

5 VERTICAL AMPLIFIER TYPE 'G'

5.1 GENERAL

The vertical amplifier type G is a dual range general purpose instrument with differential input facilities. It has a substantially flat frequency response from DC - 10 Mc/s at 20mV/cm and from DC - 0.5 Mc/s at 2mV/cm.

Direct coupling is used throughout to minimize phase shift and cathode follower output stages give low impedance outputs to the CRT 'Y' plates and trigger circuit.

The maximum differential input on either the 20mV/cm or 2mV/cm position is 10V P to P. The rejection ratio varies from 1000:1 at low frequencies to 100:1 at 10 Mc/s.

5.2 CIRCUIT DESCRIPTION

The vertical amplifier type G circuit is shown in Fig. 3.6 and is balanced throughout.

Input cathode followers, V1A and V2A, drive a cascode connected long tailed pair, consisting of transistors TR1 and TR2 as the lower part of the cascode arrangement and V1B and V2B as the upper part. A transistor TR3 acts as a high impedance tail.

To equalise the gains between the two halves, RV22, SET REJECTION, acts as a balanced attenuator between the cathode follower and amplifier stage. To equalise the DC levels, RV20, SET DC BALANCE, varies the cathode follower anode potentials, and hence cathode potentials.

Diodes MR1 and MR2 protect the transistors against large input voltage signals.

The output at V1B and V2B anodes, are connected via cathode followers V3A, V3B, to the output stage V4A, V5A. This is another long tailed pair with a preset SET GAIN control RV57 connected between the cathodes.

V4A and V5A-anodes are connected via cathode followers V4B, V5B to the CRT 'Y' plates.

Sync. signals are taken from V4B to the trigger circuit.

The gain is increased X10 by increasing the anode loads of V1B, V2B.

A negative supply is obtained by rectifying the 12.6V AC supply via MR3 and C22. A smoothed low impedance output is available from emitter follower TR4, the smoothing being achieved by R74, C21, R73, C19. The output potential is fixed by the attenuator R74, R73, R71.

A DC heater supply for V1 and V2 is obtained by rectifying the same 12.6V AC winding by MR4, C23.

Attenuator Network

The input attenuator is in a 1-2-5 ratio, having 2:1 and 5:1 attenuators between the emitters of TR1 and TR2 and 10:1 and 100:1 attenuators between the input sockets and V1.

The 10:1 and 100:1 attenuators are balanced and accurately set with presets RV3 and RV8.

5.3 G AMPLIFIER TEST PROCEDURE

Set DC Bal. & Rejection

Set DC BAL. fully clockwise; set REJECTION control to approx. mid-position using X1 gain.

With no input signal.

Switch to 0.1V/cm and centre trace with 'Y' SHIFT.

Switch to 0.2V/cm and centre trace with DC BAL. If trace will not centre, interchange V1 and V2.

Repeat this procedure until there is no trace movement in the attenuator switch positions.

Feed a 10 volt P to P signal to both inputs, and adjust the Set Rejection control for minimum display end signal.

Repeat the above-procedure until both DC BAL. and REJECTION are optimum.

Set Gain

With an accurately known 0.5V calibrating voltage at a frequency of about 1 to 10 Kc/s connected to either input I or II, DC, switch to 0.1V/cm and adjust SET GAIN (RV57) to give 5 cms deflection.

Switch to 0.02V/cm and a calibrating voltage of 0.1V and set preset trimmer (RV29) to correct gain. (5cms deflection).

Check that 0.02V/cm
0.05V/cm
0.1 V/cm

are all correct.

Set Attenuator

Apply a 1Kc/s squarewave (about 0.5V peak to peak) to both Input 1 and 2. Switch to Input 2 AC.

Turn the V/CM SWITCH to 0.2V/cm and adjust C4 for a flat-topped response.

Now switch to Input 1 AC. Adjust C1 for a flat-topped response.

Switch to differential AC and adjust RV3 until a straight horizontal trace is obtained (i.e. zero vertical deflection).

Repeat this procedure in the 2V/cm position of the attenuator switch, this time adjusting C12, C9 and RV8.

Connect a high impedance probe to both inputs and connect the output of the generator to the probe tip. Select Input I. Set the input attenuator to 0.02V/cm and the squarewave to give about 2 cms deflection.

Adjust the probe trimmer which is available through a hole in the probe body to give a flat top to the squarewave. Switch to 0.2V/cm and increase the squarewave amplitude. Adjust C5, for a flat top. Switch to 2V/cm and increase the squarewave amplitude. Adjust C7 for a flat top. Switch to Input II and repeat the above procedure but adjust C6 and C8 on the 0.2V/cm and 2V/cm ranges.

Set H.F. Response

Switch to 0.1V/cm sensitivity and X1 gain setting.

Adjust coils L1 to L4 for optimum pulse response.

Switch to 0.02V/cm sensitivity and adjust the preset trimmer capacitor for optimum response.

Check frequency response on 0.02V/cm range is not less than 3dB at 10 Mc/s.

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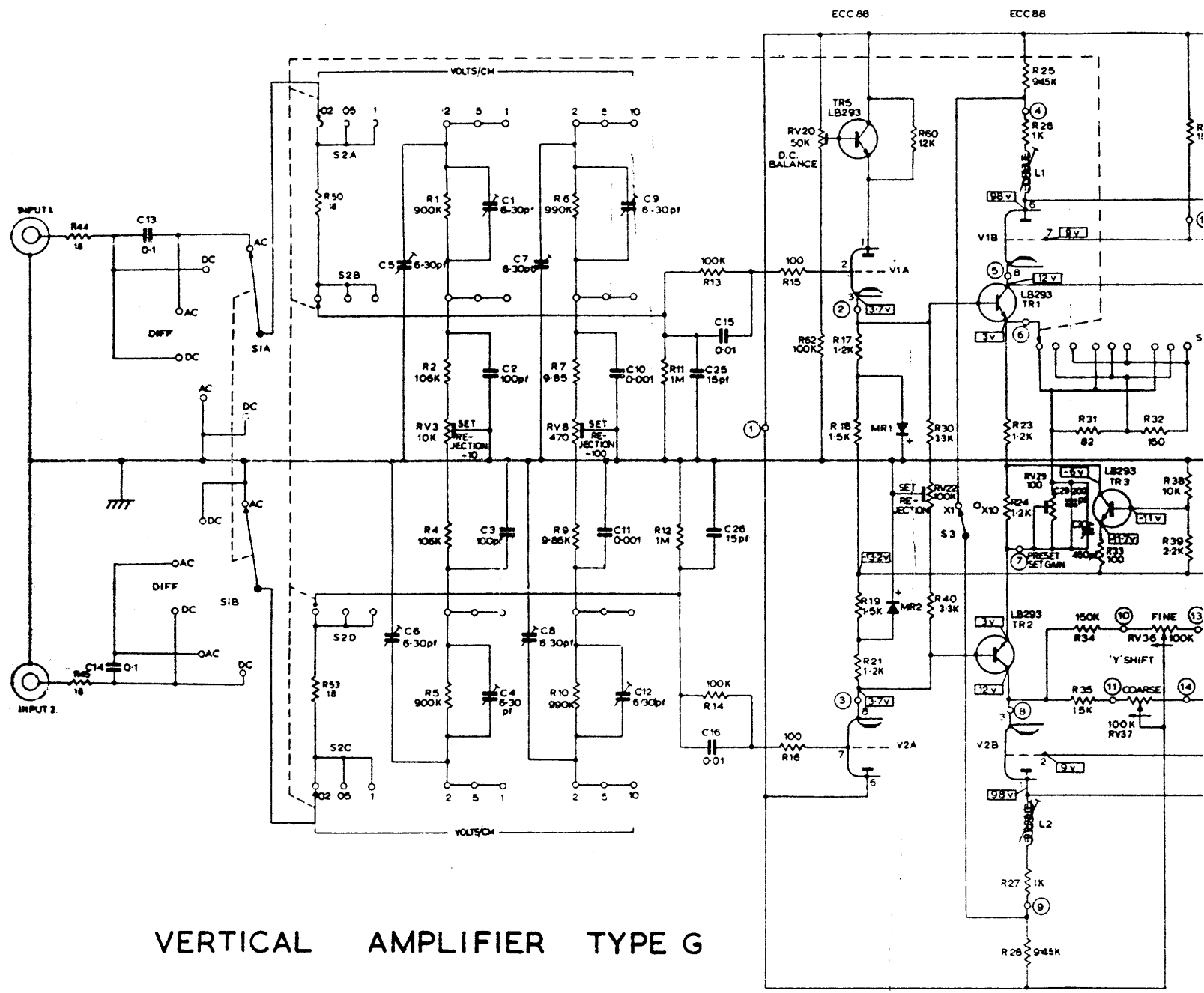
Part No.	C.C.T. Ref.	Value	Description	Tolerance	Rating @70°C	Part No.	C.C.T. Ref.	Value	Description	Tolerance	Rating @70°C
						121L	R32	150	HSC	1%	1/2w
12M	R 1	900K	HSC	1%	1/2w	S10110	R33	100	C	10%	1/2w
72M	R 2	106K	HSC	1%	1/2w	S15410	R34	150K	C	10%	1/2w
17C	RV 3	10K	C Potentiometer Preset ± 10 'Set Rejection'			Y15310	R35	15K	C	10%	1/2w
						24C	RV36	100K	C Potentiometer 'Fine Shift'		1/2w
72M	R 4	106K	HSC	1%	1/2w	118C	RV37	100K	C " 'Course Shift'		2w
12M	R 5	900K	HSC	1%	1/2w	S10310	R38	10K	C	10%	1/2w
11M	R 6	990K	HSC	1%	1/2w	S22210	R39	2.2K	C	10%	1/2w
71M	R 7	9.85K	HSC	1%	1/2w	S33210	R40	3.3K	C	10%	1/2w
16C	RV 8	470	C Potentiometer Preset ± 100 'Set Rejection'			S15410	R41	150K	C	10%	1/2w
						S15410	R42	150K	C	10%	1/2w
71M	R 9	9.85K	HSC	1%	1/2w	Y15310	R43	15K	C	10%	1/2w
11M	R10	990K	HSC	1%	1/2w	S18010	R44	18	C	10%	1/2w
10M	R11	1M	HSC	1%	1/2w	S18010	R45	18	C	10%	1/2w
10M	R12	1M	HSC	1%	1/2w	S10310	R46	10K	C	10%	1/2w
S10410	R13	100K	C	10%	1/2w	S10310	R47	10K	C	10%	1/2w
S10410	R14	100K	C	10%	1/2w	S10310	R48	10K	C	10%	1/2w
S10110	R15	100	C	10%	1/2w	S10110	R49	100	C	10%	1/2w
S10110	R16	100	C	10%	1/2w	S18010	R50	18	C	10%	1/2w
S12210	R17	1.2K	C	10%	1/2w	31X	R51	7.5K	W/W	5%	3w
S15210	R18	1.5K	C	10%	1/2w	31X	R52	7.5K	W/W	5%	3w
S15210	R19	1.5K	C	10%	1/2w	S18010	R53	18	C	10%	1/2w
146C	RV20	50K	C Potentiometer Preset 'Set D.C. Balance'			Y27210	R54	2.7K	C	10%	1/2w
						125L	R55	8.2K	W/W	5%	5w
S12210	R21	1.2K	C	10%	1/2w	125L	R56	8.2K	W/W	5%	5w
104C	RV22	100K	C Potentiometer Preset 'Set Rejection'			119C	RV57	500	C Potentiometer Preset 'Set Gain'		
						Y27210	R58	2.7K	C	10%	1/2w
S12210	R23	1.2K	C	10%	1/2w	S10110	R59	100	C	10%	1/2w
S12210	R24	1.2K	C	10%	1/2w	S12310	R60	12K	C	10%	1/2w
97L	R25	9.45K	HSC	1%	1/2w	S10110	R61	100	C	10%	1/2w
83L	R26	1K	HSC	1%	1/2w	S10410	R62	100K	C	10%	1/2w
83L	R27	1K	HSC	1%	1/2w	S15310	R63	15K	C	10%	1/2w
97L	R28	9.45K	HSC	1%	1/2w	S15310	R64	15K	C	10%	1/2w
113C	RV29	100	C Potentiometer 'Preset Set Gain'			74L	R65	4.7K	MO	5%	3/2w
S33210	R30	3.3K	C	10%	1/2w	74L	R66	4.7K	MO	5%	3/2w
120L	R31	82	HSC	1%	1/2w	S10110	R67	100	C	10%	1/2w

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Part No.	C.C.T. Ref.	Value	Description	Tolerance	Rating @ 70°C
S10110	R68	100	C	10%	1/2w
S47210	R69	4.7K	C	10%	1/2w
S27210	R71	2.7K	C	10%	1/2w
S47210	R72	4.7K	C	10%	1/2w
S22110	R73	220	C	10%	1/2w
S18110	R74	180	C	10%	1/2w
64L	R75	9.1	WW	5%	1w
S47210	R76	4.7K	C	10%	1/2w
73L	R77	680	MO	5%	3/2w
16J	C 1	6.30pF	CER TRIMMER		350v
59K	C 2	100pF	SM	20%	350v
59K	C 3	100pF	SM	20%	350v
16J	C 4	6.30pF	CER TRIMMER		350v
16J	C 5	6.30pF	CER "		350v
16J	C 6	6.30pF	CER "		350v
16J	C 7	6.30pF	CER "		350v
16J	C 8	6.30pF	CER "		350v
16J	C 9	6.30pF	CER "		350v
61K	C10	0.001	SM	20%	350v
61K	C11	0.001	SM	20%	350v
16J	C12	6.30pF	CER TRIMMER		350v
16K	C13	0.1	POL	20%	400v
16K	C14	0.1	POL	20%	400v
67J	C15	0.01	POL	20%	400v
67J	C16	0.01	POL	20%	400v
29J	C17	0.01	POL	20%	125v
40X	C18	32	ELEC		300v
33X	C19	250	ELEC		18v
33X	C21	250	ELEC		18v
33X	C22	250	ELEC		18v
47X	A/B	1000	ELEC		18v
	C23	1000	ELEC		18v
65J	C24	0.1	POL		400v

Part No.	C.C.T. Ref.	Value	Description	Tolerance	Rating @ 70°C
63X	C25	15pF	CER	5%	750v
63X	C26	15pF	CER	5%	750v
54K	C29	200pF	CER	20%	350v
15J	C30	450pF	CER TRIMMER		
18T	V 1		Valve Mullard ECC88		
18T	V 2		Valve Mullard ECC88		
18T	V 3		Valve Mullard ECC88		
18T	V 4		Valve Mullard ECC88		
18T	V 5		Valve Mullard ECC88		
119T	TR1		Transistor LB293 Motorola		
119T	TR2		Transistor " "		
119T	TR3		Transistor " "		
120T	TR4		Transistor Mullard ACY22		
119T	TR5		Transistor LB293 Motorola		
34E	MR1		Diode Mullard OA 81		
34E	MR2		Diode Mullard OA 81		
10E	MR3		Diode Ferranti ZS70		
10E	MR4		Diode Ferranti ZS70		
	L 1	5.5/11μH	Variable Inductor		
	L 2	5.5/11μH	Variable Inductor		
	L 3	14/36 μH	Variable Inductor		
	L 4	14/36 μH	Variable Inductor		
	L 5	1.22 μH	Inductor		
	L 6	1.22 μH	Inductor		
46D	S 1		Switch AC/DC		
47D	S 2		Switch Attenuator		
78C	S 3		Switch X1 X10 Slide SW		



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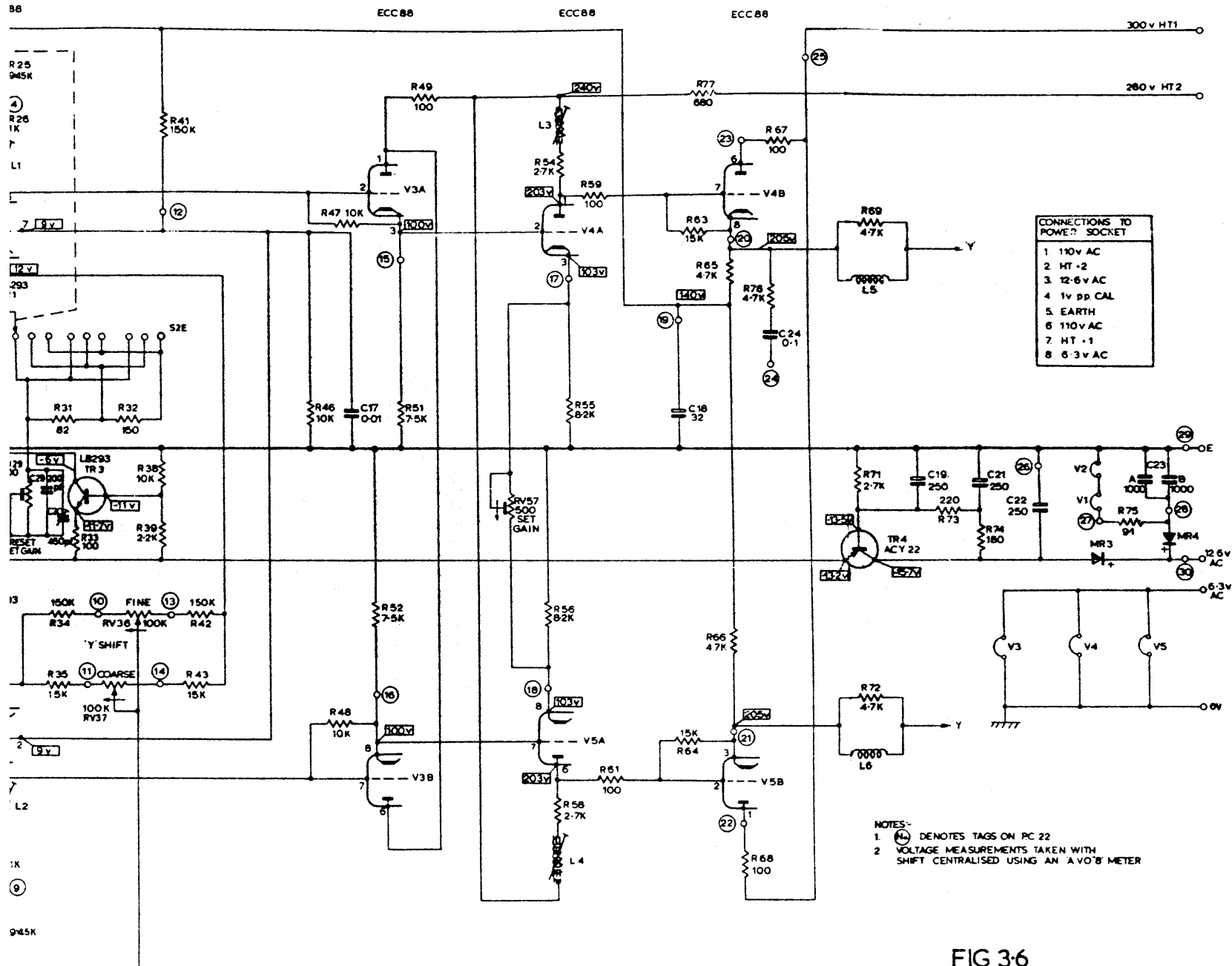
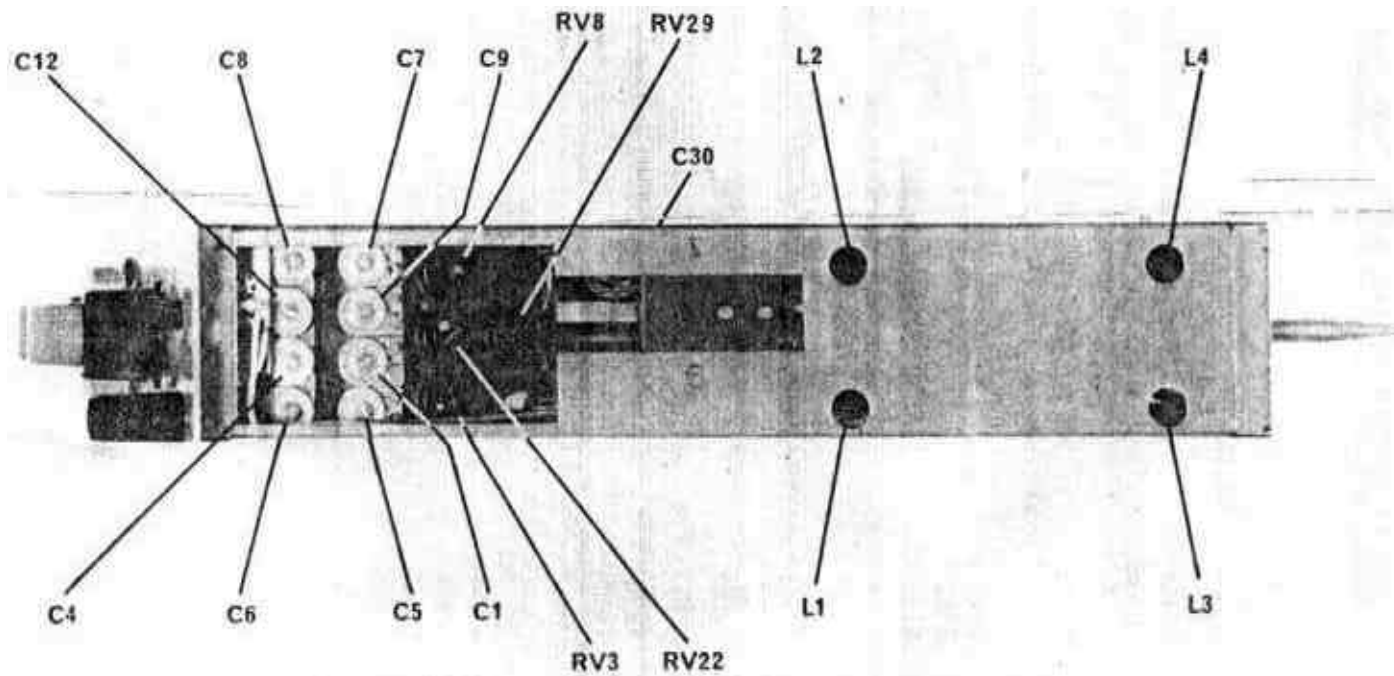


FIG 3-6



PRESETS TYPE G AMPLIFIER PLATE 6