INTERCOMMUNICATION AMPLIFIER AM1/7

General Description

The AM1/7 equipment is a three-stage amplifier with a gain which is adjustable between limits of 50 dB and 70 dB, depending upon the value of an external fixed resistor. It is designed for general use in all types of communication circuits, usually in conjunction with the loudspeaker amplifier AM8/8, as on the Intercommunication Panel Type PA8/197A. The amplifier can be operated with a d.c. supply at either 24 volts or 50 volts.

The amplifier has been kept small by omitting transformers and thus the input and output circuits are unbalanced. It is essential to use external input and output transformers if the equipment is associated with lengthy cable runs.

Components are assembled on a printed-wiring board and all input, output and supply circuits are taken through a 15-way plugging connector. The assembly is fixed to steel covers, the rear cover being lined with 1/32-in. insulating material.

General Specification

Supply Voltage

Either 24 V.d.c. or 50 V.d.c.

Total Current

Either 13 mA at 24 volts or 16 mA at 50 volts.

Voltage Gain

50-dB (±1 dB) with external resistor of 2·4 kilohms; 70-dB (±3 dB) with no external resistor. These figures were obtained with 1-kc/s tone, from a 600-ohm source, and an output load of 50 kilohms.

Input Impedance

Typical values are as follows:

Frequency	*Impedance (kilohms) at:*	
	50-dB gain	*70-dB gain*
60 c/s	17·5	5·0
1 kc/s	16·3	10·0
10 kc/s	15·7	8·0

Output Impedance

At frequencies above 300 c/s the output impedance is 600 ohms ± 10 per cent. Below 300 c/s there is a slight rise when the gain is reduced by feedback.

Frequency Response

With the amplifier fed at constant voltage from a 600-ohm source and loaded with a high impedance, the limits of the response are:

Frequency	*Output relative to 1 kc/s, at:*	
	50-dB	*70-dB*
50 c/s	0 ± 1 dB	−14 dB ± 3 dB
300 c/s	0 ± 0·2 dB	− 2dB ± 1 dB
20 kc/s	0 ± 0·1 dB	0 ± 1 dB

Distortion and Noise

At an output level of +5 dB into a 600-ohm load, the total harmonic distortion should not exceed 2 per cent at 60 c/s and 1 kc/s. In practice the figure is likely to be 1·5 per cent.

Note: The maximum output at the onset of clipping should not be less than +6 dB into 600 ohms. At 70-dB gain the noise output (using a 300-ohm input load) as measured on a T.P.M. peaking to 6, should be less than −55 dB.

The following table of noise measurements taken on a prototype are given for reference.

Input Termination	*Gain*		
	50-dB	*60-dB*	*70-dB*
30 ohms	−77 dB	−71 dB	−61 dB
300 ohms	−74 dB	−66 dB	−57 dB
600 ohms	−72 dB	−65 dB	−56 dB

Circuit Description (Fig. 1)

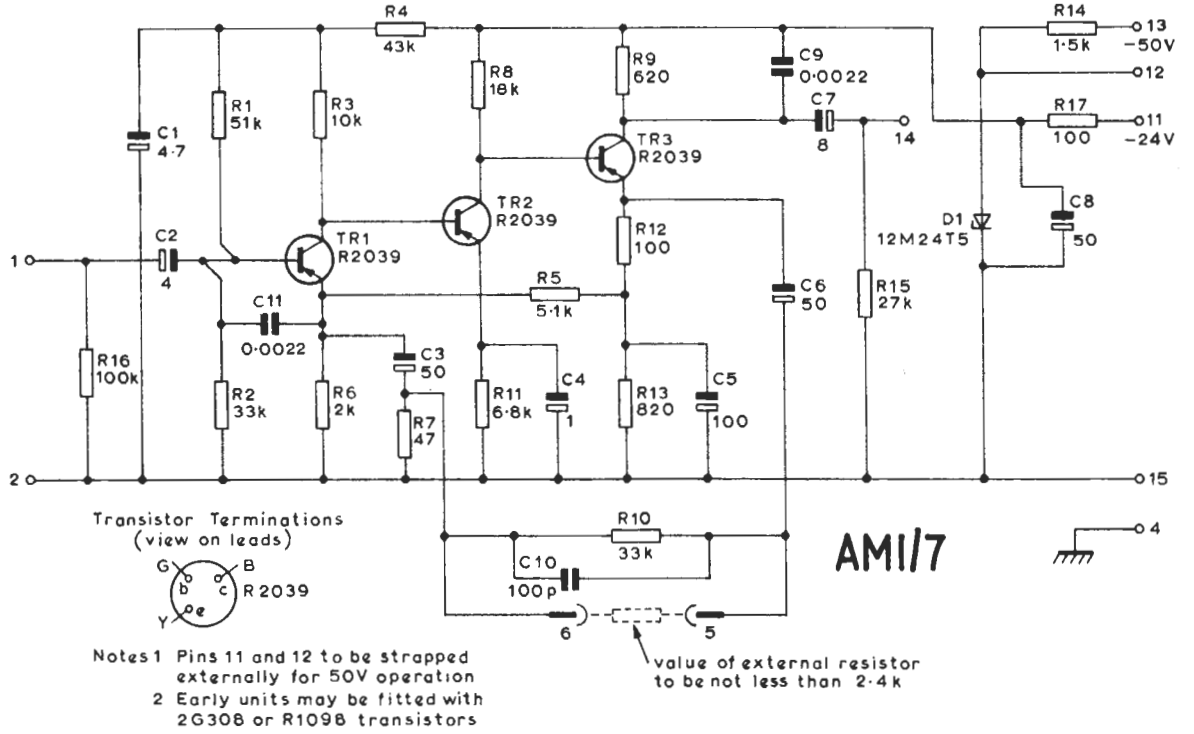
The circuit comprises three stages with conventional d.c. couplings. In addition to local feedback due to resistors R7 and R12, there is a.c. feedback through the path formed by C6, R10 and C3 and the d.c. feedback is via R5. In the 70-dB condition the amount of loop feedback is approximately 10 dB. Current feedback effectively raises the output impedance of TR3 to a value which is virtually that of R9 in parallel with R15.

R14 and zener diode D1 form a voltage-divider which ensures that the negative line is maintained at 24 volts when a 50-volt supply is being used. For this condition terminals 11 and 12 of the equipment are strapped.

D.C. Readings

A table of typical voltages at transistor terminals with no signal input is given to assist in fault finding.

Transistor	*Voltage to earth*		
	Emitter	*Base*	*Collector*
TR1	2·5	2·65	4·5
TR2	4·4	4·5	9·1
TR3	8·9	9·1	16·3



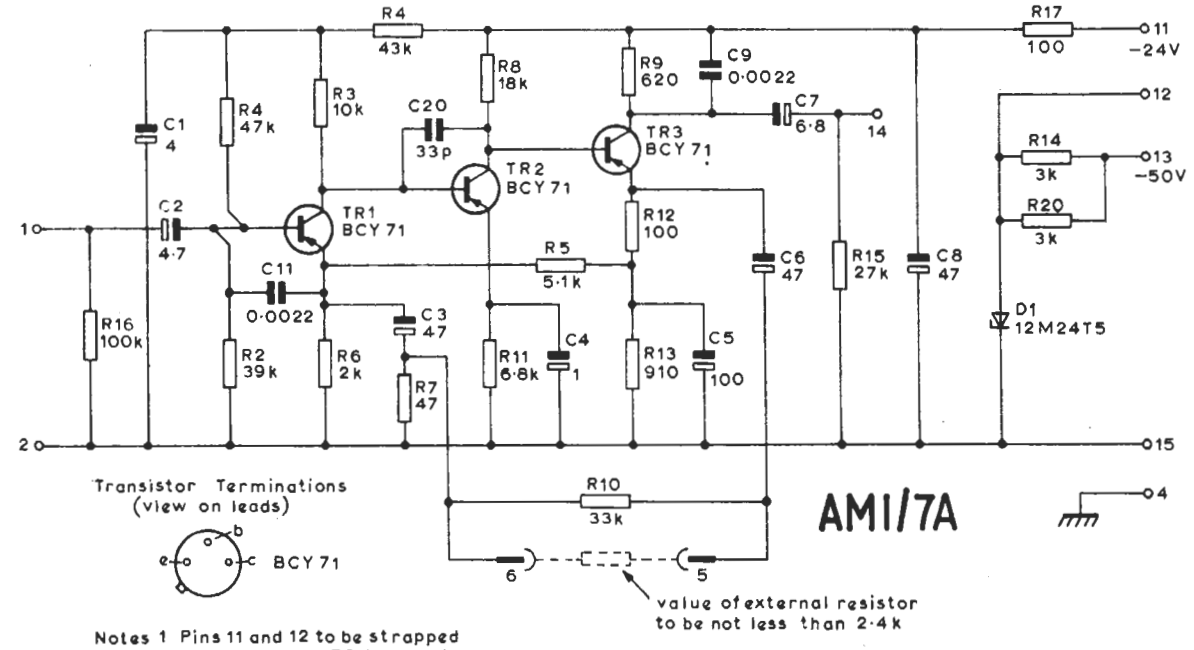


Fig. 1 Circuit of the AM1/7 and 7A