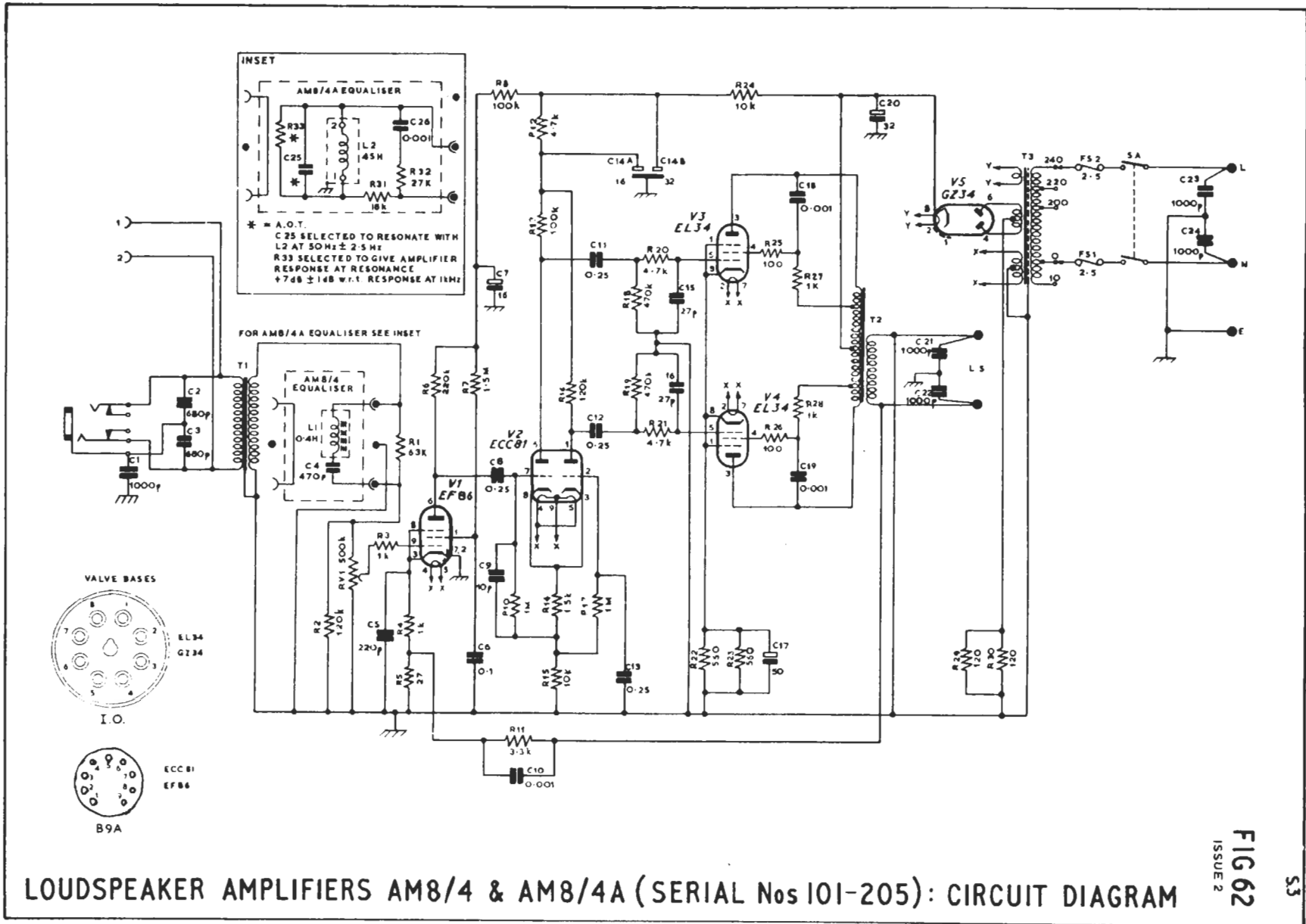
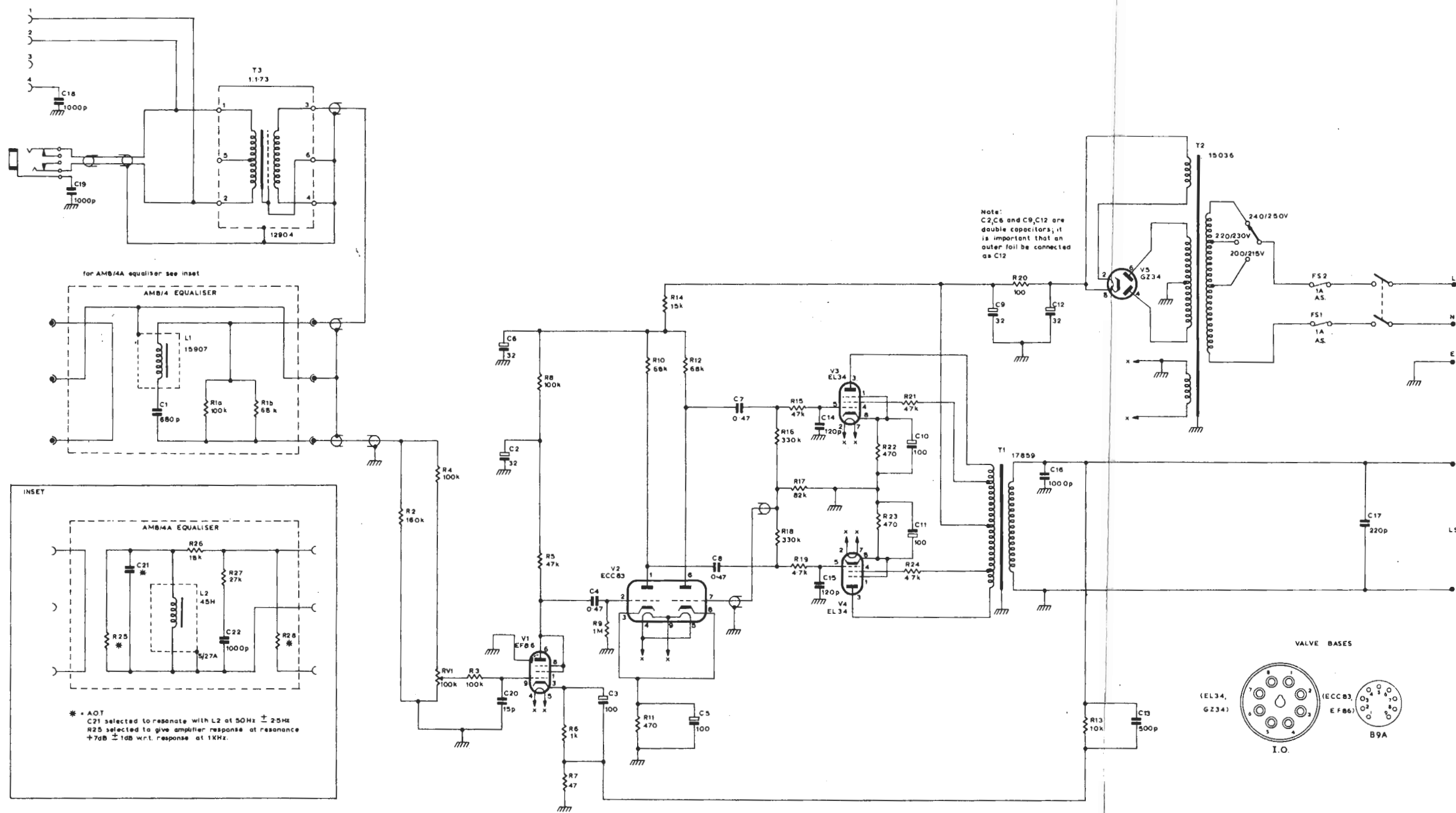


FIG62  
ISSUE 2

from EH12037 issue 1  
parts list (per Equipment Dept.)  
Clarke and Smith Schedule Ha.710

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LOUDSPEAKER AMPLIFIERS AM8/4 & AM8/4A (SERIAL Nos. FROM 206): CIRCUIT DIAGRAM