

## LOUDSPEAKER AMPLIFIERS AM8/6, AM8/6A General Description

The AM8/6 and AM8/6A are mains operated loudspeaker amplifiers giving an output of 30 watts for a voltage input level of  $-18$  dB. The AM8/6 has been designed primarily for use with the suspended loudspeaker LS5/2 in conditions where the 15-watt output of the AM8/4 is inadequate. The AM8/6 normally contains an equaliser suitable for use with the LS5/2, but different equalisers can be fitted if the amplifier is used to feed other types of 25-ohm loudspeakers.

The AM8/6A is identical with the AM8/6, except that the equaliser is omitted and different strappings are used on the secondary winding of the output transformer to give a 30-watt output at 110 volts for feeding a public-address system.

Precautions have been taken in the design to keep both non-linearity and amplitude/frequency distortion as low as possible and to avoid instability and radio-frequency interference under all likely working conditions.

Printed wiring boards are used for the pre-amplifier and the main amplifier, and these, with the valve-holders attached, can be readily released for access to the components. The output valves are considerably under-run to ensure a long valve life.

The sides of the steel chassis are cut away and a perforated base guard ensures good air circulation over the components provided the amplifier is not installed in a confined space where air cannot circulate freely.

The input, output and mains transformers and sockets are mounted on the top of the chassis with the sockets at one end. On the end-face of the same end are the gain control, the fuses and the input listen jack.

Each amplifier weighs approximately 25 lb and is  $15\frac{1}{4}$  in. long by 8 in. wide by  $8\frac{1}{4}$  in. high.

### Circuit Description (Fig. 69)

The circuit of both amplifiers is shown in Fig. 69.

The input transformer, which gives a balanced input of high impedance, is coupled via a continuous uncalibrated gain control to a double-triode pre-amplifier V1 with the second half working as a direct-coupled cathode-follower. This stage is followed by an equaliser unit in the AM8/6 to give the correction required for use with the suspended LS5/2 loudspeaker. The correction provided gives a rise of  $+4$  dB at 11–12 kc/s, together with alternative bass correction of  $+3$  dB or  $+5$  dB at

34 c/s as required.

In the AM8/6A, which is used to feed a public-address system, the equaliser unit is replaced by a 15-kilohm resistor.

The main amplifier consists of a pentode valve V2, direct-coupled to a double-triode phase-changer valve V3, which drives a pair of output valves V4 and V5 working in class AB1 with ultra linear anode/screen connection on the output transformer. (The advantages of this type of connection are given in the description of loudspeaker amplifier AM8/1.) Approximately 20 dB of negative feedback, derived from the secondary winding of the output transformer, is applied to the cathode circuit of V2.

The four sections of the secondary winding of the output transformer are connected in parallel in the AM8/6 and in series in the AM8/6A.

Radio-frequency by-pass capacitors are fitted at the input and output terminals of the amplifier and the mains input to avoid r.f. interference received either by direct pick-up or injected along the leads.

The h.t. supply is obtained from a bridge-rectifier circuit using silicon rectifiers. The h.t. fuse has been placed on the load side of the circuit to prevent it from being blown by the charging surge of the reservoir capacitor, and the value of 250 mA has been selected to protect the rectifiers from faults on the equipment. Protection of the mains transformer is obtained by using anti-surge mains fuses.

The general earthing arrangements, and the wiring of the output transformer in particular, have been chosen to ensure minimum hum level and maximum stability.

### General Data

#### Mains Power Supply

Voltage: 200 to 250 V a.c.

Frequency: 45 to 55 c/s.

#### Impedances

Input impedance:  $18\text{ k}\Omega$  approx. at 1 kc/s (measured by simple substitution).

Output impedance (AM8/6):

60 c/s	$1.3\ \Omega$	} (measured by simple substitution)
1 kc/s	$1.2\ \Omega$	
10 kc/s	$2.2\ \Omega$	

#### D.C. Conditions

Typical voltage measurements using an Avometer Model 8 are shown on Fig. 69.

### Instruction S.3

#### Section 10

Page reissued November 1967

#### Stability

No tendency to self-oscillation should be evident with any combination of resistive and capacitive load in the range  $R = 25 \Omega$  to infinity and  $C = 0.1 \mu\text{F}$  to 0, and also with either output valve removed.

#### Sensitivity and Power Output

With a sinusoidal voltage input of  $-18 \pm 1$  dB at a frequency of 1 kc/s, the output power should be 30 watts at 27.4 volts into 25 ohms for the AM8/6, and 30 watts at 109.6 volts into 400 ohms for the AM8/6A.

#### Frequency Response

With a source impedance of 600 ohms, and a load of 25 ohms for the AM8/6 and of 400 ohms for the AM8/6A, the frequency response with respect to that at 1 kc/s should be within the following limits for any setting of the gain control:

- (a) *AM8/6A, and AM8/6 with equaliser replaced by 15 k $\Omega$*   
+0.2 dB and -0.5 dB at all frequencies between 30 c/s and 15 kc/s.
- (b) *AM8/6 with h.f. equalisation*  
As (a) from 30 c/s to 1 kc/s.  
+2 dB  $\pm 0.2$  dB at 5.9 kc/s relative to (a).  
+4 dB  $\pm 0.2$  dB at 11.5 kc/s relative to (a).
- (c) *AM8/6 with medium l.f. equalisation (C-D strapped)*  
+1.5 dB  $\pm 0.2$  dB at 68 c/s relative to (b).  
+3 dB  $\pm 0.2$  dB at 34 c/s relative to (b).
- (d) *AM8/6 with maximum l.f. equalisation (A-B strapped)*  
+2.75 dB  $\pm 0.2$  dB at 68 c/s relative to (b).  
+5.5 dB  $\pm 0.2$  dB at 34 c/s relative to (b).

#### Harmonic Distortion

Typical figures for percentage harmonic distortion at 30 watts power output into the appropriate resistive loads are:

Condition	Harmonic	Percentage Distortion		
		60 c/s	1 kc/s	5 kc/s
Unequalised	2nd	0.24	0.12	0.31
	3rd	0.15	0.03	0.03
H.F. equalisation only	2nd	0.2	0.15	0.37
	3rd	0.14	0.07	0.25
H.F. and medium l.f. equalisation	2nd	0.25	0.15	0.37
	3rd	0.17	0.07	0.25
H.F. and maximum l.f. equalisation	2nd	0.26	0.15	0.37
	3rd	0.18	0.07	0.25

#### Noise

With the input terminated with a 600-ohm resistor the total noise volume read on a T.P.M. peaking to 6 should not be greater than the following:

- AM8/6 -45 dB across 25- $\Omega$  load
- AM8/6A -33 dB across 400- $\Omega$  load

#### Installation

Considerable care has been taken to ensure that maximum air can flow through the amplifier chassis and across the components. It is absolutely essential that this air flow is fully maintained and the amplifier must not be installed in a confined space, cupboard or cavity where this is prevented.

#### Maintenance

For access to components the printed wiring board assemblies, complete with valveholders on their mounting pillars, can be released and swung through 180 degrees by removing the screws which fix the valveholder mounting plates. These screws are on top of the chassis and are ten in number, two for the pre-amplifier and eight for the main amplifier.

Test points for checking d.c. voltages are indicated on the circuit diagram (Fig. 69). The voltages shown are those of a typical amplifier measured on the appropriate range of an Avometer Model 8.

W.G. 3/64

Instruction S.3

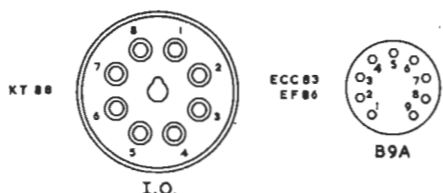
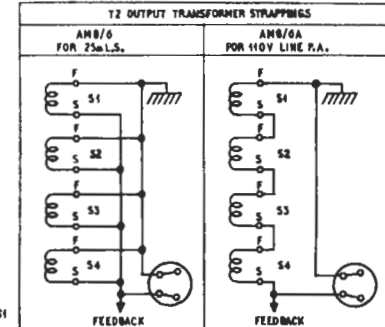
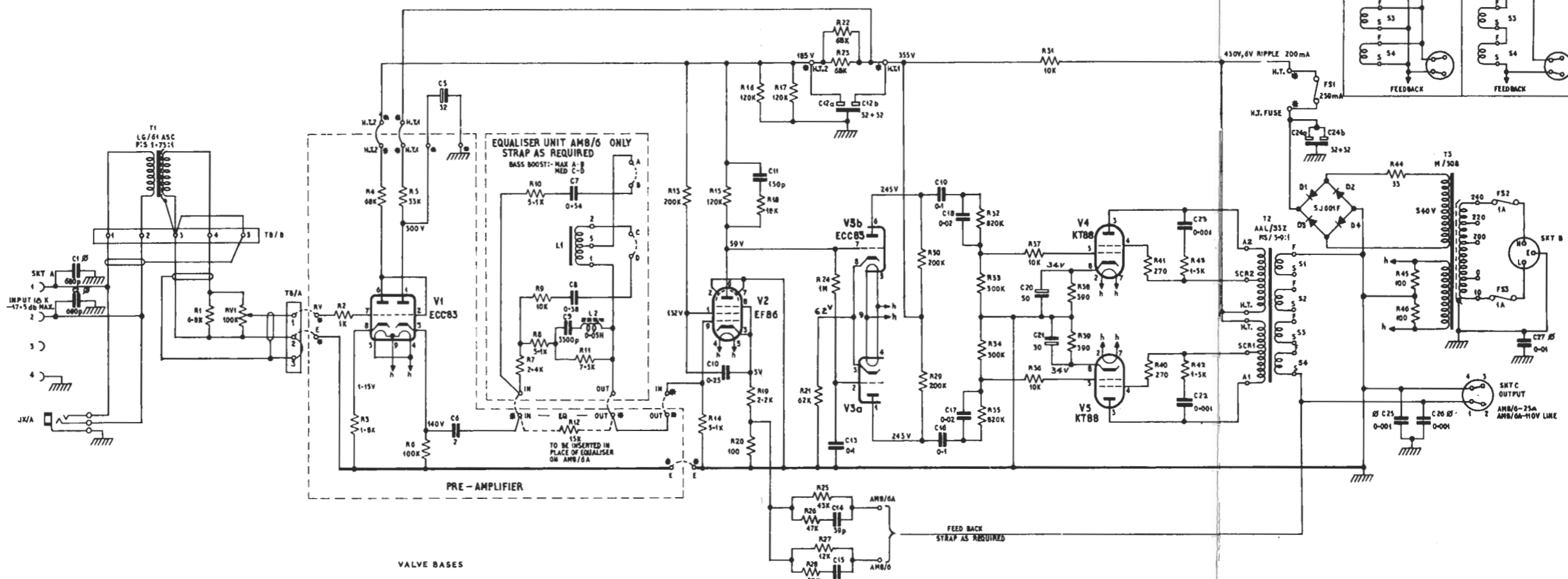
COMPONENT TABLE : FIG. 69

Comp.	Loc.	Type	Tolerance per cent	Comp.	Loc.	Type	Tolerance per cent
C1	A5	Erie K350081/831 500V		R9	J5	Erie NI	2
C2	A5	Erie K350081/831 500V		R10	J4	Erie NI	2
C5	G2	Plessey CE811/I 450V		R11	K6	Erie NI	2
C6	H8	Hunt B450 K150V		R12	J8	Erie 109 (AM8/6A only)	2
C7	J4	G.E.C. polyester 150V	2	R13	L4	Erie 109	2
C8	J5	G.E.C. polyester 150V	2	R14	M8	Erie NI	2
C9	J6	Salford PF 125V	2	R15	M4	Erie 109	2
C10	M7	Hunt B513K 350V		R16	M2	Erie 100	2
C11	M3	Salford PF 350V	10	R17	N2	Erie 100	2
C12a	O2	Plessey CE 824/I 450V		R18	M4	Erie NI	2
C12b	O2	Plessey CE 824/I 450V		R19	M7	Erie NI	2
C13	O8	T.C.C. CP37N/PVC 350V		R20	M8	Erie NI	2
C14	O9	Salford PF 125V		R21	N7	Erie 109	2
C15	O10	Salford PF 125V		R22	O1	Erie 100	2
C16	P8	T.C.C. CP46S/PVC 500V		R23	O1	Erie 100	2
C17	Q8	Hunt BM14KV 250V		R24	O5	Erie 108	2
C18	Q4	Hunt BM14KV 250V		R25	O9	Erie 109	2
C19	Q4	T.C.C. CP46S/PVC 500V		R26	O9	Erie NI	2
C20	R6	U.C.C. SC615/6LS 50V		R27	N10	Erie 109	2
C21	R6	U.C.C. SC615/6LS 50V		R28	O10	Erie NI	2
C22	T8	Hunt BM6KV 500V		R29	P7	Erie 109	2
C23	U4	Hunt BM6KV 500V		R30	P5	Erie 109	2
C24a	W3	Dubilier 500V		R31	R2	Erie 100	2
C24b	W3	Dubilier 500V		R32	Q4	Erie 108	2
C25	X8	Erie K350081/831 500V		R33	Q5	Erie NI	2
C26	X8	Erie K350081/831 500V		R34	Q6	Erie NI	2
C27	Y6	Erie K7004/811 500V		R35	Q7	Erie 108	2
				R36	R7	Erie NI	2
				R37	R5	Erie NI	2
L1	J5	S/26 A		R38	S6	Painton P301A	5
L2	K6	Vinkor 25A/159		R39	S6	Painton P301A	5
				R40	T7	Painton MV1A	5
				R41	T5	Painton MV1A	5
R1	C6	Erie 109	2	R42	T7	Erie 109	2
R2	E6	Erie 109	2	R43	T5	Erie 109	2
R3	F8	Erie NI	2	R44	X3	Painton P301A	5
R4	F4	Erie 109 (AM8/6)	2	R45	X5	Erie 100	2
		Erie 108 (AM8/6A)	2	R46	X6	Erie 100	2
R5	F4	Erie 109	2				
R6	G8	Erie 108	2				
R7	H7	Erie NI	2				
R8	J6	Erie NI	2	RV1	D6	Plessey E	

A B C D E F G H J K L M N O P Q R S T U V W X Y Z

NOTE 1: POINTS MARKED THUS \* ARE TERMINATION TAGS ON PRINTED CIRCUIT BOARDS.

CAPACITORS INDICATED THUS Ⓞ ARE R.F. BY-PASS CAPACITORS DIRECT FROM TAG TO EARTH.



LOUDSPEAKER AMPLIFIERS AM8/6 AND AM8/6A : CIRCUIT

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