

RESPONSE SELECTION AMPLIFIER AM1/9 AND AM1/9P

General Description

This five-stage amplifier has a mid-band gain adjustable to unity; the gain at high and low audio frequencies, that is, the frequency response, is variable to enable the amplifier to perform a similar function to that of the Variable Correction Unit Type VCU/1A (Instruction R.5, Section B). The unit incorporates a mains-operated power supplier.

The amplifier is constructed on a 19-in. by 5¼-in. panel, and can be mounted on a bay, through which the unit projects, or in a standard case for portable use. The apparatus-code suffix P denotes the portable version. The construction is partly of conventional wire-connected components on a chassis, with the small components (including some transistors) on tag strips; two parts of the circuit, however, form sub-assemblies on printed-wiring boards.

The input and output connections are via pairs of paralleled jacks on the panel; the mains lead of the portable version passes through a hole in the panel. The sheet-metal cover for the chassis has a cut-away to enable internal soldered connections to be made to the unit when it is bay-mounted.

General Specification

Frequency-control Facilities

(a) Hum Filters

One or two component frequencies can be attenuated approximately 30 dB with respect to the remainder of the signal. These frequencies can be either 50 Hz or 60 Hz, and/or either 100 Hz or 120 Hz (Fig. 1.3).

(b) Treble and Bass Variation

The gain of the amplifier can be varied continuously between +14 dB and -14 dB (approximately) at frequencies of 10 kHz and 40 Hz, either separately or together; the frequency response rises and falls gradually between these frequencies and 800 Hz; see Fig. 1.1.

(c) Presence Effect

The gain of the amplifier can be increased over a narrow frequency range about 1.4 kHz, 2.8 kHz or 5.6 kHz, at which central frequencies the maximum increase can be either 3 dB or 6 dB; see Fig. 1.2.

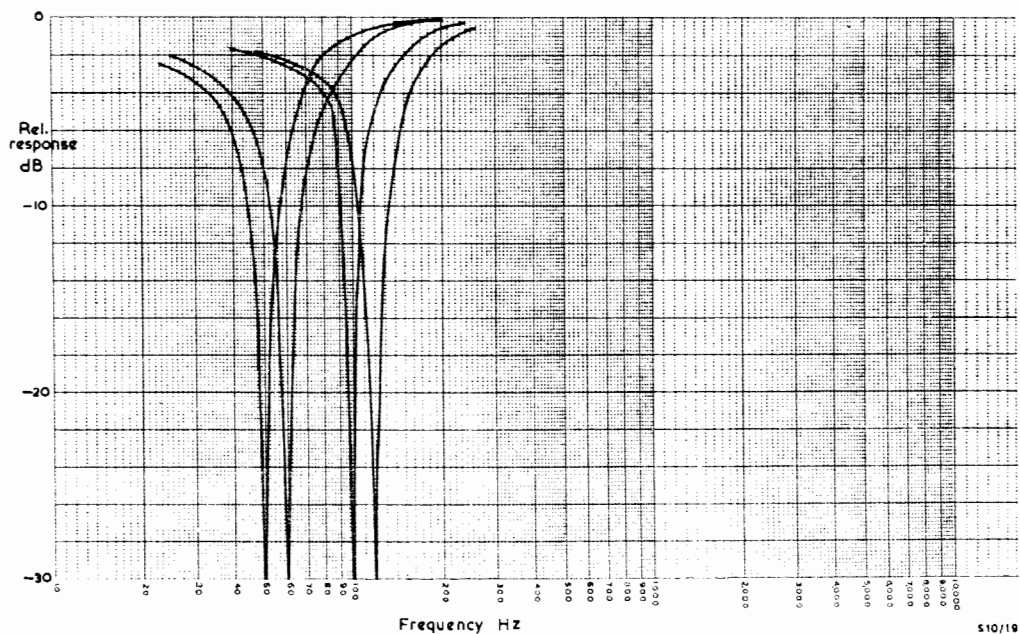


Fig. 1.3. Effect of Hum Filters
Drawing No. D 16837 A4

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(d) Low-pass Filters

Four filters are provided, and they can be switched into the amplifier circuit either singly or in any combination. Their characteristics are as follows:

Filter No.	Nominal Cut-off Frequency (kHz)	Cut-off Frequency (kHz)	Frequency of Infinite Attenuation (kHz)
1	5	5.3	15.7
2	7	7.3	15.7
3	9	9.23	10.125 & 15.7
4	14	14.25	15.7

The frequency-response curves of these filters are shown in Fig. 1.4.

Unmodified Frequency Response

With the *Bypass* key operated, the response of the amplifier in the range 60 Hz to 10 kHz should lie between +0.2 dB and -0.6 dB relative to that at 1 kHz. In the range 40 Hz to 15 kHz the values

are +0.2 dB and -1.0 dB.

Levels and Impedances

Normal level of operation Zero programme volume
 Maximum output level +22 dB (voltage) across 600 ohms
 Maximum input level +12 dB (voltage)
 Nominal voltage gain 0 dB at 1 kHz, variable by ± 5 dB
 Input impedance 50 kilohms at 1 kHz
 Normal source resistance 300 ohms
 Normal load Not less than 600 ohms

Distortion and Noise

With the *Gain* control at its maximum setting and the input-signal level set to give an output level of +18 dB, the total harmonic content of the output signal should not exceed:

0.4 per cent at 1 kHz,
 0.6 per cent at 60 Hz

The level of the total noise, measured by a Test Programme Meter peaking to 6, should not exceed -65 dB.

Supply Voltage

200—260 V, 50 Hz.

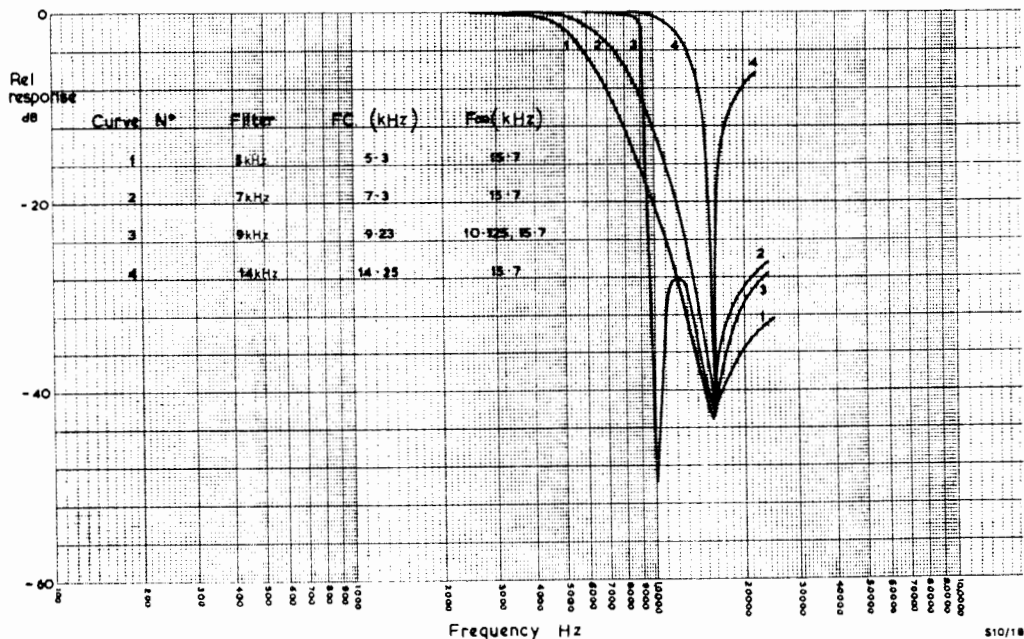
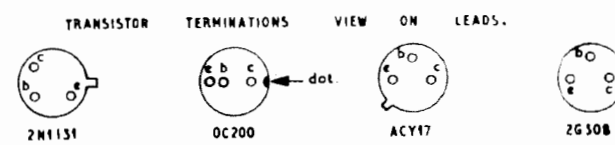
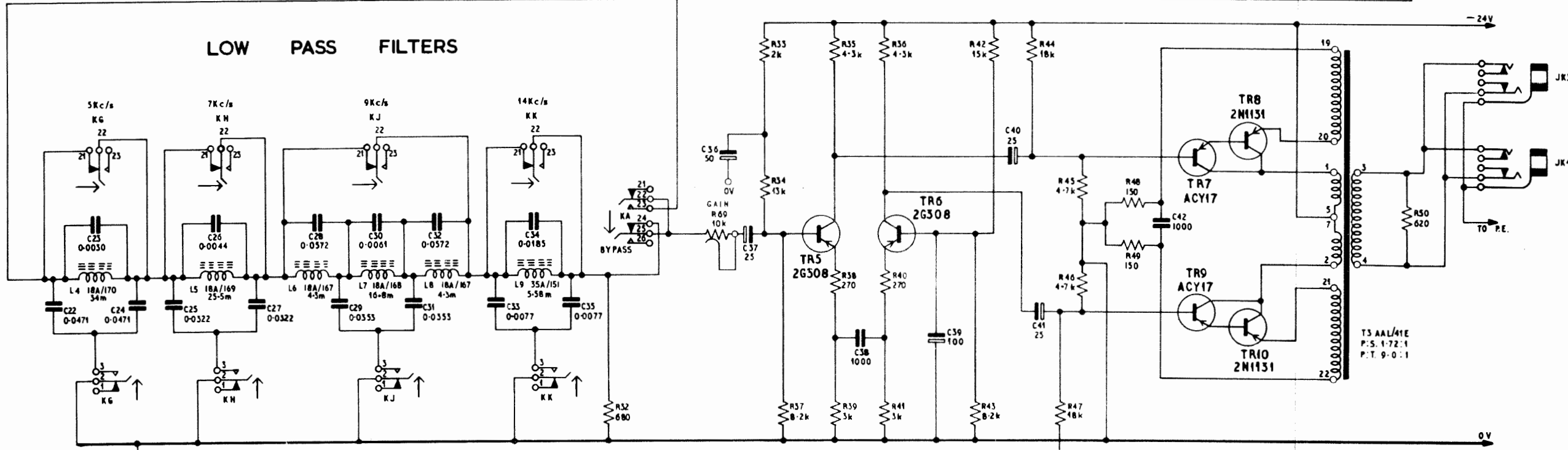
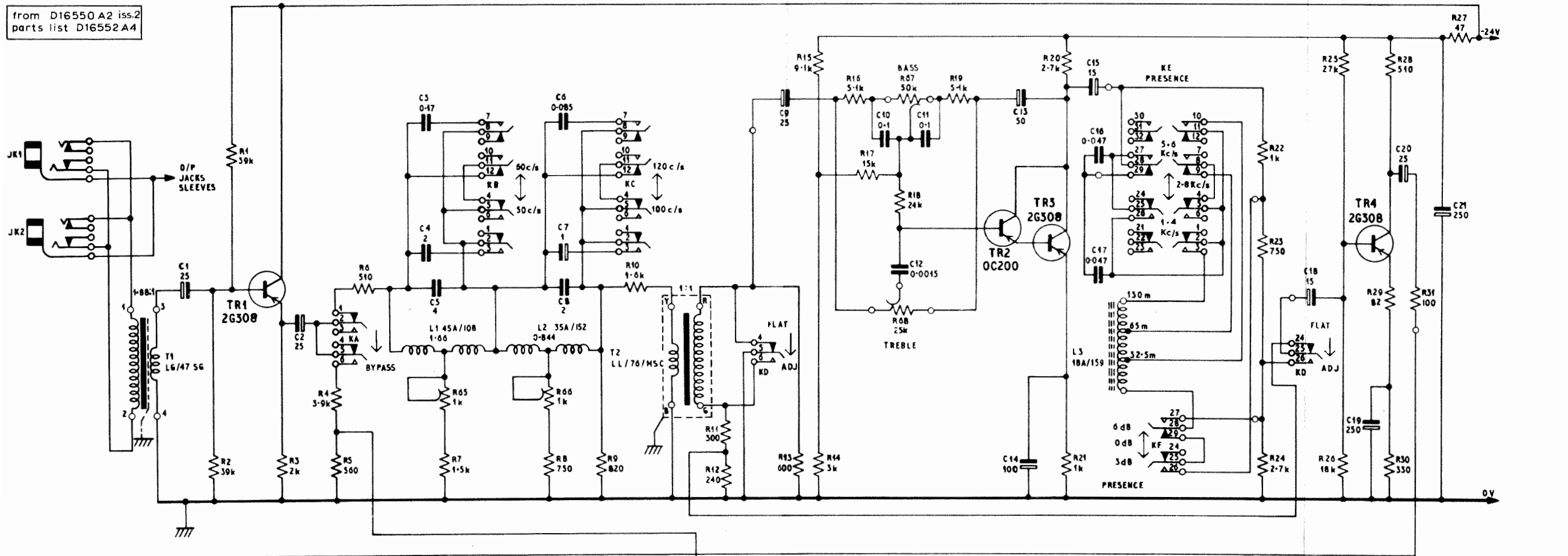


Fig. 1.4. Effect of Low-pass Filters
 Drawing No. D 16840 A4



all resistors are to be $\frac{1}{4}w$,
except R28 & R30 which are $\frac{1}{2}w$

Fig. 1.5. Response Selection Amplifier AMI/9
and AMI/9P: Circuit

Controls

- (a) *Bass* and *Treble* controls. These enable the low- and high-frequency responses, respectively, of the amplifier to be varied continuously as shown in Fig. 1.1.
- (b) *Gain* control. This enables the mid-frequency gain of the amplifier to be adjusted to unity.
- (c) *Normal/Bypass* key. When set to *Bypass*, this key switches out of circuit all the frequency-response-modifying devices of the unit.
- (d) *Notch c/s* keys. There are two keys, each having a normal setting intermediate to alternative settings identified by figures. The figures, 50 and 60 on one key and 100 and 120 on the other, apply to the rejection frequencies (in Hz) of hum filters switched into circuit at the labelled settings. The keys can be used either individually or together.
- (e) *Frequency-response Controls*. These are a group of three keys. One is labelled *Flat/Adj.*, and the other two are identified by a common *Presence* designation in addition to their individual labelling, 3 dB/0/6 and 1.4 kc/s/2.8/5.6.

When set to *Flat*, the first-mentioned key switches out of circuit the *Bass* and *Treble* controls, item (a), and also the *Presence* keys, but does not affect the hum filters and low-pass filters.

The *Presence* keys operate the facility described in item (c) of the General Specification.

(f) *Low-pass Filter* keys. There are four keys, individually associated with filters for which tabulated details are given under heading (d) in the General Specification. They switch the filters into circuit when operated from unlabelled normal settings to settings labelled *L.P. Filter: 5 kc/s*, (7 kc/s, 9 kc/s and 14 kc/s). The keys with the 9 kc/s and 14 kc/s designations are also labelled *T.V. Whistle Supp.: 405 lines* and *525/625 lines*, respectively, indicating intended use of the filters to eliminate unwanted signal components induced in audio circuits by television equipment.

Circuit Description

Circuit diagrams of the amplifier and the power supplier are given in Figs. 1.5 and 1.6, respectively.

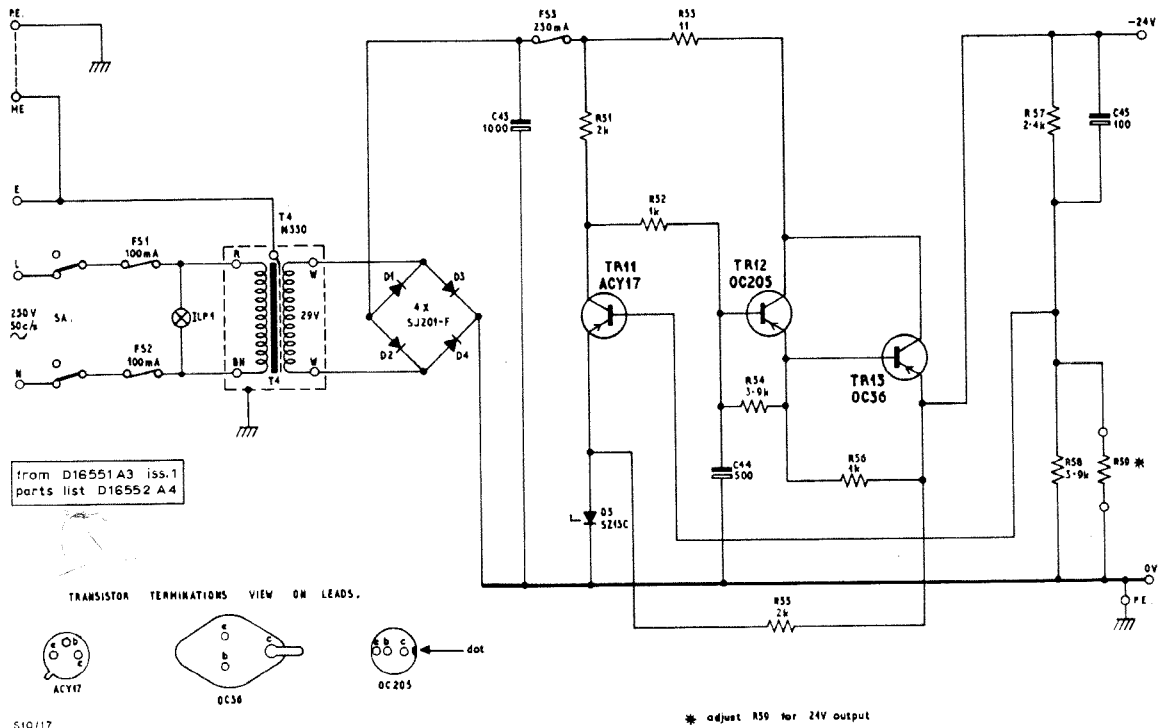


Fig. 1.6. AMI/9 and AMI/9P: Circuit of Internal Power-supplier

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The incoming signal is applied via an emitter-follower to the hum filters, which are of similar configuration and connected in tandem. Normally the filters are bypassed through contacts of the *Notch c/s* keys. When these keys are operated, capacitors C5 and C8 are shunted by additional capacitors having values appropriate to tuning the filters to the required rejection frequencies.

The circuit between T2 and C20 closely resembles that of the AM1/4 amplifier, previously described in this Section. Minor differences are the dissimilar wiring of the *Flat/Adj.* key KD and the use of key KE, instead of a rotary switch, to select the operative frequency of the Presence facility.

The low-pass filters are connected in tandem, each normally bypassed with its shunt elements disconnected by contacts of the associated key (KG, KH, KJ and KK). The more complex filter, C28-C32 and L6-L8, has two frequencies of infinite attenuation, the lower one corresponding to the line frequency of a 405-line television system (Fig. 1.4).

From the low-pass filters the signal passes via the *Gain* control R69 to output amplifying stages, comprising a phase-splitting stage TR5, TR6 driving a push-pull stage TR7, TR8 and TR9, TR10.

The power supplier (Fig. 1.6) incorporates a

voltage-stabilising circuit using TR11, TR12 and TR13 in accordance with a well-known technique described in Instruction G.2.

Maintenance

D.C. Readings

The following table of typical voltages *with no signal input* is given to assist in fault-tracing.

<i>Transistor</i>	TR1	TR3	TR4	TR5	TR6	TR8	TR10
<i>Emitter-earth Voltage</i>	11·4	4·5	7·8	8·1	8·1	4·2	4·2

The measured voltages of TR8 and TR10 should be equal within 0·1 volt.

Adjustment of Tuned Circuits

The tuning of the hum filters and the low-pass filters is described under headings 5 and 7 respectively in Designs Department Specification No. 3.418(65). Adjustment of the hum filters involves pre-set resistors R65 and R66 (Fig. 1.5), which should not otherwise be disturbed.

DEH/0167