SOUND-IN-SYNCS AUDIO EXPANDER AM1/38

Introduction

The AM1/38 forms part of the audio expander system of a sound-in-syncs decoder[1] and is used in conjunction with a UN3/27 Audio Expander Control Unit and a FL1/31 Filter Unit.

The unit accepts:

(a) an audio signal from the sample-and-hold section of the decoder
(b) a pilot tone signal from the UN3/27
(c) a control signal from the UN3/27

and provides:

(a) an expanded and de-emphasised audio signal
(b) an expanded pilot tone signal for use in the UN3/27
(c) an uncontrolled audio signal for use in the FL1/31.

The expansion provided by the AM1/38 is determined by the control signal which is derived from the UN3/27 unit; this signal is applied to two matched variable-gain stages in which the amplitudes of the audio and pilot-tone signals are determined. The gain is variable over a range of 18 dB.

The AM1/38 is constructed on a CH1/12A chassis fitted with a CH1A/16 screen and which has index pins in positions 29 and 35. Power supplies at +24V are required.

General Specification

Inputs

Audio	unbalanced, 600 ohms.
Filtered Audio	unbalanced, 600 ohms, maximum input level −20 dB w.r.t. 1mW.
Pilot Tone	unbalanced, 600 ohms, maximum input level −20 dB w.r.t. 1mW.
Control Voltage	high-impedance w.r.t. 600 ohms, normally in range +200mV to +4V.

Outputs

Expanded Audio	balanced, 120-ohms, maximum output level +12 dB w.r.t. 1mW when feeding a 600-ohm load.
Audio to FL1/31	two, unbalanced 600-ohm.
Signal-to-Noise Ratio	70 dB, weighted (peak signal to peak noise)
Harmonic Distortion	less than 0·2% at 1kHz with an output of +10 dB w.r.t 1mW into 600 ohms.
Power Consumption	100 mA at +24V.

Circuit Description

A circuit diagram of the AM1/38 is given in Fig.1. The audio input signal at PLA 14 is applied to emitter-followers TR1 and TR2. The output from TR2 is fed, via PLA 13, to series-connected band-stop and low-pass filters in an associated FL1/31 Filter Unit; here the pilot-tone component of the signal is removed and the remaining audio signal is band-limited. The filtered audio is then fed back to the AM1/38 via PLA 4. The output from TR1 is fed. via PLA 12, to a band-pass filter in the same FL1/31 unit.

The matched field-effect transistors TR3 and TR4 are fed with a control voltage which is derived from a pilot tone signal in an associated UN3/27 unit. The control voltage amplitude is determined by the compression applied to the pilot tone signal in the coder. As the control voltage varies so does the drain/source resistance of transistors TR3 and TR4; thus TR3 and TR4 function as variable-gain devices and apply a varying amount of attenuation to the signals which are applied to their drain electrodes, TR3 controls the pilot tone signal and TR4 the audio signal.

Transistors TR5 to TR7 form a three-stage low-noise amplifier; d.c. feedback is applied to the base of TR5 from the emitter of TR6 and a.c. feedback is applied to the emitter of TR5 from the emitter of TR7. From the amplifier the signal is applied to a de-emphasis network comprising R28, R29, R30 and C8; this network complements the pre-emphasis network provided in the coder and restores the high-frequency components of the audio signal to their correct value. Variable resistor R30 determines the maximum h.f. loss introduced by the de-emphasis network and is adjusted as part of the line-up procedure for the decoder as a whole.

The de-emphasised signal is fed via emitter-follower TR13 to a two-stage amplifier comprising transistors TR8 and TR9. The gain of the amplifier is dependent on the setting of R37 and can be varied between +14 dB and +26 dB; the normal setting is 20 dB. Resistor R47 and capacitor C8 provide a small increase in gain at frequencies above 10 kHz and thus compensate for losses introduced by the filters in the FL1/31.

Transistors TR10 to TR12 form a three-stage output amplifier which provides a low output impedance and has a nominal gain of 15 dB. Negative feedback is applied from the emitter of TR12 to the emitter of TR10. The signal developed at the emitter of TR12 is capacitor-coupled to transformer T1 to prevent d.c. flowing in the primary winding. The effective output impedance of the unit is almost wholly made up of the transformer winding resistance referred to the transformer secondary.

Maintenance

The unit should be tested as part of a sound-in-syncs decoder. With the UN23/531 sample-and-hold unit removed from the decoder assembly and the AM1/38 mounted on an extender board, the typical measurements given in Table 1 should be obtained; the figures correspond to an input of 1 kHz at 0 dB at the coder, when the decoder is delivering 0 dB into a 600-ohm load.

Table 1

Measured at	*a.c. p p voltages*
TR1 emitter	1·0V
TR2 emitter	1·0V
PLA 4	90 mV
TR5 base	9 mV
TR5 collector	35 mV
TR6 collector	150 mV
TR6 emitter	–
TR13 emitter	60 mV
TR8 base	40 mV
TR8 collector	–
TR9 collector	520 mV
TR10 base	–
TR10 collector	600 mV
TR11 collector	2·7V
TR12 emitter	2·7V

References to Typical Associated Equipment
1. Sound-in-syncs Decoder CD3M/504

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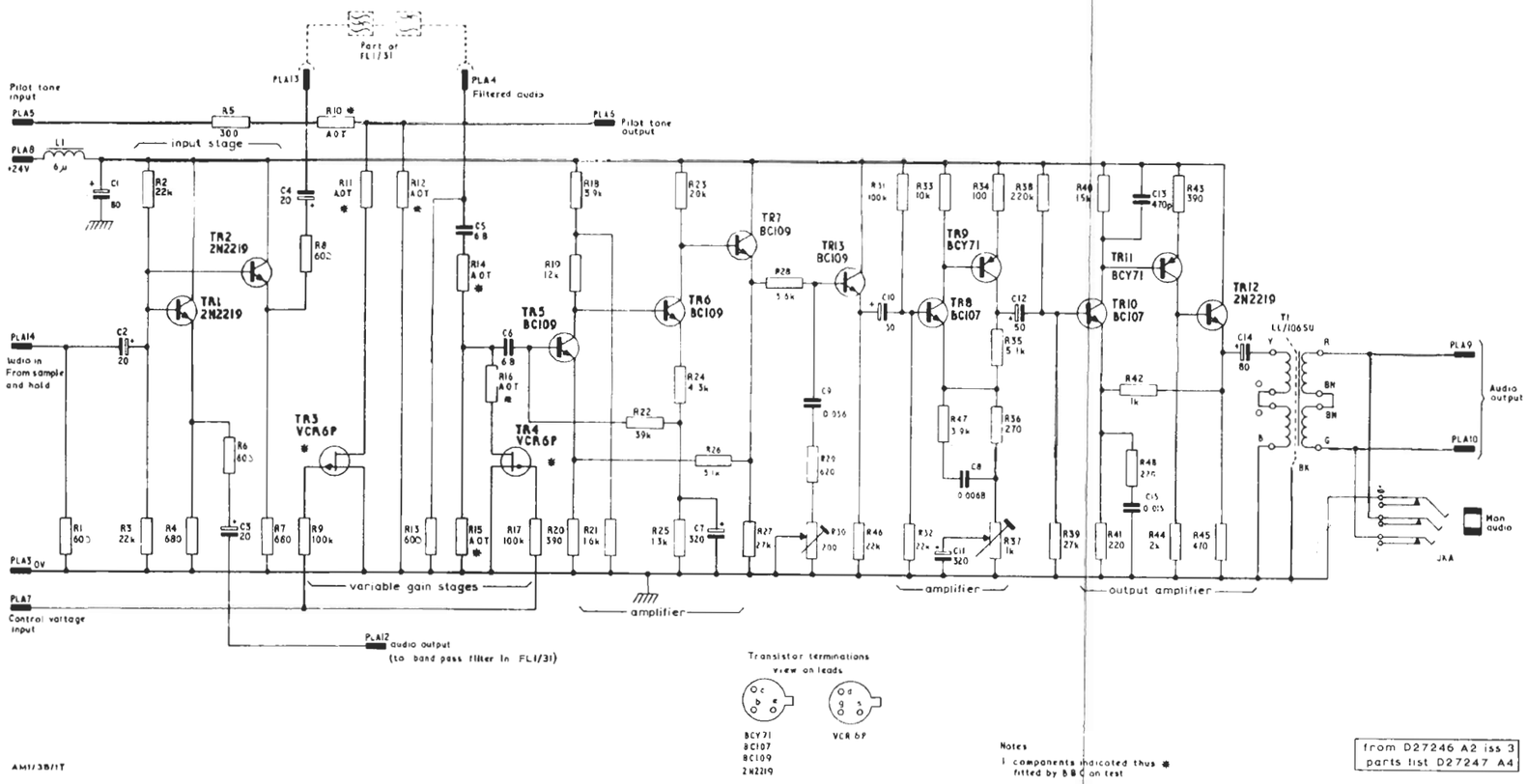

Fig. 1 Circuit of the Audio Expander Amplifier AM1/38