SECTION 7

LINE AMPLIFIERS: AM7 SERIES

LINE SENDING AMPLIFIERS AM7/2 AND AM7/2A

General Description

Amplifier AM7/2 is an audio-frequency transistor amplifier of fixed 10-dB gain, intended primarily for sending programme to line, and superseding the C/9.

The amplifier is constructed on a CH1/18C chassis with printed wiring, and plugs into bay-mounting panels of the PN3/23 series, which accommodate up to eight amplifiers constructed on this type of chassis. Index pegs are fitted in positions 9 and 30.

The input impedance is high and the output impedance is 600 ohms, but provision is made for a 100-ohm output for low-impedance lines. A monitoring output also is provided.

Amplifier AM7/2 is itself superseded by amplifier AM7/2A, which has a maximum output level about 3 dB higher. This is achieved by adding heatsinks to the output transistors and by the use of OC205 or equivalent transistors for TR1 and TR2, with some attendant changes in component-values. The AM7/2A amplifier has a higher total current consumption, and to minimise the voltage drop across the fuse its rating has been increased from 100 to 500 mA.

Circuit Description (Figs. 2 and 7.1)

The circuit of the AM7/2 is shown in Fig. 2 and of the AM7/2A in Fig. 7.1. It consists of what is effectively a single push-pull stage each half of which comprises two transistors connected as a 'Darlington' or 'super-alpha' pair*. Such a pair behaves as a single transistor with a high current gain which is approximately equal to the product of the current gains of the individual transistors; this arrangement enables a high input impedance to be obtained and an adequate amount of negative feedback to be used. Also, due to the compensatory effect of the first transistor output on that of the second, there is an improvement in linearity at high values of total output compared with the performance of the second transistor alone.

The feedback is obtained from a winding on the output transformer and has a magnitude of 24 dB.

* See *BBC Engineering Monograph* No. 26, August 1959: 'Transistor Amplifiers for Sound Broadcasting,' by S. D. Berry.

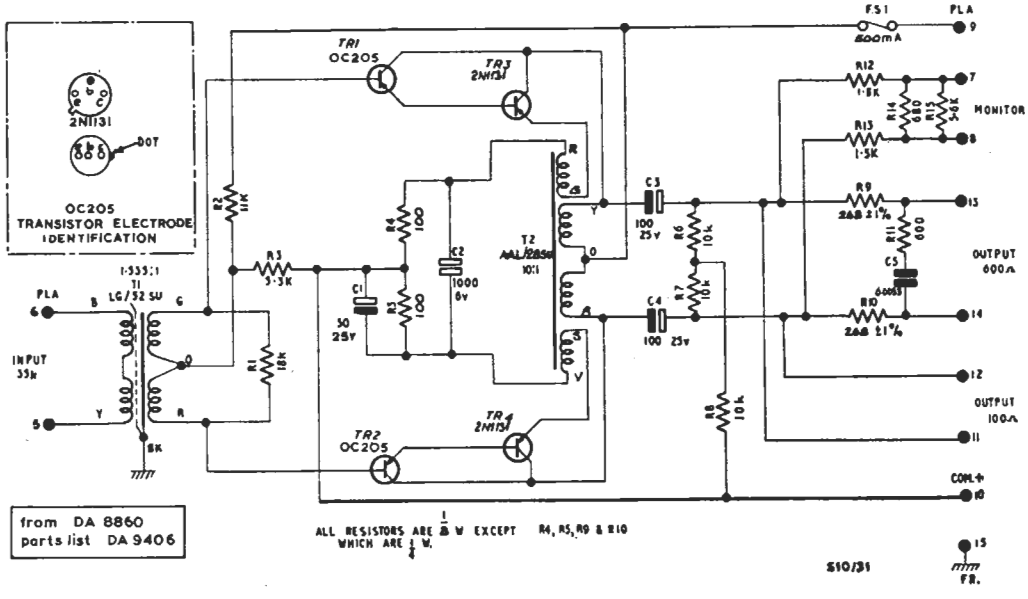

Fig. 7.1. Amplifier AM7/2A: Circuit

The output is taken from the primary winding of the transformer, using this as a balanced choke, and is fed into a network to give a 600-ohm output. This avoids the effects of the leakage inductance necessarily present in an output transformer, and the arrangement is adequately balanced for practical purposes as the amplifier is normally followed by an accurately balanced line transformer. A monitoring output and a 100-ohm output for use where a low impedance circuit is required are also provided.

The amplifier is intended for use with a PS2/9 or PS2/49 power supplier, but any similar source of low impedance and ripple may be used.

General Data

Power Requirements

Supply voltage	24·5 ±0·25 V d.c.
Total current	AM7/2: 60 mA AM7/2A: 84 mA

Impedances

Input impedance	35 kΩ nominal
Output impedance	600 Ω ±2% resistive component at 1 kHz and 10 kHz, 15 Ω max. reactive component at 10 kHz.

Gain

Main output	10 ±0·3 dB voltage gain at 1 kHz from a 300-Ω source into a 600-Ω load at an output level of +10 dB.

Frequency Response

The output level under the conditions as above for measuring gain with constant input level should be within the following limits:

Between 60 Hz and 15 kHz: ±0·1 dB
Between 40 Hz and 20 kHz: ±0·2 dB

Nonlinearity

With source and load impedances as for measuring gain, the total harmonic distortion should not exceed 0·5 per cent as 60 Hz and 1 kHz, at an output level of +18 dB for the AM7/2 and of +21 dB for the AM7/2A. The onset of serious distortion, judged from an oscilloscope trace, should not occur at an output level of less than +21 dB for the AM7/2 or +23 dB for the AM7/2A.

Noise

The total noise, indicated on a T.P.M. peaking to 6, should be not greater than −80 dB.

Phase

With an asymmetric signal applied to the input terminals, pin 5 should be in phase with pins 7, 11 and 13, as indicated on an oscilloscope.

Typical Voltages

The following typical voltages between emitter and common positive, measured with an Avometer 8, are given to assist fault finding:

Amplifier	*Voltage*	
	TR3	*TR4*
AM7/2	9·2	9·2
AM7/2A	4·1	4·1

The figures for the two transistors should not differ by more than 0·3 volt.

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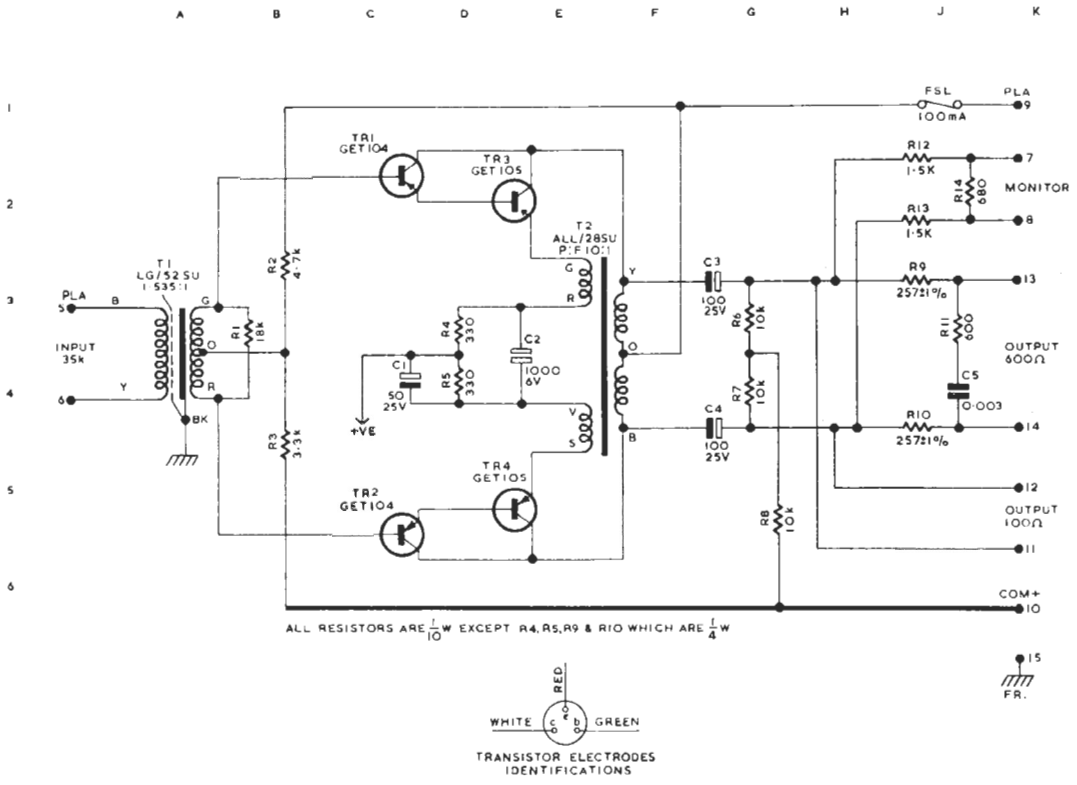
COMPONENT TABLE: FIG. 2

Comp.	Loc.	Type	Tolerance per cent
C1	C4	Universal SC517/8LS 25V	
C2	E4	Plessey CE8037 6V	
C3	G3	Universal SC596/7LS 25V	
C4	G4	Universal SC596/7LS 25V	
C5	J4	Suflex HS15/E 125V	
R1	B3	Erie NI 0·1W	2
R2	B3	Erie NI 0·1W	2
R3	B4	Erie NI 0·1W	2
R4	D4	Erie 109 0·25W	2
R5	D4	Erie 109 0·25W	2
R6	G3	Erie NI 0·1W	2
R7	G4	Erie NI 0·1W	2
R8	G5	Erie NI 0·1W	2
R9	J3	Painton 92 0·25W	1
R10	J4	Painton 92 0·25W	1
R11	J3	Erie NI 0·1W	2
R12	J1	Erie NI 0·1W	2
R13	J2	Erie NI 0·1W	2
R14	J2	Erie NI 0·1W	2
T1	A3	LG/52 SU	
T2	E3	AAL/28SU	

FIG 2



LINE SENDING AMPLIFIER AM7/2: CIRCUIT

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