SECTION 11

AMPLIFIER MNA/1

General Description

This amplifier is used in the new Type-A studio equipment to provide facilities for simultaneous visual and aural monitoring across a high-level programme circuit. Strictly speaking, the MNA/1 is an interim design, and consists essentially of a PPM/2 amplifier modified to give an audio output circuit. The design is such that existing PPM/2 amplifiers can be modified to the new circuit arrangement if required.

Electrical Design Considerations

The amplifier comprises a stage of voltage amplification with feedback, feeding two output circuits, one giving a signal at zero level and having 600-ohms impedance for aural monitoring purposes, and the other feeding a peak programme meter amplifier circuit, for visual monitoring. The latter is very similar to the circuit of the PPM 2, and has controls for adjusting the sensitivity, zero reading, zero balance and law of the programme meter. As in the PPM/2, a switch precedes the first valve and is used when the peak programme meter is calibrated in conjunction with a CAL 1 unit. The amplifier has a high input impedance so that it may be connected across 300-ohm or 600-ohm programme sources without appreciably affecting the level.

Mechanical Design Considerations

The amplifier is built on a standard 4½-in. panel and when mounted on a bay the following controls are accessible at the front with the cover in position :—Calibration Switch ; Zero Control ; Feed Meter Jack ; Feed Meter Switch ; Programme Meter Jack. The law, sensitivity and zero balance controls are only accessible when the cover is removed. A drawing of the front of the amplifier is given in Fig. 11.1.

Circuit Description (Fig. 31)

The full circuit diagram of the MNA/1 is given in Fig. 31. It is very similar to that of the PPM/2 and reference should be made to Instruction S4, for full details of the method of operation. But the MNA/1 differs from the PPM/2 in the following respects :—

(a) It uses current and not voltage feedback. The feedback is applied to V1 by means of the resistors R14, R37 and R33. The p.d. developed across R14 and R33 by the a.c. component of the anode current of V1 is applied to the grid circuit via C1, R12 and R13 giving a feedback voltage of 10 dB. The d.c. component of the anode current in flowing through R14 provides automatic grid bias via R37, R12 and R13.

(b) The anode load of V1 consists of R17 and R19 in parallel and R18 as shown in the simplified circuit diagram, Fig. 11.2. The p.d. developed across the parallel network is used to feed the programme meter amplifier via C4 and T2, and the amplitude of the signal thus obtained can be adjusted by varying R17, this being the *Adjust Sensitivity* control. The particular arrangement

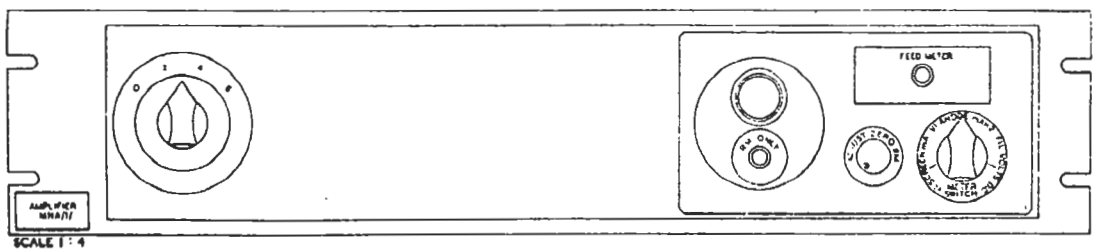


Fig. 11.1 MNA/1. Face Panel

adopted for the connections of this *Adjust Sensitivity* control is designed to maintain the source impedance feeding the diode circuit as nearly constant as possible. The p.d. developed across R18 provides the output for aural monitoring, connections to the output tags being made via C7 and the step-down matching transformer T3, which makes the output impedance effectively equal to 600 ohms.

Operation of the MNA/1

Input Volume

The MNA/1 can be used with an input volume of 0, + 4 or + 10 dB. Adjustment for the volume

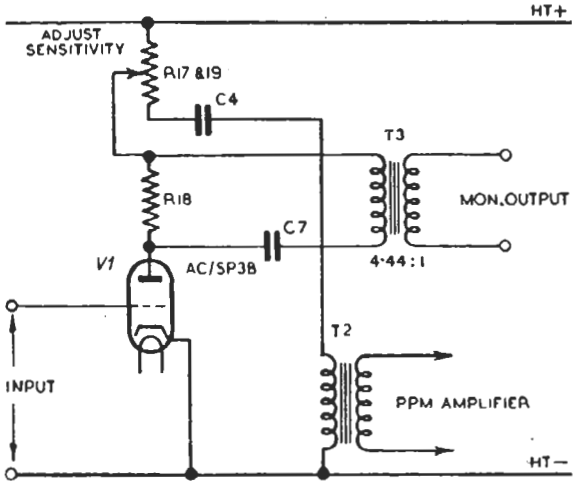


Fig. 11.2. MNA/1. Simplified Circuit of V1

normally required is made by soldering the two flexible leads on the input attenuator to the appropriate tags, which are accessible when the front cover is removed. The meter is adjusted so that it reads 4 at normal volume and 6 at maximum permissible peaks.

Calibration

This is carried out with the aid of a calibration unit CAL/1. The amplifier should be switched on at least ten minutes before calibration in order to ensure stability.

(1) Note the reading of the meter with no input to the amplifier. If this is not zero, turn the *Adjust Zero* control until zero reading is obtained.

(2) Connect the output of the CAL/1 to the input of the amplifier and set the calibration switch on the amplifier to 4. The meter should now read 4. If it does not, remove cover and adjust the *Sensitivity* control until a reading of 4 is obtained.

(3) Set the calibrating switch to 2 and 6 in turn. The meter should read 2 and 6 respectively.

If it does not, proceed as follows :—

(a) If the scale is too cramped, i.e., if the meter reads above 2 and below 6.
  (i) Remove the input plug.
  (ii) Turn the *Adjust Law* control until the meter reads between 0 and 1
  (iii) Bring the pointer back to zero by means of the *Adjust Zero* control.
  (iv) Replace the input plug and repeat (2) and (3).

(b) If the scale is too ' open,' i.e., if the meter reads below 2 and above 6, proceed as in (a) except that in test (ii) set the meter to read below zero in no-signal conditions by means of the *Adjust Law* control.

The process must be repeated until the error is reduced to a minimum.

Recalibration after Neon and Valve Replacements

Replacement of the rectifier D41 should not affect the calibration in any way, but after replacement of a neon tube or AC/VP1, the zero and law calibration including ' zero balance ' must be checked and adjusted. For this purpose it is necessary to provide a means of varying the supply voltage, and a tapped transformer or ' Variac ' should be interposed between the mains-supply socket and the mains unit feeding the amplifier MNA/1. A variation from the normal working voltage down to about 15 per cent below normal (e.g., from 240 volts down to 200 volts) should be obtainable.

The procedure is as follows :

(i) Adjust the mains-unit input voltage to the nominal value, e.g., 240 volts, and with the *Zero Balance* control fully clockwise (i.e., neon returned to earth), line up the programme meter in the usual way.

(ii) Set the *Zero Balance* control to its mid position, and restore the meter reading to zero by means of the *Adjust Law* control.

(iii) Reduce the mains-unit input to 200 volts. If the meter reading rises, the *Zero Balance* control has not been rotated far enough. If the reading falls, the control has been turned too far.

(iv) Restore the mains-unit input voltage to normal, rotate the *Zero Balance* control a small amount in the direction as indicated in (iii) above, and re-set the meter zero by means of the *Adjust Law* control.

(v) Reduce the mains unit input volts once again to 200, and proceed as above, until varying the voltage between 240 and 200 produces no change in the meter zero reading.

(vi) The *Zero Balance* control should be left in the position thus found unless either the neon tube or the AC/VP1 valve has to be replaced.

Each time the a.c. voltage is varied, before proceeding with the next step about 20 seconds should be allowed to elapse for the consequent variation in valve-heater voltage to take effect.

Valve Data

Valve	*Anode Potential*	*Anode Current*	*Screen Potential*	*Screen Current*	*Fil. Potential*	*Fil. Current*
Stage 1 AC/SP3B	80V	10mA	285V	3·5mA	4V a.c.	1A
Stage 2 D41	—	rectifier	—		4V	0·3A
Stage 3 AC/VP1	150V*	1·5mA*	†	0·6mA*	4V	0·65A

† Adjusted for law. *With no input.

Total Feed

L.T. Supply, 4 V a.c. 2·3 A or 6 V d.c.
H.T. Supply, 300 V 17 mA.

General Data

Neon Stabiliser
BBC Type S1
Pilot Lamp
P.O. No. 2, 4 V
Potentiometers
Adjust Sensitivity : Reliance TW, 5,000 Ω.
Adjust Zero : Morganite Stackpole, Type MNAP 50350, 50,000 Ω.
Adjust Law : Morganite Stackpole, Type MNAP 10250, 1,000 Ω.
Zero Balance : Morganite Stackpole, Type LHAP 50250, 5,000 Ω.

Switches
Calibration : Plessey Yaxley, Type B, s.p., 4-position.
Metering : Plessey Yaxley, Type A, 2-bank, 9-position.

Impedances
Normal Source Z = 300 Ω (balanced).
Normal Input Z = 10,000 Ω.
Output Z = 600 Ω.
Normal Load Z = 600 Ω (balanced).

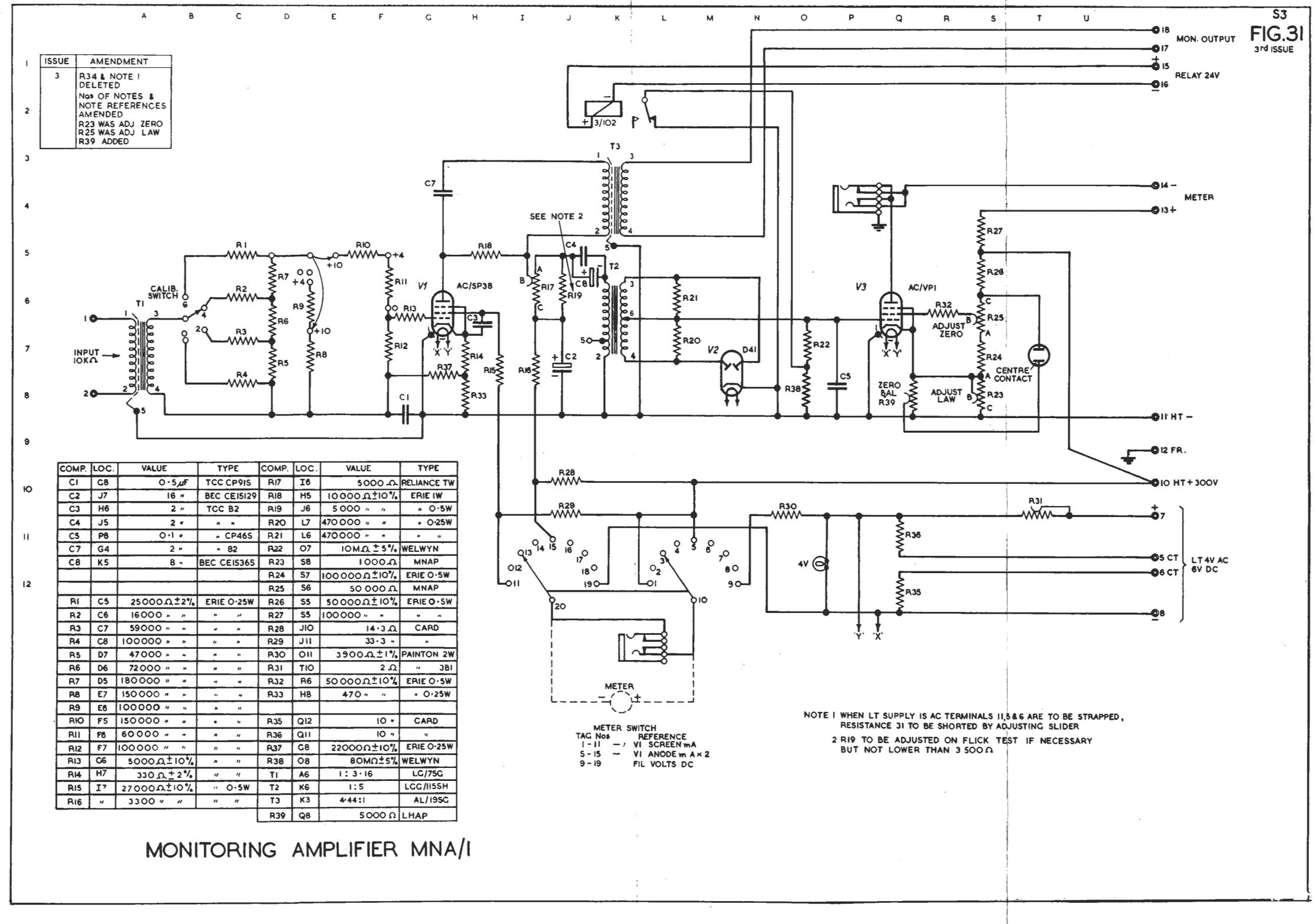
Normal Working Input Volume
0 dB, + 4 dB or + 10 dB. (Apparatus adjusted to read 4 on steady tone.)

Normal Working Output Volume
0 dB approximately when programme meter is peaking 6.
Normal Voltage Gain (audio)
Zero.
600-ohm Test Gain (audio-circuit)
15 dB with calibration switch on 6
Test Input Level
Zero (to give meter reading 4, with calibration switch at 4, and zero level on audio circuit).
Frequency Characteristic
±0·5 dB from 50 c/s to 10,000 c/s both audio and visual.
Total Percentage Harmonic Content

Frequency	*Normal working input and output levels*	*8 dB above normal input and output levels*
50 c/s	< 0·5	< 2
1,000 c/s	< 0·35	< 1·6

S3
FIG.31
3rd ISSUE

ISSUE	AMENDMENT
3	R34 & NOTE 1 DELETED Nos OF NOTES & NOTE REFERENCES AMENDED R23 WAS ADJ ZERO R25 WAS ADJ LAW R39 ADDED



COMP.	LOC.	VALUE	TYPE	COMP.	LOC.	VALUE	TYPE
C1	G8	0·5 µF	TCC CP91S	R17	I6	5000 Ω	RELIANCE TW
C2	J7	16 "	BEC CE15129	R18	H5	10000 Ω ±10%	ERIE 1W
C3	H6	2 "	TCC B2	R19	J6	5000 " "	" 0·5W
C4	J5	2 "	" "	R20	L7	470000 " "	" 0·25W
C5	P8	0·1 "	" CP46S	R21	L6	470000 " "	" "
C7	G4	2 "	" 82	R22	O7	10MΩ ± 5%	WELWYN
C8	K5	8 "	BEC CE15365	R23	S8	1000 Ω	MNAP
				R24	S7	100000 Ω ±10%	ERIE 0·5W
				R25	S6	50 000 Ω	MNAP
R1	C5	25000 Ω ±2%	ERIE 0·25W	R26	S5	50000 Ω ±10%	ERIE 0·5W
R2	C6	16000 " "	" "	R27	S5	100000 " "	" "
R3	C7	59000 " "	" "	R28	J10	14·3 Ω	CARD
R4	C8	100000 " "	" "	R29	J11	33·3 "	"
R5	D7	47000 " "	" "	R30	O11	3900 Ω ±1%	PAINTON 2W
R6	D6	72000 " "	" "	R31	T10	2 Ω	" 3B1
R7	D5	180000 " "	" "	R32	R6	50 000 Ω ±10%	ERIE 0·5W
R8	E7	150000 " "	" "	R33	H8	470 " "	" 0·25W
R9	E6	100000 " "	" "				
R10	F5	150000 " "	" "	R35	Q12	10 "	CARD
R11	F6	60000 " "	" "	R36	Q11	10 "	"
R12	F7	100000 " "	" "	R37	C8	22000 Ω ±10%	ERIE 0·25W
R13	C6	5000 Ω ±10%	" "	R38	O8	80MΩ ±5%	WELWYN
R14	H7	330 Ω ±2%	" "	T1	A6	1 : 3·16	LG/75G
R15	I7	27000 Ω ±10%	" 0·5W	T2	K6	1 : 5	LGG/115SH
R16	"	3300 " "	" "	T3	K3	4·44 : 1	AL/195C
				R39	Q8	5000 Ω	LHAP

NOTE 1 WHEN LT SUPPLY IS AC TERMINALS 11,5 & 6 ARE TO BE STRAPPED, RESISTANCE 31 TO BE SHORTED BY ADJUSTING SLIDER

2 R19 TO BE ADJUSTED ON FLICK TEST IF NECESSARY BUT NOT LOWER THAN 3 500 Ω

MONITORING AMPLIFIER MNA/1