LINE AMPLIFIER AM7/7

Introduction

This unit is used in programme effects generator EP1M/8 and also in magnetic recorder RD4/4 and linking console DK1/5. It has a fixed gain, normally of 40 dB, and is then intended to deliver programme from a 50-ohm balanced output impedance into a 600-ohm line.

Mechanical Details

All components except the output transformer, which is mounted separately, are carried on a printed-wiring board of standard ISEP size (7 in by 4.4 in) having a 25-way plug fitting into a standard ISEP nest. The plug coding positions are 3, 7 and 19.

General Specification*

1-kHz Impedances and Gain

Source impedance	1 kilohm
Input impedance	about 12.5 kilohms
Output impedance	about 50 ohms balanced
Load impedance	600 ohms
Gain with 1-mW output into 600 ohms	47 ±1 dB

1-kHz Harmonic Distortion†

Output (dBm)	*Total %*	*% 2nd*	*% 3rd*
+10	0.3	<0.3	<0.1
+20	0.2	<0.1	<0.2
+25	starts to clip		

*With standard output transformer AAL/41-E. See Fig. 1.

†In addition to the total harmonic figure used for general maintenance purposes and given under Maintenance Tests, limit values for the two main distortion components are specified here because:

(a) AM7/7 units are frequently used in sound tape-recording systems, and distortion products generated in the basic magnetic recording process are mainly third harmonics, whereas transistor-circuit distortion is often predominantly second harmonic. Consequently, a knowledge of individual harmonic distortion percentages in apparatus used with tape machines can be helpful in isolating a fault.

(b) If a transistor in an AM7/7 has to be changed, it may be necessary to measure the separated harmonic products so as to ensure that the replacement has parameters which suit the particular circuit. (Some transistor types exhibit a wide spread in the amount of second harmonic distortion produced by different examples.)

Obviously, a harmonic analyser is required to check individual distortion-component percentages. Since such instruments are not generally available, suspect units must be returned to an appropriate maintenance area for measurement and repair.

Frequency Response

20 Hz to 20 kHz	±0.5 dB

Noise

With the input terminated by a 600-ohm resistor, the noise measured (peaking to 6) across a 600-ohm load with a high-impedance T.P.M. should be at least 65 dB below 0 dB.

Circuit Description

The circuit of the amplifier is shown in Fig. 1, which has been annotated to describe the functions of the different parts.

Maintenance Tests

Fig. 2 shows a suitable test circuit.

Test Apparatus

The following test apparatus was used to obtain the measurements given subsequently.

24-volt power supplier
Audio-frequency tone-source
600-ohm attenuator
1:1 transformer
High-impedance a.c. voltmeter (Z > 1 megohm)
Harmonic routine tester FHP/3
Avometer Model 9
Oscilloscope
Two 600-ohm ±2% resistors

D.C. Conditions

Typical values measured with the Avometer Model 9 on its 100-mA and 30-volt ranges are:

Supply voltage	−24 volts
Total current	67 mA
TR1 emitter	−1.4 volts
TR2 emitter	−8.5 volts
TR3 emitter	−8.5 volts
TR6 emitter	−4.2 volts
TR7 emitter	−4.2 volts

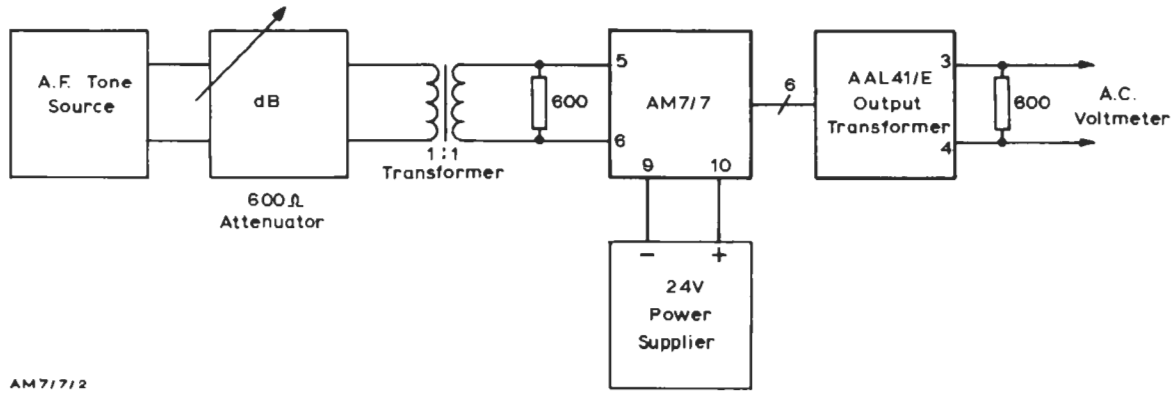

Fig. 2. Test Circuit for the AM7/7

Total Harmonic Distortion

For tests carried out with harmonic routine tester FHP/3 the following figures should be obtained.

Output (dBm)	*Harmonic Separation (dB)*	*Equivalent Percentage Harmonics*
+10	50	0.3
+20	40	1

Typical Internal Levels

With 0 dB output into 600 ohms, the following levels should be obtained when measured with a high-impedance measuring instrument, e.g., an a.c. voltmeter.

Measuring Point	*dB*	*Volts*
Input tags 5 and 6	−47	0.00346
TR1 collector	−30.5	0.0231
TR2 collector	−19	0.0821
TR3 collector	−20.5	0.0733
TR6 collector	−0.7	0.716
TR7 collector	−0.7	0.716

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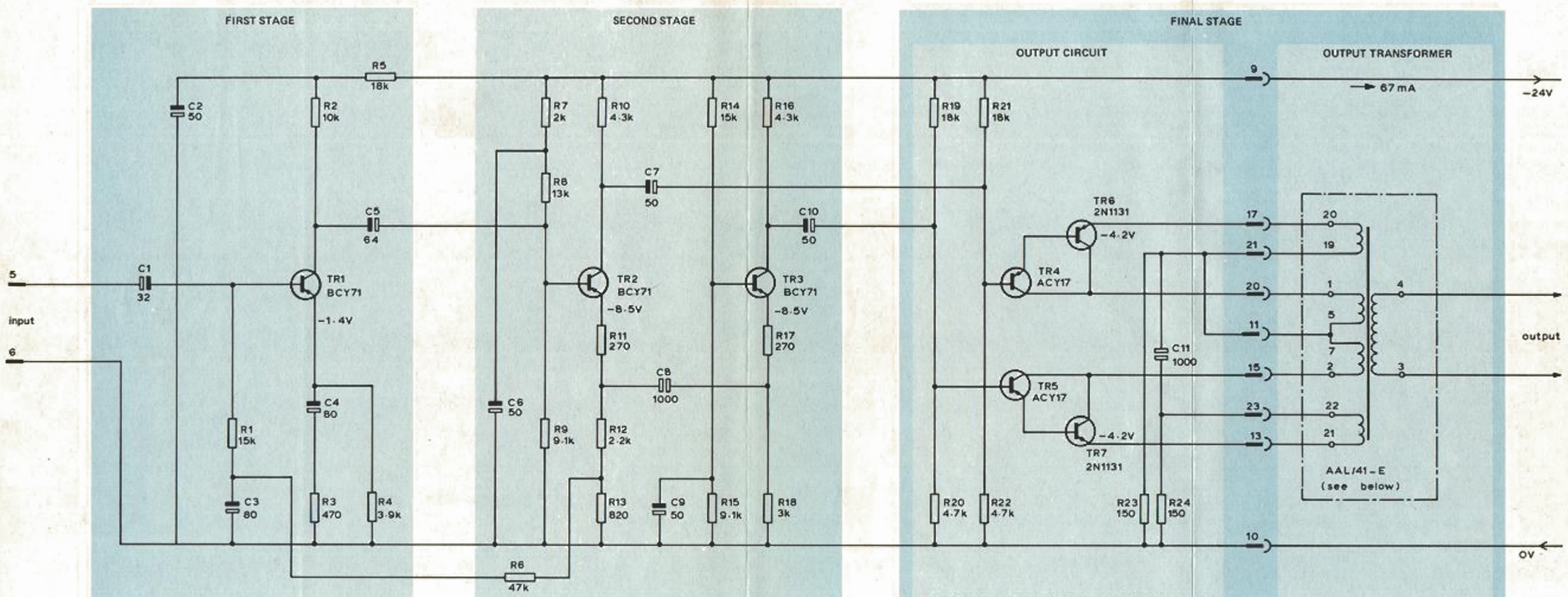
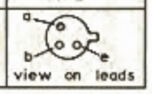


TR1 has emitter negative feedback via R3 above about 20 Hz. Base bias is obtained from emitter circuit of TR2 via R6.

TR2/TR3 form a paraphase pair with input to the base of TR2. Anti-phase outputs are produced at TR2 and TR3 collectors to feed next stage.

Two 'Darlington' pairs, TR4/TR6 and TR5/TR7 in class-A push-pull coupled to the externally-mounted output transformer which has feedback windings in the emitter circuits of TR6 and TR7. (Balanced) output impedance is 50 ohms.

Note that an alternative output transformer (type AAL/47-E) can be fitted suitable for a load of about 6 ohms. The overall gain is then reduced by 10 dB.

TR No.	REF	TYPE
1, 2, 3, 4, 5, 6, 7.	BCY71 ACY17 2N1131	 view on leads

from D22822 A3

AM7/7/1A

Fig. 1. Circuit of AM7/7